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Basic needs analysis of participants in social forestry projects in north-west Bangladesh.

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BASIC NEEDS ANALYSIS OF PARTICIPANTS IN SOCIAL FORESTRY PROJECTS IN NORTH-WEST BANGLADESH

by

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Summary

Satisfaction of basic needs is among the priority objectives of the Bangladesh government, a priority reflected in the forestry sector. Elaborate programmes have been chalked out in both public and private sectors. This study attempts to assess performance of a public sector social forestry project in Bangladesh in terms of basic needs fulfilment of participating rural farmers. 'Thana Afforestation and Nursery Development Project' is a major social forestry project in Bangladesh, covering the whole country except the Sundarbans mangrove forest and the hill forests in the east. The project has several components, major among which are agroforestry (AF) and woodlot (WL) schemes. The project started in revised form in 1991–92. This research attempts to study the consumption pattern of basic needs goods (food and non-food) of participants and the project's contribution to satisfying basic needs. Rajshahi Division comprises north west Bangladesh and supports a large area of social forestry plantations.

A stratified multi-stage random design was adopted for sampling participants. Stratification was based on agro-ecological zones (AEZs), while the stages consisted of districts, villages and participants. The sample consisted of 180 participants (90 each from AF and WL) from 32 villages distributed in five districts and in five agro-ecological zones. A household questionnaire survey was administered to participants to apprehend various aspects like socio-economic profile, basic consumption needs, involvement in the project, benefits derived, and knowledge, awareness, attitude and opinions. Tree growth measures of participants' plots were also recorded to estimate expected final return, since no plot has been harvested, despite reaching the rotation age in 1998. Data analyses on socio-economic aspects of participants reveal that most males and females occur in the most economically active age class. 54% are literate with 24% having primary education. Agriculture is the main occupation (54%), while 32% have other occupations like tradespersons and professionals. Seasonal employment is dominant (57%) depending upon the nature of agriculture. Most households (42%) reported monthly income in the range Tk.1000-2000. AF plots are mostly in the range 0.2–0.4 ha while WL plots are larger (0.4–1.0 ha). Although the project is designed for landless farmers, in reality only 17% of farmers were genuinely landless, the remainder having their own land in the range 0.02–0.11 ha. Own land of AF and WL farmers is highly unequally distributed with Gini concentration ratio (GCR) of 0.60 and 0.61 respectively. 75% of participants have cattle (2 or more head). Food consumption of participants has been studied to some depth, food being the most important basic needs item. Participants consume 1010 gms of food per head per day, rice and vegetables constituting 55% and 22% of average daily food basket. Energy and protein consumption are relatively high in the national context (2427 Kcal and 72.38 gms per head per day). They derive higher food value from all major food items except fish and fruits, which are dearer and less available items in Rajshahi (also explained by income elasticity and regression analysis results). Poverty analysis tells quite an encouraging story: poverty head count ratio (HCR) of 21.4, compared with national HCR of 47.5. AF farmers are less poor (HCR 20.76) than WL farmers (HCR 22.05). Depth of poverty is higher for WL farmers, while severity of poverty is higher for AF farmers. Income inequality of participants is less than both national and rural distributions (GCR of 0.35, compared to 0.43 and 0.38 respectively). WL farmers suffer less income inequality. Incidence of poverty is lowest in TMF zone and highest in LBT zone, although income inequality is lowest in the latter zone.

Both schemes are profitable in all AEZs, with the WL scheme promising greater returns per ha and HBT zone showing the highest NPV value. Mean financial IRRs are high: 57% for AF and 48% for WL. Conversely, financial BCRs are higher for WL plots (5.32) than for AF plots (3.32). Altogether, WL plots generate higher financial revenues than AF plots over the project life (8 years). Sensitivity analyses show that both schemes are financially robust under differing site and cost conditions. Per capita per day basic needs income needed to satisfy the minimum caloric requirement, derived from both food and non-food items, has been estimated as Tk. 16.00. Basic needs outcomes of the combined analyses show that both schemes successfully fulfil the basic needs of participants and WL is more promising. LBT zone ranks first in the AF scheme, while HBT zone provides the highest per ha per year basic needs value.

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List of Abbreviations

A.D.	Anno domini
ACCF	Assistant Chief Conservator of Forests
ACF	Assistant Conservator of Forests
ADB	Asian Development Bank
AEZ	Agro-ecological zones
AF	Agroforestry
ARTEP	Asia Regional Team for Employment Promotion
ASNIC	Asia Studies Network and Information Centre
B.C.	Before [the birth of] Christ
BBS	Bangladesh Bureau of Statistics
BCR	Benefit cost ratio
BFD	Bangladesh Forest Department
BFIDC	Bangladesh Forest Industries Development Corporation
BFRI	Bangladesh Forest Research Institute
BNCF	Basic needs conversion factor
BNI	Basic needs income
BNV	Basic needs value
BO	Beat Office
BRAC	Bangladesh Rural Advancement Committee
BWDB	Bangladesh Water Development Board
CA	Cropped area
CAFOD	Catholic Agency for Overseas Development
CAPA	Capabilities approach to project analysis
CARE	Co-operative Assistance for Relief Everywhere
CBA	Cost benefit analysis
CCF	Chief Conservator of Forests
CEA	Cost effectiveness analysis
CF	Conservator of Forests
CHT	Chittagong Hill Tracts
CI	Cropping intensity
CIDA	Canadian International Development Agency
CRI	Consumption rate of interest
DAE	Department of Agricultural Extension
DCA	Double cropped area
DCCF	Deputy Chief Conservator of Forests
DFID	Department for International Development
DFO	Divisional Forest Officer
ECBA	Economic cost benefit analysis
ECNEC	Executive Committee of National Economic Council
ESAP	Economic structural adjustment programmes
FAO	Food and Agriculture Organization of the United Nations
FCBA	Financial cost benefit analysis
FD	Forest Department
FE	Foreign exchange

FENTC	Forest extension and nursery training centre
FFW	Food for Work
FRMP	Forest Resources Management Project
FTW	Full time worker
FY	Fiscal year
FYP	Five Year Plan
GDP	Gross domestic product
GE	Goods effect
GNP	Gross national product
GPRB	Government of the People's Republic of Bangladesh
GRP	Gross regional product
Ha	Hectare
HBT	High Barind Tract
HDI	Human development index
HES	Household Expenditure Survey
HYV	High yielding variety
ICRAF	International Council for Research in Agroforestry
IE	Income effect
ILO	International Labour Office
IRR	Internal rate of return
JASPA	Jobs and Skills Programme for Asia
Km	Kilometre
L	Linear
LBT	Level Barind Tract
LC	Local currency
LEB	Life expectancy at birth
LF	Logical framework
M	Million
M/F	Male to female ratio
MM	Man months
MOEF	Ministry of Environment and Forests
N	Nucleated
N/K	Net benefit-investment ratio
NCA	Net cropped area
NEBT	North East Barind Tract
NGE	Net goods effect
NGO	Non-governmental organisation
NPCC	National Project Co-ordination Committee
NPP	Net primary production
NPV	Net present value
NTFP	Non-timber forest products
NW	North-West
NWFP	Non-wood forest products
ODA	Overseas Development Administration
OECD	Organisation for Economic Co-operation and Development
OHPP	Old Himalayan Piedmont Plain
PD	Project Director
PTW	Part-time worker
PVC	Present value of costs

Raj	Rajshahi
RF	Reserve Forests
RO	Range Office
ROAP	Regional Office for Asia and the Pacific
S	Scattered
SAF	Structural Adjustment Facility
SAL	Structural adjustment lending
SAP	Structural adjustment programme
SCA	Single cropped area
SCBA	Social cost-benefit analysis
SCg	Basic needs opportunity cost of goods
Sci	Basic needs opportunity cost of income
SE	Sout-East
SN	Semi-nucleated
SOC	Social opportunity cost
Sq	Square
Sq.km	Square kilometre
STP	Social time preference
SW	South-West
TANDP	Thana Afforestation and Nursery Development Project
TCA	Triple cropped area
ToCA	Total cropped area
Tk	Taka
TMF	Tista Meander Floodplain
TNO	Thana Nirbahi Officer
U5MR	Under 5 mortality rate
UANDP	Upazila Afforestation and Nursery Development Project
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
US	United States
USAID	United States Agency for International Development
USF	Unclassed State Forests
VFFP	Village and Farm Forestry Programme
Viz	Which see
WFP	World Food Programme
WHO	World Health Organisation
WL	Woodlot
WRI	World Resources Institute

Chapter One

Introduction and Objectives of the Study

1.1 Introduction

The main objective of the Bangladesh Government's current (fifth) Five Year Plan is to ensure the provision of basic needs to every citizen (GPRB 1998). This core objective is based on the ground, among others, of the principal task now faced by the country. Reducing poverty is the central development challenge in Bangladesh (World Bank 1998, DFID 1998). Around half Bangladesh's 125 million people are poor, as measured by calorie intake or cost of basic needs approaches, with lack of education and access to land being key determinants, and over half of these are in extreme poverty. An additional 20% are on the margins of poverty and at risk of being reduced to below the threshold by personal, environmental or institutional shocks.

Bangladesh has made progress, though only slowly, in reducing the incidence of poverty in terms of income and has achieved significant improvements in some social indicators during the nineties. Progress has been helped by strong Bangladeshi non-governmental organisations (NGOs) as well as by external assistance. Gains from education are high and have persisted over time. But poverty overall remains high and many social indicators are still unsatisfactory. Rising inequality has reduced the rate of poverty reduction. It will be a major challenge for Bangladesh to achieve further and faster progress in reducing poverty.

Bangladesh faces considerable environmental challenges, which threaten to make poverty elimination even more difficult. Apart from the potential impact of global warming on coastal flooding and salination, population pressure intensifies the already serious environmental problems. Even on optimistic forecasts of fertility, Bangladesh's population will double before stabilising. This will further intensify land use and accelerate urbanisation, adding significantly to already evident environmental pressures. To this end, the Fifth Five Year Plan (current) spells out in its objectives the protection and preservation of environment by putting in place adequate regulatory regimes and effective institutions, keeping in view the need for regeneration, recycling and optimum exploitation of natural resources consistent with sustainable development.

The ecological security of a country depends largely on its forest cover. In recent years issues relating to deforestation and degradation have received great attention from professional foresters and academicians. Bangladeshi forests are under tremendous pressure to supply fuelwood and other forest produce to a growing population. Fuelwood is still the most important form of domestic energy in the rural areas. The demand for fuelwood as well as other forest produce is increasing with increase in income and population. Many poor people living in and around forests are an integral part of the forest ecosystem and depend heavily on it for subsistence needs. Most forests are in a state of degradation due to over exploitation to meet the demands (by illegal removals). Consequently, the productivity of natural forests and plantations is very low.

Bangladesh Forest Department is currently facing the great challenge in bringing a balance between meeting people's demand and preservation of the resource base. The response to such a situation has been threefold:

(a) Enrichment of growing stock by rehabilitation of existing forests through raising plantations of fast growing species,
(b) Encouragement of community and farm forestry, and
(c) Promotion of people's participation in forest conservation and management.

1.2 Rationale of the study

In view of the Government's growing commitment to forestry and natural resource development, a number of forestry projects (mainly afforestation) have been implemented with the help of bilateral (SDC, CARE etc.) and multilateral agencies (ADB, World Bank) in various parts of the country. The success of such projects is usually assessed using cost-benefit analysis (CBA) tools coupled with a separate study of socio-economic factors. The emphasis in such evaluations seems to be on assessing the financial and economic viability in a fixed framework rather than limitations discussed in detail in Chapter 8. The evaluation of this project and its success from the perspectives of providing basic needs and reducing poverty are of great importance for formulation of future projects.

1.3 Objectives of the study

The present study has been undertaken with the following broad objectives in mind:

1. To assess the poverty situation and status of income distribution of the participants.

2. To evaluate the financial viability of the AF and WL schemes, and of the project as a whole.

3. To evaluate the impacts of the project with regard to the satisfaction of basic needs of the rural poor.

1.4 The thesis

The thesis has been structured into three broad parts, focusing on different issues. Part I discusses the background of the problem and the area under study. This part contains four chapters. Chapter 2 describes the physical and socio-economic background of Bangladesh with special reference to Rajshahi Division, while Chapter 3 describes the land use complexes of Bangladesh. Chapter 4 details the social forestry practice in Bangladesh and particularly describes the project under this study.

Part II begins with a review of literature on the main theme of this study, i.e., basic needs. This is done in Chapter 5. The next chapter reviews work hitherto carried out in project appraisal in the sphere of afforestation or reforestation. Chapter 7 describes the methodology of basic needs evaluation developed by Nair (1981) and updated by Singh (1995). Chapter 8 describes the methodology adopted for sampling and data collection in the study area.

Part III concerns the results of the application of the methodology outlined in part II using the data collected from Bangladesh. This part consists of five chapters. Chapter 9 discusses the socio-economic profile of the participants. Chapter 10 elaborates on food consumption pattern of the participants, food being the most important item in the basic needs basket. The next chapter focuses on the poverty and income distribution situation of the farmers in the social forestry project. Chapter 12 outlines the steps followed for financial analysis and discusses the viability of the project.

Part IV deals with the main theme of the research, basic needs analysis and consists of four chapters. Chapter 13 attempts to identify the basic needs goods and estimate the basic needs income for Rajshahi region. Chapter 14 discusses the estimation of basic needs conversion factors for the inputs and outputs involved in the project, while the next chapter estimates the basic needs income from inputs and outputs of the project. The last chapter of this part (Chapter 16) elaborates the estimation of social costs of the inputs incurred in the production of basic needs goods and in the generation of basic needs income.

Finally, Chapter 17 discusses the overall result of the study in brief, with conclusions and suggestions for further improvement in methodology of basic needs evaluation of land use projects and ends with offering scope for further study in the field.

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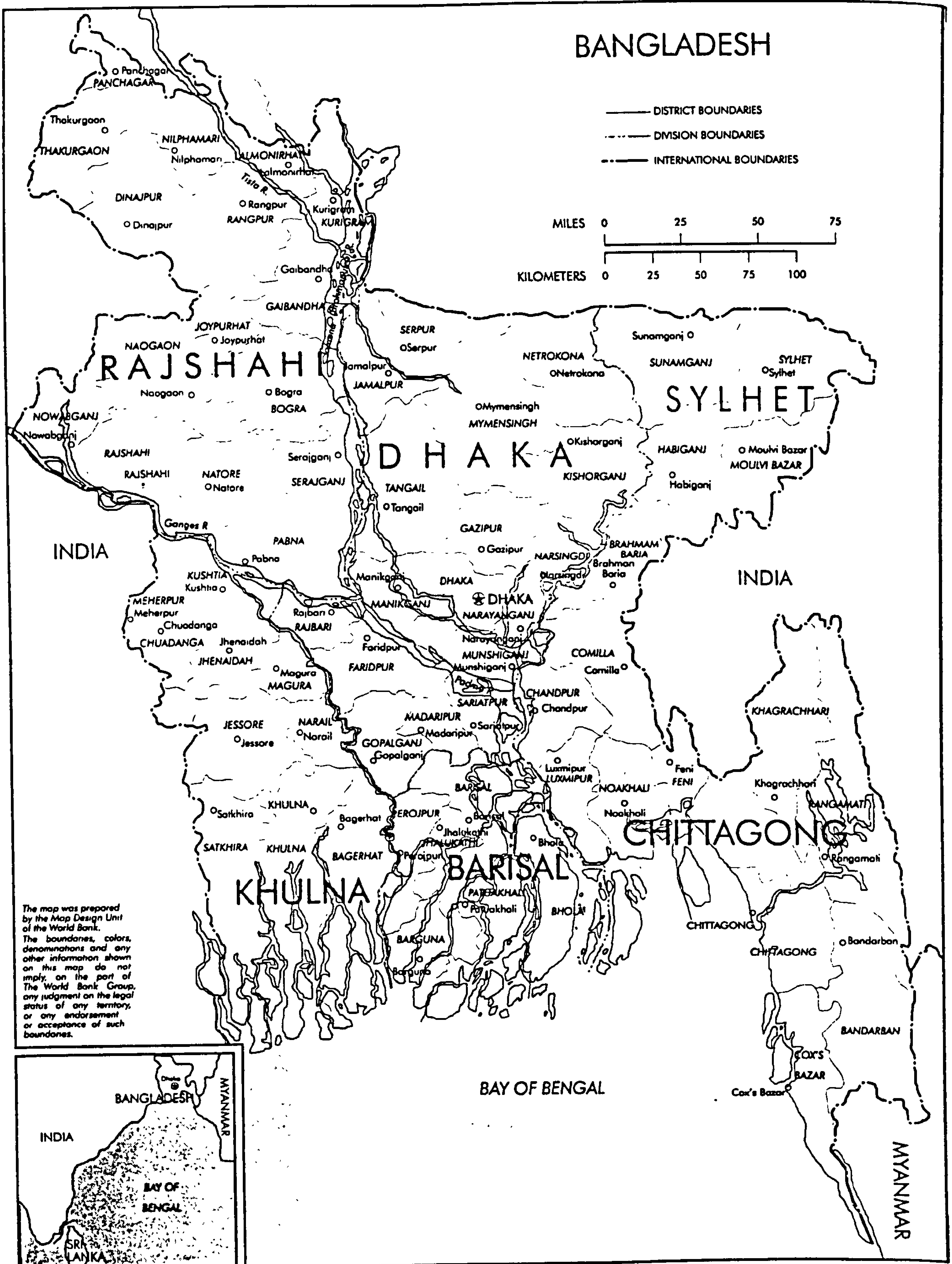

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Chapter Two

Physical and Socio-economic Background of Bangladesh with Particular Reference to Rajshahi Division

2.1 Physical environment

2.1.1 Geographical location

Bangladesh constitutes part of the largest deltaic plain in the world, situated at the confluence of three large river systems, the Ganges, the Brahmaputra and the Meghna (Ipe 1995). The country stretches latitudinally between 20°34′N and 26°38′N, and longitudinally between 88°01′E and 92°41′E. It is bounded by India in the north, west and north-east, by Myanmar in the south-east and by the Bay of Bengal in the south. Covering a landmass of 0.147 million sq. km, which is just over half the size of the United Kingdom (Barker 1994), Bangladesh is divided into six civil administrative divisions, which are further subdivided into 64 zilas (districts), 496 thanas (subdistricts), 4,451 unions[1] and 59,990 mouzas[2] (BBS 1999a).

Rajshahi division lies in the north-western part of the country. It is bordered by the Indian states of Meghalaya, Assam and West Bengal on the east, north and west sides respectively. Inland towards the south, its adjacent divisions are Dhaka and Khulna. The division lies between 23°45′N to 26°32′N latitude and 88°05′E to 89°48′E longitude. Area-wise, Rajshahi division is the largest division, occupying a total area of 34,513 sq. km (23% of the total area of Bangladesh) and accommodates 16 zilas, 127 thanas, 1,092 unions and 18,906 mouzas. Map 1.1 shows the location of Rajshahi within Bangladesh.

2.1.2 Constitutional and administrative framework

Bangladesh emerged as an independent, sovereign country on March 26, 1971. The war of liberation ended on 16 December 1971 in victory of Bangladesh forces and surrender of the occupying Pakistani army. Absolute trust and faith in the almighty Allah, nationalism,

[1] For political and administrative purposes each thana has several smaller units known as unions.

Agro-Ecological Zones of Bangladesh
N
W
E
S
30 0 30 60 Kilometers
1 Old Himalayan Piedmont Plain
2 Active Tista Floodplain
3 Tista Meander Floodplain
4 Karatoya-Bangali Floodplain
5 Lower Atrai Basin
6 Lower Purnabhaba Floodplain
7 Active Brahmaputra-Jamuna Floodplain
8 Young Brahmaputra and Jamuna Floodplain
9 Old Brahmaputra Floodplain
10 Active Ganges Floodplain
11 High Ganges River Floodplain
12 Low Ganges River Floodplain
13 Ganges Tidal Floodplain
14 Gopalganj-Khulna Bils
15 Arial Bil
16 Middle Meghna River Floodplain
17 Lower Meghna River Floodplain
18 Young Meghna Estuarine Floodplain
19 Old Meghna Estuarine Floodplain
20 Eastern Surma-Kusiyara Floodplain
21 Sylhet Basin
22 Northern and Eastern Piedmont Plains
23 Chittagong Coastal Plain
24 St. Martin's Coral Island
25 Level Barind Tract
26 High Barind Tract
27 North-Eastern Barind Tract
28 Madhupur Tract
29 Northern and Eastern Hills
30 Akhaura Terrace
Reserved Forest
Rivers
Urban
Waterbody
Kaptai Lake
Not Sueveyed
Produced by : BARC-GIS Project, BGD/95/006

democracy and socialism meaning economic and social justice constitute the fundamental principles of state policy (BBS 1993). Bangladesh is governed by a parliamentary form of government. The Prime Minister is the chief executive of the country. S/he is selected by the president from the majority party leader, who is assisted by a council of ministers in discharging his/her duties. The President of Bangladesh is elected by members of parliament in accordance with law, holding office for a term of five years. The President acts in accordance with the advice of the Prime Minister.

For administrative convenience, the country is divided into six administrative divisions, each placed under a Divisional Commissioner. Each division is further sub-divided into zilas (districts), the administration of which is headed by a Deputy Commissioner. Zila is divided into a number of thanas headed by Thana Nirbahi Officer (TNO). Local government in urban and rural areas is entrusted to bodies elected by the people. Such bodies in the urban areas are called Municipalities or *Pourashavas* and in rural areas, *Union Parishads* (Union Councils). There are also Zila Parishad and Thana Parishad in zila and thana levels respectively (BBS 1993, BBS 1997a).

Map 1.1 shows location of 16 districts of Rajshahi Division. Areawise, Dinajpur is the largest district (3,438 sq. km.), while Joypurhat is the smallest (965 sq. km.).

2.1.3 Agro-ecological zones

Bangladesh includes a wide range of environmental conditions, chiefly characterised by small-scale complexity of soil and hydrological conditions, further diversified by year to year variability in moisture, temperature and flood regimes. Environmental diversity occurs not only at national and regional levels, it occurs also at thana and village levels. Thirty agroecological regions have been identified by the Soil Resources Development Institute (FAO 1988), the fertility status in which varies considerably. Out of those thirty, thirteen zones occur within the Rajshahi Division, which has been shown in Map 1.2. A brief account of those thirteen zones is given below:

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[2] For revenue administration purpose.

1. Old Himalayan Piedmont Plain. Distinctive region, developed in an old Tista alluvial fan extending out from the foot of the Himalayas. It has a complex relief pattern comprising broad and narrow floodplain ridges and linear depressions.

2. Active Tista Floodplain. Includes the active floodplains of three minor rivers. Characterised by complex patterns of low, generally smooth ridges, inter-ridge depressions, river channels and cut-off channels.

3. Tista Meander Floodplain. Most areas have broad floodplain ridges and almost level basins. Soils in higher floodplain ridges are rapidly permeable and those in lower lands are slowly permeable.

4. Karatoa-Bangali Floodplain. Apparently comprises an admixture of Tista and Brahmaputra (Jamuna) sediments. Most areas have smooth, broad, floodplain ridges and almost level basins.

5. Lower Atrai Basin. Comprises the low lying area between the Barind Tract and the Ganges River Floodplain. Smooth, basin land occupies most of the region.

6. Lower Punarnabha Floodplain. Occupies basins and bils separated by low floodplain ridges.

7. Active Brahmaputra-Jamuna Floodplain. Comprises the belt of unstable alluvial land along the Brahmaputra-Jamuna rivers where land is constantly being formed and eroded by shifting river channels. It has an irregular relief of broad and narrow ridges and depressions.

10. Active Ganges Floodplain. Occupies unstable alluvial land within and adjoining the Ganges river, having irregular relief of broad and narrow ridges and depressions.

11. High Ganges River Floodplain. Comprises the western part of the Ganges River Floodplain which is predominantly highland and medium highland. Most areas have

complex relief of broad and narrow ridges and inter-ridge depressions, separated by areas with smooth, broad ridges and basins.

12. Low Ganges River Floodplain. Comprises the eastern half of the Ganges River Floodplain which is low-lying. The region has a typical meander floodplain landscape of broad ridges and basins.

25. Level Barind Tract. The region is developed over a typical local variety called the Madhupur Clay. The landscape is almost level and locally irregular along river channels.

26. High Barind Tract. Includes the western part of the Barind Tract where the underlying Madhupur Clay has been uplifted and cut into by deep valleys.

27. North Eastern Barind Tract. Occupies several discontinuous areas on the north-eastern margins of the Barind Tract. It stands slightly higher than adjoining floodplain land.

Note: the numbers preceding each zone are the serial numbers of the thirty agro- ecological zones as appears in Map 1.2, rather than the serial numbers of the thirteen zones occurring within Rajshahi Division.

Table 2.1 Description of agroecological zones (AEZs) of Rajshahi Division

AEZ No.	AEZ name	Districts under each AEZ	Area of AEZ (sq.Km)	Percent coverage of AEZ
1	Old Himalayan Piedmont Plain	Panchagarh, Thakurgaon	4252	12.3
2	Active Tista Floodplain	Nilphamari, Rangpur, Gaibandha, Kurigram	1107	3.2
3	Tista Meander Floodplain	Lalmonirhat, Kurigram, Naogaon	9782	28.3
4	Karatoa-Bangali Floodplain	Bogra, Sirajganj	2696	7.8
5	Lower Atrai Basin	Naogaon, Natore	895	2.6
6	Lower Punarnabha Floodplian	Naogaon	231	0.7
7	Active Brahmaputra-Jamuna Floodplain	Bogra, Gaibandha, Kurigram	472	1.4
10	Active Ganges Floodplain	Rajshahi	924	2.7
11	High Ganges River Floodplain	Nawabganj, Rajshahi	3938	11.4
12	Low Ganges River Floodplain	Pabna	1768	5.1
25	Level Barind Tract	Dinajpur, Joypurhat, Naogaon, Bogra	5331	15.4
26	High Barind Tract	Naogaon, Nawabganj, Rajshahi	1626	4.7
27	North-eastern Barind Tract	Dinajpur, Joypurhat, Bogra	1490	4.3
All	13	16 (overlapping)	34,512	100.00


NEPAL
Darjeeling
Siliguri
Jalpaiguri
Alipur Duār
Cooch Behār
Karatoya
Mahananda
Thākurgaom
DINAJPUR
Pirganj
Saidpur
Tista
Lālmanir Hāt
Rangpur
Dinājpur
RANGPUR
Jamuneswari
English Bāzār
Farakka
Farakka Barrage
BOGRA
Sāntāhār
Bogra
RĀJSHĀHI
Nawābganj
Atrai
Rājshāhi
Jamālpur
Brahmaputra
Sirajganj
TANGAIL
Tangail
Ishurdi
PABNA
Pābna
Berhampore
INDIA
Kushtia
KUSHTIA
Padma
Madhumati
JESSORE
Faridpur
26
24
90

2.1.4 Climate

Bangladesh enjoys generally a sub-tropical monsoon climate (BBS 1997a), characterised by high temperatures, heavy rainfall, often excessive humidity and fairly marked seasonal variations. Though more than half the area is north of the Tropics, the effect of the Himalayan mountain chains is such as to make the climate tropical, more or less throughout the year (Rashid 1991). While there are six seasons in a year, three namely winter, summer and monsoon are prominent. The pleasant winter lasts from November till end February; without much fluctuation, the temperature ranges between 7°-13°C and 24°-31°C maximum. The maximum temperature recorded in summer months is 37°C although in some places it occasionally rises to 40°C or more. April, the hottest month brings one of the most distinctive features of Bangladesh's climate, the severe north-eastern storms (Robinson 1989). The monsoon starts in July and stays up to October; this period accounts for nearly 80% of the total rainfall. Average annual rainfall varies from 1400mm to 4300mm. The maximum rainfall is recorded in the north-eastern part (Sylhet Division; 4600mm), while the minimum is observed in the western (Khulna Division; 1860mm) and north-western parts (Rajshahi Division; 1740mm) of the country. Humidity is high throughout the year. Average relative humidity for the whole year ranges from 78.1 to 70.5. The maximum and minimum can be as extreme as 82 during June to September and 57 during March respectively.

Rajshahi division is the region of several climatic extremes within Bangladesh. Rashid (1991) has worked out seven climatic sub-zones of Bangladesh, of which three sub-zones prevail in this region viz.

(a) <u>Northern part of the northern region</u>: an area of extremes. Summer mean maximum temperature is well above 32°C, whereas winter mean minimum is below 10°C. The summer is dry, with scorching westerly wind, but the rainy season is very wet, with 2000-3000mm of rainfall.

(b) North-western: except that the extremes are less and the rainfall is lower, this sub-zone is similar to (a). The lower rainfall makes this area both atmospherically and pedologically drier.

(c) Western: this is the driest part of Bangladesh, with rainfall generally below 1500mm and summer humidity less than 50%. In summer, it is the hottest and driest of all sub-zones. Mean summer maximum is over 35°C.

2.1.5 Geology

Bangladesh was formed during the Tertiary era (6.5 to 1 million years ago) on a mass of sediments underlain by the very old rocks of the Gondwana continent (Rashid 1991). It is the central part of the Bengal Basin, which is an active tectonic region and is surrounded by the Garo-Rajmahal plateau in the west, the Himalayas in the north and the Meghalaya plateau in the east. The Bengal Basin has been filled by sediments washed down from the highlands on three sides of it, especially from the Himalayas, where the slopes are steeper and the rocks less consolidated. Large sections of the early deposits remain as the Barind Tract of the northern region and the Madhupur Tract of the central region. Most of the deltaic southern part of the Bengal Basin is probably not more than 10,000 years old.

2.1.6 Relief/Topography

Bangladesh's landscape is a level to gently undulating floodplain criss-crossed by a network of river systems. The highest topographic regions are the Chittagong Hill Tracts to the south-east, rising to some 800m at places, and the piedmont hills in the north-east. A semi-arid area of uplifted and dissected terraces consisting of old alluvium, called the Barind Tract, lies in the north-west between the Padma and Jamuna (Ganges and Brahmaputra) rivers. The Madhupur Tract, consisting of older alluvial deposits, is situated north of Dhaka, but is less fertile than the new alluvial deposits which dominate the floodplain.

The network of rivers includes the Padma, the Jamuna, the Teesta, the Brahmaputra, the Surma, the Meghna and the Karnaphuli. These, along with their tributaries numbering about 230 with a flowing length of nearly 24,150 km covering the whole country, flow down to the Bay of Bengal. Thus the alluvial soil is continuously being enriched by heavy silts, deposited by rivers during the rainy season (Ipe 1995, BBS 1997a).

2.1.7 Soils

The soils of Bangladesh are deep, reasonably fertile and well drained. Floodplain (alluvial) soils constitute about 80% of the total area, which are replenished every year by new deposits of silt, itself very rich in plant nutrients (Robinson 1989). The major ecological considerations affecting land and soils are: extensive flooding by rivers and rain water (UNESCO 1977); drought leading to desertification, particularly in the Barind Tract; low organic matter content and thus poor water holding capacity of soils; soil erosion resulting from deforestation in the eastern hill parts; and salinisation in the coastal areas (CIDA 1989, Ipe 1995). Although the FAO/UNESCO (1977) soil map of the world has designated the soil type of Bangladesh broadly as fluvisols, the three primary soil types are floodplain soils, hill soils and terrace soils, which have further been subdivided into twenty general soil types (FAO 1971, Rashid 1991, BBS 1997a).

General soil types of Rajshahi division with their respective occurrence and characteristics have been shown in Table 2.2.

Table 2.2 Distribution and characteristics of soil types of Rajshahi division

Soil types	Districts of major occurrence	Soil characteristics
Floodplain Soils		
Noncalcareous Alluvium (*Eutric Fluvisols*)	Gaibandha, Kurigram	Grey or greyish brown, silty or sandy and neutral to moderately alkaline.
Noncalcareous Grey/Brown Floodplain Soils (*Eutric Cambisols*)	Dinajpur, Thakurgaon	Dark brown topsoil (acidic) with yellowish brown subsoil (neutral); silty clay loams to clays.
Calcareous Dark Grey Floodplain Soils (*Calcaric Fluvisols*)	Nawabganj, Natore, Pabna	Silty clay loams to heavy clays; highly crack prone when dry and become strongly acid but neutral-ise upon submergence.
Black Terai Soils (*Humic Cambisols*)	Panchagarh, Thakurgaon	Very dark grey to black sandy loams to clay loams; topsoils are strongly acidic but subsoils are slightly acidic.
Terrace Soils		
Deep Red-Brown Terrace Soils (*Dystric Nitosols*)	Gaibandha, Rangpur	Finely structured friable clay loams to clays; slightly to strongly acidic.
Grey Terrace Soils (*Dystric Gleysols*)	Bogra, Joypurhat, Naogaon, Rajshahi	Silt loams to silty clay loams, speckled with brown/red mottles; slightly to strongly acidic when dry but neutralise upon submergence.

Source: compiled from Rashid 1991, BBS 1997a.

2.2 Social background

2.2.1 Demographic features

Despite its tiny size, Bangladesh is the world's 8^{th} most populous country, supporting a population of 125 million resulting in a density of 920 persons per sq. km. With an average growth rate of 2.17%, the population of the country is expected to reach 129.6 million and 223.25 million by AD 2000 and AD 2025 respectively (BBS 1997a, WRI 1994). Sex ratio of the population is 106 males per 100 females, ranging in between 98 and 125 among the 64 districts. Literacy rate of the country obtained from the latest census in 1991 was 32.4 percent for population 7 years and above.

The people of Bangladesh can be divided into four ethnic groups, namely the *Dravidians*, the *proto-Australoids*, the *Mongoloids* and the *Bangalis*. The former three belong to the minority ethnic tribal groups, who are scattered along the borders of the country (except the south-western border with India). Bangalis are by far the largest group being more than 98% of total population and who contain an admixture of the proto-Australoids, the Mongoloids and the Caucasoids (Rashid 1991). In 1991, the percentage of Muslim population was 88.3 while those of Hindu, Buddhist and Christian religions were 10.5, 0.6 and 0.3 respectively.

Various international development organisations have described Bangladesh's human perspective in their own way, which is depicted below in Table 2.3.

Table 2.3 Basic development indicators for Bangladesh

Organisation	Indicator and value	Rank of Bangladesh	Note on indicator
UNDP	**HDI** - 0.368	144 out of 175 (descending order)	Human Development Index based on longevity, education and adjusted real income.
World Bank	**GNP per capita** - US$ 350	175 out of 210 (descending order)	Gross National Product in US $, calculated using the World Bank Atlas method.
WHO	**LEB** - 51.8	99 out of 127	Life Expectancy at Birth: average number of additional years a person would live if current mortality trends were to continue.
UNICEF	**U5MR** – 122	39 out of 145 (descending order)	Under-5 Mortality Rate: annual number of deaths of children under 5 years of age per 1000 live births.

Source: WHO 1992, UNICEF 1995, UNDP 1997, UNDP 1998, World Bank 2000.

Out of these four indicators, the HDI adopted by UNDP appears to be the most widely used one from the international standpoint. Table 2.4 shows the trend in Bangladesh's HDI ranking from an international perspective. Bangladesh falls under the "low human development" category (rankings between 131 and 175). The 1997 HDI shows Bangladesh making some progress as the index increased from 0.365 to 0.368 (Table 2.4). This did not, however, improve the country's position in the global pecking order. The ranking in the 175 countries for which HDIs were calculated fell from 143 to 144. In this connection, it should be mentioned that in 1997, one country was added to the

HDI, which had a higher HDI than Bangladesh and thence did not really affect its relative position.

Table 2.4 Human Development Index (HDI) situation of Bangladesh during current decade

Year of Estimation	HDI Score[a]	HDI Rank	No. of countries below Bangladesh's HDI rank
1990	0.318	107	23
1991	0.186	136	24
1992	0.185	135	25
1993	0.189	147	26
1994	0.309	146	27
1995	0.364	146	28
1996	0.365	143	31
1997	0.368	144	31
1998	0.440	150	24
1999	0.461	146	28

Note: a. The low HDI scores reported for 1991, 1992 and 1993 are due to the use of log of GDP per capita (instead of GDP per capita) in estimating the index.

Source: compiled from UNDP 1998, 1999, 2000.

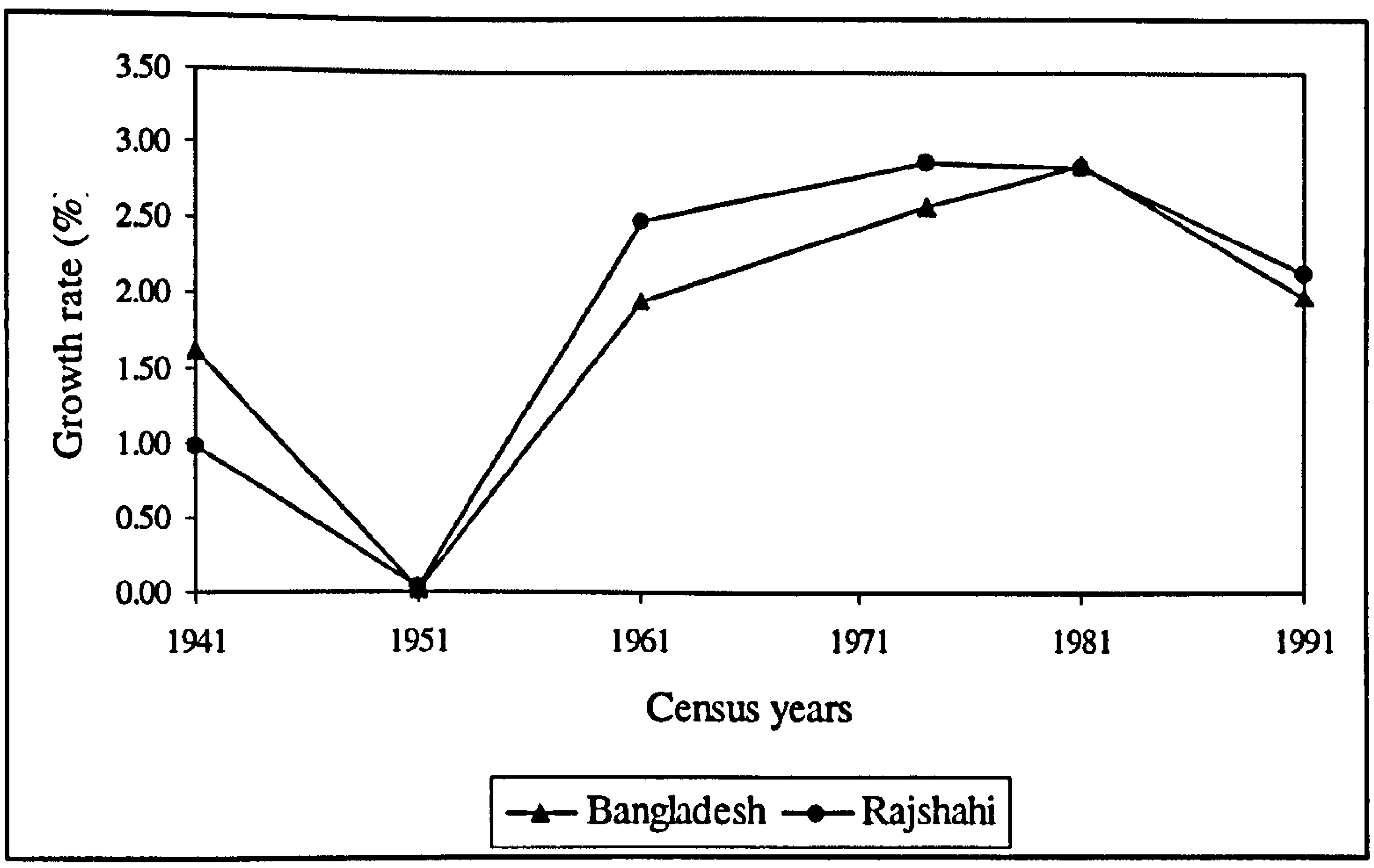
The largest division of Bangladesh, Rajshahi, accommodated 26.2 million people in 1991, crowding 797 persons per sq. km. Male-female ratio stood at 105. Average size of household was found as 5.4. Distribution of people by religion follows the same pattern as that for overall Bangladesh except for the Buddhists representing only about 0.1% of the population of Rajshahi Division. The Buddhists are concentrated in the hill districts of south-eastern Bangladesh, adjoining Myanmar and India.

Table 2.5 Population trend of Bangladesh and Rajshahi Division

Census year	Total population (million)		Intercensal growth rate (%)	
	Bangladesh	Rajshahi	Bangladesh	Rajshahi
1941	41.8	9.30	17.42	10.32
1951	41.9	9.33	0.24	0.32
1961	50.9	11.92	21.5	27.76
1974[a]	71.4	17.33	40.27	45.38
1981	87.1	21.13	21.98	21.93
1991	106.3	26.20	22.04	23.99

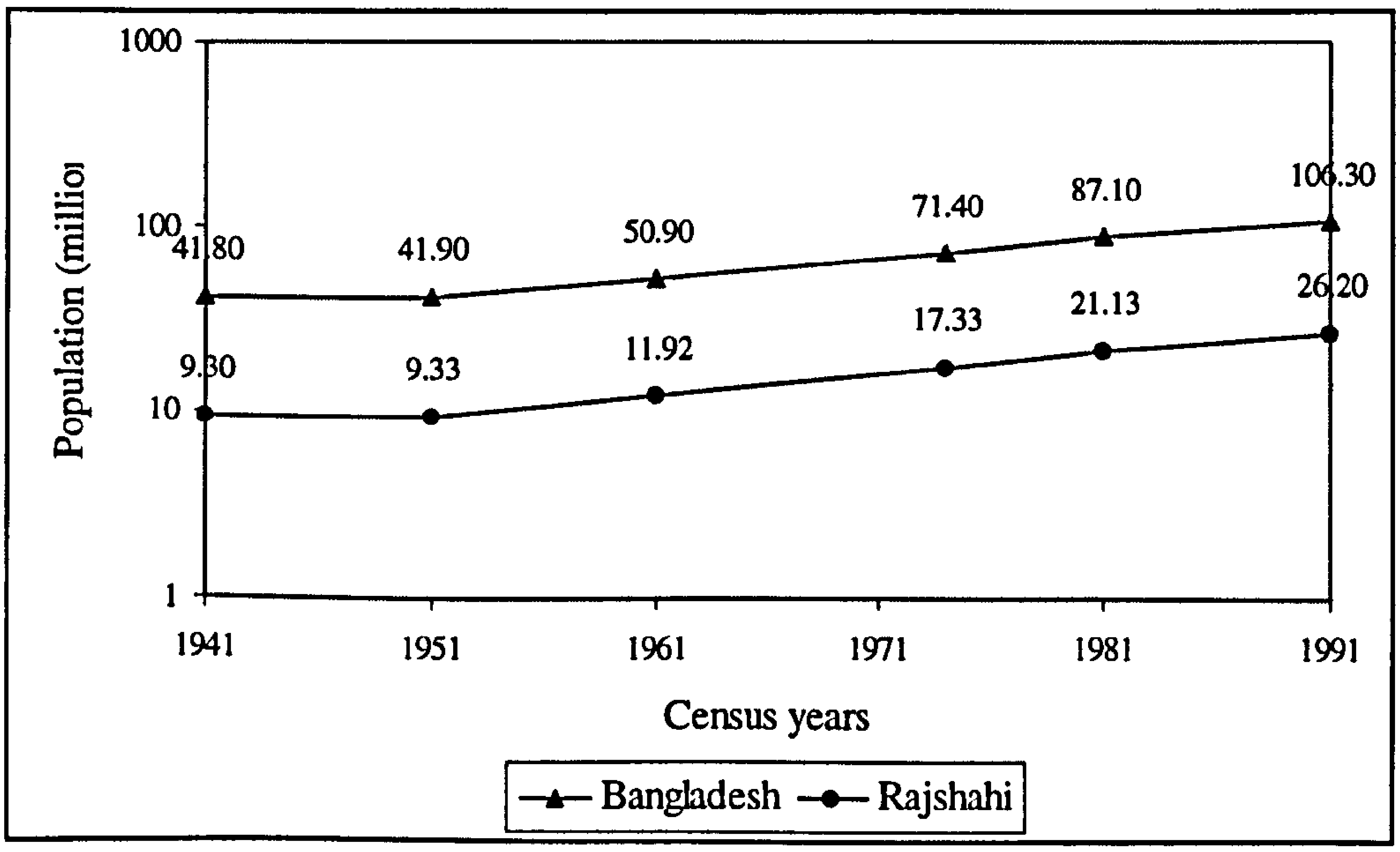
Note: a. In 1971 the census could not be conducted because of the War of Liberation and the country took a few years to recover from the holocaust of the war. So, the next possible census was held in 1974.
Source: BBS 1997a.

Figure 2.1 Annual growth rate (%) of the population of Bangladesh and Rajshahi at different census years



It can be visualised from Table 2.5 and Figure 2.1 that the population of Bangladesh as a whole and that of Rajshahi has increased nearly threefold during the 50 year time span to about 106 million and 26 million respectively (Figure 2.2). Both the decennial growth rates fell drastically in the first decade due to two devastating cyclonic storms in 1948 and 1950 respectively, then rose during the middle parts of the period through to late seventies, and then the growth rate started to decline from the eighties. This decline in the population growth rate was due largely to the consciousness of the people and the government, and adoption of family planning measures by the literate sector of the population. One peculiar pattern in the intercensal growth rate to be noticed is that Rajshahi stayed above Bangladesh in all the four latter decades except in 1981.

Figure 2.2 Estimated population of Bangladesh and Rajshahi in last five decades



2.2.2 Socio-cultural attributes

Bangladesh is a new state in an ancient land. Etymologically, the word Bangladesh is derived from the cognate "*Vanga*" which was first mentioned in the Hindu scripture *Aitareya Aranyaka* (composed between 500 B.C and 500 A.D). Legend has it that Bengal was first colonised by Prince Vanga, the son of King Bali and Queen Sudeshna of the Lunar dynasty. According to linguists, the roots of the term Vanga may be traced to languages in the adjoining areas.

Bangladesh is the frontier of South Asian civilisation. It is the natural bridge between South and South East Asia. Because of its location, Bangladesh was the intermediary in trade and commerce between the South Asian sub-continent and the Far East. Bangladesh region also played a seminal role in disseminating her beliefs, art and architecture in the wider world of Asia.

The first great indigenous empire to spread over most of present-day India, Pakistan, and Bangladesh was the Mauryan Empire (ca. 320-180 B.C.), whose most famous ruler was Asoka (ca. 273-232 B.C.). The Middle Age in Bengal coincided with the Muslim rule. Out of about 550 years of Muslim rule, Bengal was effectively ruled by Delhi-based all India empires for only about two hundred years. For about 350 years Bengal remained virtually independent. The Muslim rule in Bengal also witnessed the gradual expansion of Islam in this region. Islam was propagated in the Bangladesh region by a large number of Muslim saints who were mostly active from the fourteenth to sixteenth centuries. While similar Muslim missionary activities failed in other regions of South Asia, Islam ultimately succeeded in penetrating deeply into Bengal because the social environment of this region was congenial to the diffusion of a new religion.

The Bangladesh region reached the zenith of economic affluence during the mediaeval period. It was known as one of the most prosperous lands in the world. The Moorish traveller *Ibn Batuta*, who visited Bengal in the fourteenth century described Bengal as the wealthiest and cheapest land of the world. Because of her fertile land and abundance of seasonal rainfall, Bengal was a cornucopia of agricultural products. Famines and scarcity were virtually unknown as compared to other areas of Asia. Bengal was the focal point of free trade in the Indian Ocean since the 14th century. She was the virtual store-house of silk and cotton not only of India and neighbouring countries but also of Europe. The Dhaka region used to produce the finest cotton in the world. The Bangladesh region was also one of the largest producers of sugar.

The greatest discontinuity in the history of Bengal region occurred on June 23, 1757 when the East India Company – a mercantile company of England – became the virtual ruler of Bengal by defeating Nawab Siraj-ud Daulah through conspiracy. Territorial rule by a trading company resulted in the commercialisation of power. The initial effects of the British rule were highly destructive. In the long run, the British rule in South Asia contributed to transformation of the traditional society in various ways. The introduction of British law, a modern bureaucracy, new modes of communication, the English language and a modern education system, and the opening of the local market to international trade opened new horizons for development in various spheres of life. The new ideas originating from the West produced a ferment in the South Asian mind. The upshot of this ferment were streams of intellectual movements which have often been compared to the Renaissance.

The Pakistan Resolution of 1940 at Lahore was the outcome of the political confrontation between Hindus and Muslims. The partition of the South Asian sub-continent into two independent states in 1947 was a defeat for the British policy. It partially undid the *Pax Britannica*, which was the greatest achievement of the *Raj*. Nevertheless, the partition forestalled the balkanisation of the sub-continent. The eastern areas of Bengal were constituted into a province of Pakistan. Pakistan, which emerged constitutionally as one country in 1947, was in fact "a double country". The two wings were not only separated from each other by more than one thousand miles, they were also culturally, economically and socially different. The relationship between the East and the West wings of Pakistan was the mirror image of the Hindu-Muslim relations in the undivided sub-continent. The creation of East Pakistan did not resolve the identity crisis of the majority people in the Bangladesh region. The disintegration of united Pakistan is not, therefore, in the least surprising. However, the way in which Bangladesh was born is unique to South Asia. Bangladesh was the product of a sanguinary revolution. The Pakistan army had to be defeated physically in 1971 to establish the new state. The birth of Bangladesh resolved the dichotomy between religion and habitat, and between extra-territorial and territorial loyalties by recognising both the facts as a reality in the life of the new nation.

The Bangladesh region contains relics of the finest specimens of Buddhist monastic architecture. The Middle Age in Bengal saw the construction of a large number of Islamic monuments which were characterised by massive arches and bold clean lines. *Bangla* is the language of more than 99 percent of the population. *Bangla* is the seventh most extensively spoken language in the world after Chinese, English, Russian, Spanish, Hindi and Arabic. The Bengali script is derived directly from *Gupta Brahmi* script, which has close affinity to Cambodian and Thai scripts. The origin of this language is usually traced to the 10th century (Library of Congress 1988, ASNIC 1999).

2.2.3 Rural settlements

A study of settlements has great relevance to human geography as the shape and pattern in any particular region reflects man's relationship with the environment. Settlements have gradually grown up and evolved over a long period of time, and by studying the site, pattern and arrangement of settlement we can conceive something about the history of man's utilisation of the surrounding land. The flooding of almost all fields in the rainy season forces settlements to be sited on higher ground or to raise the land artificially for the homesteads (Rashid 1991). Four main rural settlement patterns are observed in Bangladesh viz., linear (L), scattered (S), semi-nucleated (SN) and nucleated (N). Among them, the Rajshahi region abounds in linear patterns along the *Jamuna* (i.e., Brahmaputra) and *Padma* (i.e., Ganges) basin areas and scattered homesteads in the central and northern parts.

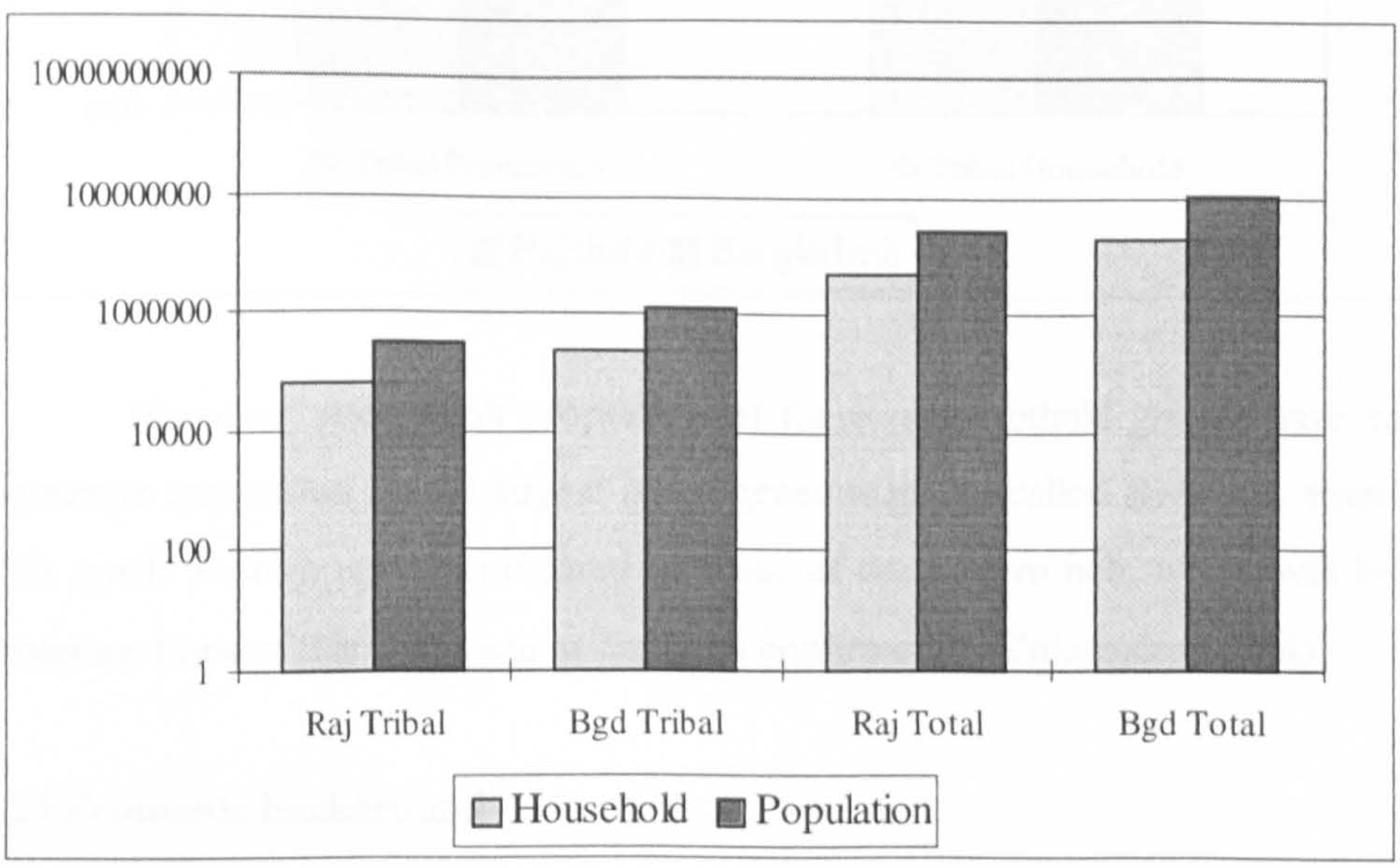
The rural houses in Rajshahi, like others throughout rural Bangladesh, are mostly made of mud, thatch and bamboo. The plinth is always mud built. Bamboo is the commonest walling material while long-bladed grasses make up the chief roofing material, sometimes replaced with large palm leaves or even paddy straw. Most of such houses (or, rather, huts) are oblong in shape, rarely square as well.

2.2.4 Tribal context

Tribal populations in Bangladesh are quite diverse with at least nineteen tribes, distributed along the border regions of northern and south-eastern parts of the country (as mapped and discussed by Rashid 1991, Timm 1991). Most of these tribals are descendants of hill people from the neighbouring countries of India, Burma (Myanmar) and also from Tibet, Nepal, even as far as from Mongolia. Although diverse in culture, religion and many other aspects, there were only some 1.2 million tribals living in the country during the last decennial census in 1991, constituting a meagre 1.1 per cent of total population (BBS 1997a).

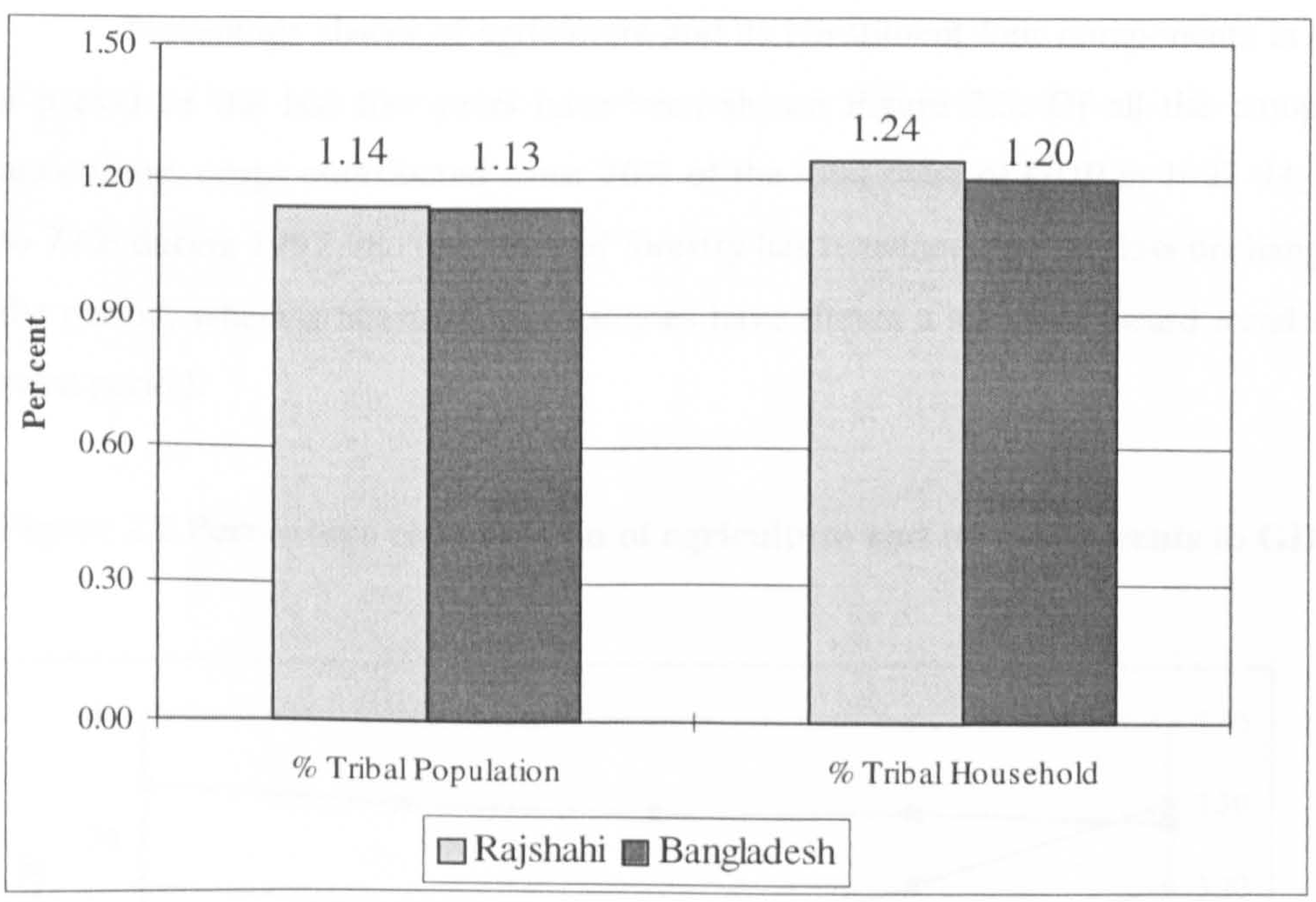
Within Rajshahi Division, three tribes namely, *Santal, Polia* and *Koch* occur in the districts of Nawabganj, Naogaon, Thakurgaon, Panchagarh, Lalmonirhat and Dinajpur. The Santals are mainly of proto-Australoid origin, while the Polia and Koch are mainly Mongoloid. In the classification of Furer-Haimendorf's (1985) tribal clans of the Indian subcontinent, the Santals fall under the 'advanced farming societies' category and outnumbers many tribes of the region. Most of the Santals within Bangladesh have settled in villages of their own and have resorted to agriculture, giving up their semi-nomadic habit due to the disappearance of the *Barind* jungles. The Polia and Koch are closely related to each other, living in the same sort of eco-demographic area. Rajshahi Division contains the second largest concentration of tribal population of the country; 27% of tribal households and 26% of tribal population live there as compared to Chittagong Division containing 48% households and 49% population, owing primarily to the hills and forests in that division. Figure 2.3 shows a graphical comparison of tribal and total population of Rajshahi Division and Bangladesh.

Figure 2.3 Comparison of tribal and total household and population of Rajshahi and Bangladesh



When the proportion of tribal households and tribal population of Rajshahi and Bangladesh are compared, it can be visualised from Figure 2.4 that a meagre 1.24 and 1.14 per cent of the total figures of Rajshahi are occupied by tribal households and tribal population respectively. Theses figures are slightly higher than those for Bangladesh as a whole (by 3.3% and 0.9% respectively), because of the Barind jungles and dense tracts of Sal forests in that part of the country (in the past), which allowed the inflow of tribals from neighbouring states of India.

Figure 2.4 Proportion of tribal household and population of Rajshahi and Bangladesh



However, such small proportion of these minor ethnic groups have caused them immense oppression by the largest heterogeneous group called *Bangalis*, even more so in this north-western region compared to those of the eastern belt, which will be evinced in latter sections of this study and as has been confirmed by Colchester (1984).

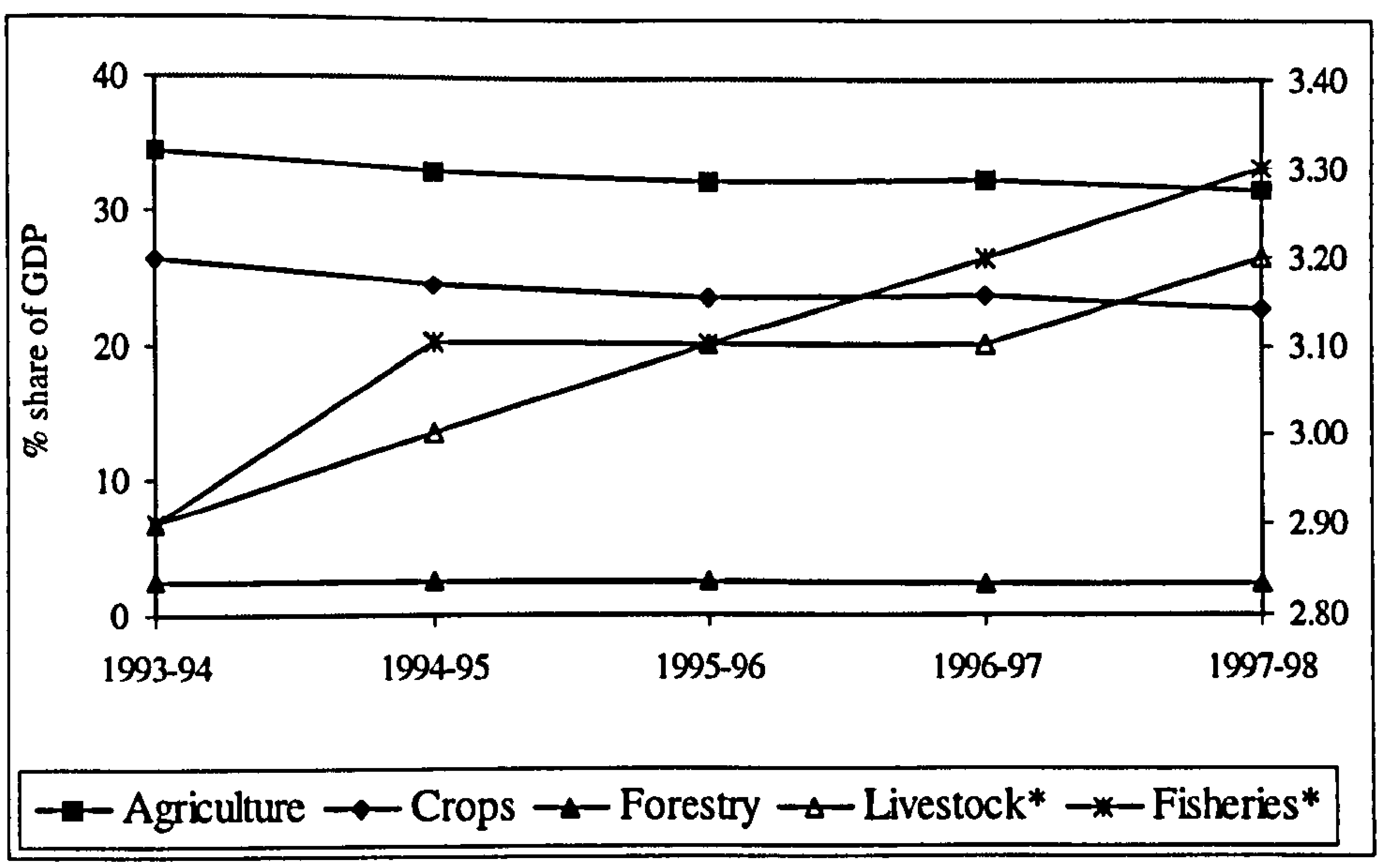
2.3 Economic background

2.3.1 A general economic profile

The Bangladesh economy is predominantly an agrarian one, agriculture being the highest sectoral contributor of GDP at both current and constant market prices, 28.6% and 31.6% respectively in 1997-98 (BBS 1999). However, this lion's share of agriculture in GDP has been declining over the current decade at varying rates. Khan (1995) demonstrated a decline by 16.5% points (of total GDP, or share in GDP) over a twenty year period, which was largely matched by a corresponding increase in the contribution of construction, public administration and services. Because of the growth in various service sectors, and the slowing down of growth in *boro* (one of three major rice varieties in Bangladesh) and wheat production, the share of agriculture has declined. Appendix 2.2 provides details of sectoral contribution to GDP.

Percentage shares of agriculture and its constituent four components in GDP over a period of the last five years have been shown Figure 2.5. Of all the components of agriculture, crops contributed some 76% of the total share of GDP in 1993-94, which fell to 72% during 1997-98. The share of forestry has remained more or less unchanged during the period, whereas livestock and fisheries have shown a slightly upward trend during the same period.

Figure 2.5 Percentage contribution of agriculture and its components to GDP



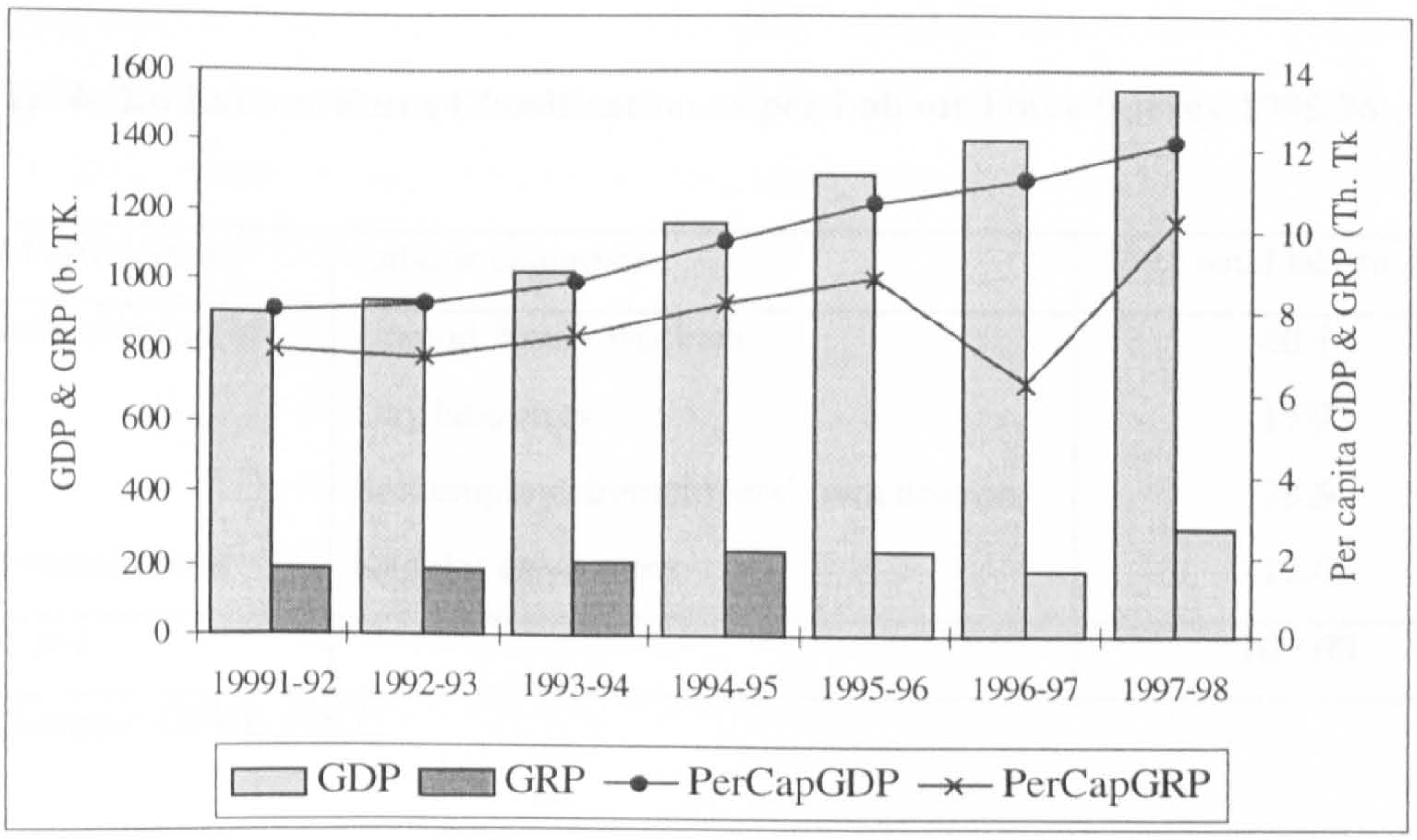
(Source: BBS 1999)

Note: *Livestock and fisheries have been plotted in the secondary (Y2) axis for ease of conception.

Per capita GNP of the country was US$350 in 1998, which ranked Bangladesh 175th among 210 economies studied by the World Bank (World Bank 2000). GNP per capita grew by 3.4% between 1997 and 1998.

Gross Regional Product (GRP) per capita for the north-west region in 1993/94 was estimated at Tk. 7400, the lowest of the four major regions, contrasting with Tk. 9000 for the nation as a whole. The north-west region is heavily agricultural; agriculture represents 42% of regional economy, industry (manufacturing + construction) 10%, and services 48%. The growth rate of the region, at 4.2%, is nearly the same as the national average and the region has kept up relatively with the rest of the economy (GPRB/ADB 1997).

Figure 2.6 GRP of Rajshahi Division compared with GDP of Bangladesh



GDP of Bangladesh as well as GRP of Rajshahi Division has grown during the current decade but not as envisaged in the five year plans. The minimal growth of GDP (9% on an average) and GRP (12% on an average) can be seen from Figure 2.6. Per capita GDP of the nation and per capita GRP (gross regional product) of Rajshahi region over the same period have been shown on the secondary axis (y2). Per capita GDP has grown steadily over the period without much variation. Per capita GRP has also followed a similar pattern except for a sharp fall in 1996-97, which had been caused by a period of drought and loss of one season's crop in the region. However, per capita GRP has managed to catch up with the previous trend in the next year.

2.3.2 Labour force scenario

The economy of Bangladesh is a small and open, labour abundant and capital poor one. Capital is fixed in the short run while labour is the only variable factor. The civilian labour force as estimated in the Labour Force Survey-1991 was 51.2 million (46% of 1991 population), of which male were 31.1 (61% of total labour force) and female 20.1 million (39%). Agriculture was the largest employer of this labour force (66%). The next labour force survey (1995/96) revealed a greater strength of 56.0 million, but slightly declining rate of participation compared to the previous LFS (45% of 1996 population), with 34.7 million male (62%) and 21.3 million female. Agriculture still employed the highest number of workers (63.2% of total labour force).

Table 2.6 Labour Force Classification as per Labour Force Survey 1995/96

Major sectors	Labour categories	% of total labour force
Informal sector	Unpaid family workers	40.1
	Day labourers	17.9
	Self employed/employers' own account	29.6
Formal sector	Regular employees	12.4
Total		100.00

(Source: GPRB 1997)

The above figures reveal that a large segment of the labour force (about 88%) thus remains outside the organised labour market and wage labour system. However, the BBS has defined labour classification into two broad economic sectors as agricultural and non-agricultural, whose details are given below for the financial year 1995/96.

Table 2.7 Labour Force Classification as per Bangladesh Bureau of Statistics (BBS)

Sex	Total (M)	Agriculture (M)	Non-agriculture (M)
Both	54.59 (100.00)	34.85 (63.2)	19.74 (36.8)
Male	33.76 (61.84)	18.44 (54.4)	15.32 (45.6)
Female	20.83 (38.16)	16.42 (77.4)	4.42 (22.6)

[Figures within parentheses are percentages of total labour force]

(Source: BBS 1999a)

Table 2.7 shows some astounding figures in terms of female labour participation in a conservative-cum-poor country like Bangladesh which is held back by the so-called *poverty-purdah trap* (Amin 1997). Not only women do occupy 38% of total labour force (42% in 1997 as reported by World Bank (1999) and ILO (1999)), but three quarters of them are engaged in agricultural works, that is in the rural areas, where women are suppressed in every walk of life. Such a radical increase in female labour force from almost zero participation has happened due to inclusion of some activities as economic ones since 1990/91 (BBS 1997a), which are performed mostly by the women in and out of agriculturally based households in the rural areas. Activities like livestock and poultry raising, planting, weeding, holing, harvesting/collecting, threshing/cleaning, husking/drying/boiling, food processing and preservation, growing vegetables/spices etc. have been considered as economic activity if one spent at least one hour in a week on any such activity (BBS 1999a). However, Rahman and Islam (1988) reported a stabilising influence of non-agricultural employment on total employment and they found education to be positively associated with non-agricultural labour use.

In 1995/96, there were 12.3 million economically active persons in Rajshahi Division, of which 7.58 million (61.6%) were male and 4.73 million (38.4%) were female. Of the total divisional labour force, only 12% were from urban areas, compared to the bulk (88%) hailing from rural areas; even within the rural areas, women constituted 40% of the force, bearing a similar picture to the national figures.

2.3.3 Unemployment/underemployment

ILO (1964) has defined unemployment, perhaps most comprehensively as, "involuntary idleness due to lack of work". Unemployment happens as a result of continued and chronic crisis in the economy in general and it is an unavoidable aspect of all capitalist and developing capitalist societies and Bangladesh is no exception in this regard (Umar 1985). Measuring employment and thus, unemployment in developing countries involves many conceptual and data problems and this is more so in a rural agrarian society like Bangladesh since the size of rural labour force varies considerably over time by frequent entries into and exits from the labour force, chiefly due to seasonalities of agricultural works (Sen 1984) and consequent changes in earnings and poverty levels (Mahmud 1989). Yet some idea of the nature and magnitude of the unemployment problem is a pre-requisite for any substantial social and economic plan to tackle this issue. Underemployment has been expressed for Bangladesh in terms of the 'time criterion' as 'working for less than 40 hours during any reference week' (BBS 1997a).

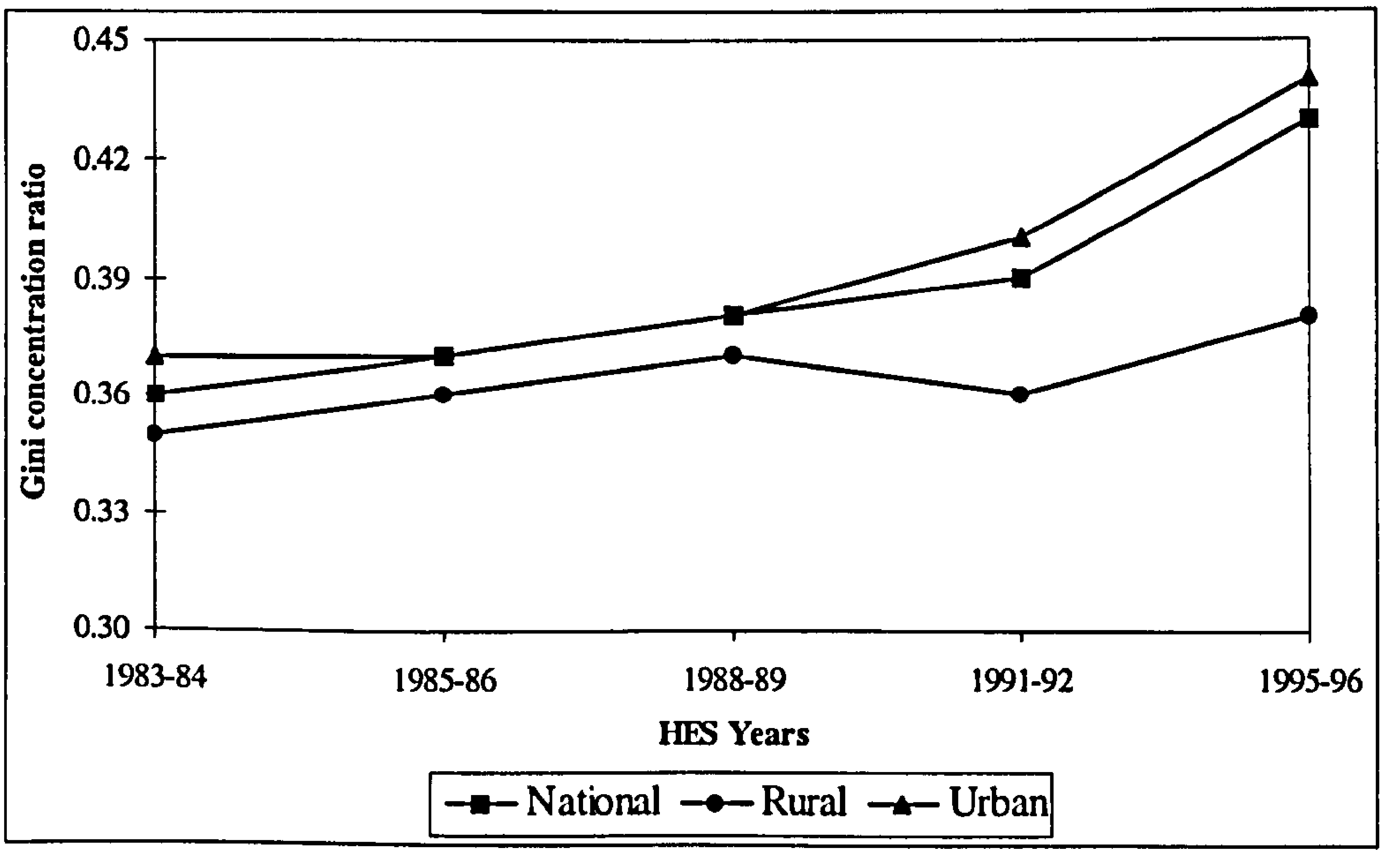
As in many low-income economies without formal unemployment benefits, the problem of 'open unemployment' does not appear to be acute in Bangladesh. The organisation of the economy is such and sharing of work is so widely used a practice that open unemployment does not emerge as an important category (ILO/ARTEP 1993). For the past two decades, open unemployment has shown strikingly low rates in the range of less than 1 per cent to a little over 2 per cent of economically active population (Khan 1985, Mahmud 1989, ILO/ROAP 1999), although it was 4.3% in urban areas in 1995/96 (BBS 1997a).

More perplexing in the context of the Bangladesh employment problem is underemployment. Mahmud (1989) has presented a number of studies dating back from early sixties till late eighties where the rate of underemployment in Bangladesh (East Pakistan from 1945 till 1971) ranged in between 30% and 19%, which has risen to 40% (of total labour force) in 1997 (ILO/ROAP 1999).

2.3.4 Income distribution and income inequality

Between the period of 1975 and 1995, per capita income increased to the tune of 38 per cent (Khan 1995). With an unchanged distribution of income, this would have led to a substantial reduction in the rate of absolute poverty. But the distribution of income did not remain unchanged; the Gini concentration ratio[3] of income distribution has increased on a national level, as well as for both rural and urban areas.

Figure 2.7 Extent of income inequality at different levels



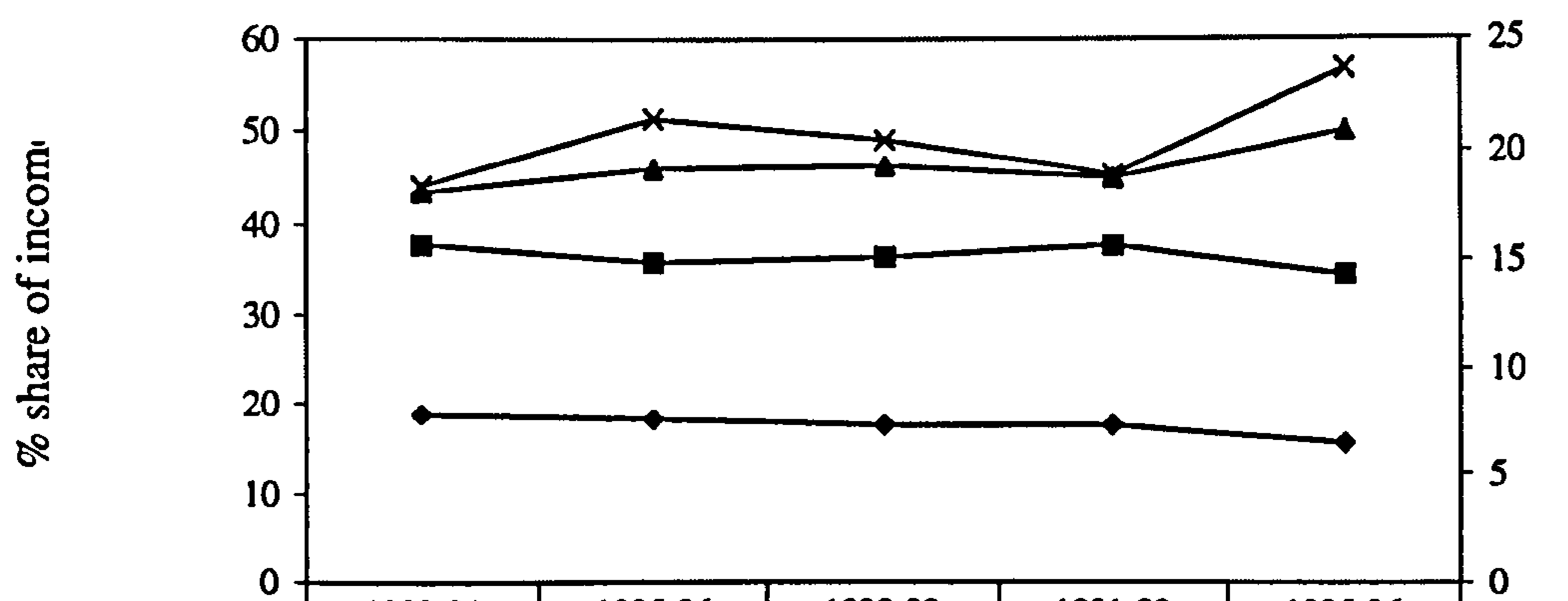
Source: BBS 1997b

The Gini ratios presented in Figure 2.7 summarise the extent of inequality in income distribution for selected years when HESs (Household Expenditure Survey) were conducted. In all surveys conducted to date, income inequality was found to be increasing at varying rates, but almost consistently higher in urban areas as compared to rural areas. Between 1983-84 and 1991-92, income inequality in the country as a whole remained in the range of 0.35 and 0.39. However, data from the last two HESs show that income inequality at all three levels has risen sharply between 1991-92 and 1995-96. One major causal factor to this dismal situation might be the two catastrophic cyclones of 1991,

[3] A measure of inequality derived from the Lorenz curve. As the degree of inequality increases, so does the curvature of the Lorenz curve, and thus the area between the curve and the 45° line becomes larger. It is

which had claimed more than 150,000 lives, 70,000 cattle heads and crops worth Tk. 42000 million were damaged (Haque and Blair 1992, BBS 1997a). This temporarily dismantled the backbone of the economy.

Figure 2.8 Percentage distribution of income accruing to different household income groups



	1983-84	1985-86	1988-89	1991-92	1995-96
Bottom 40%	18.95	18.17	17.53	17.41	15.54
Middle 40%	37.67	35.80	36.27	37.72	34.38
Top 20%	43.38	46.03	46.20	44.87	50.08
Top 5% *	18.30	21.35	20.51	18.85	23.62

Source: compiled from BBS 1997b.

Note: * income shares of top 5% of households have been shown in Y2 axis for proper conception since these figures are derived from those of top 20%.

The above figure shows that there was not a remarkable worsening of the distribution of income. For example, income share of the poorest 40 per cent of the population declined from 18.95 per cent in 1983-84 to 15.54 per cent in 1995-96.

Hossain *et al.* (1994) reported from their study of agricultural income distribution throughout Bangladesh that agricultural income is less unequally distributed than nonagricultural incomes. Nearly half of the inequality in the distribution of total household

the ratio of the area between the Lorenz curve and the 45° line and its value ranges between 0 (perfect equality) and 1 (perfect inequality) (Bannock *et al.* 1984).

income is due to nonagricultural income, despite the fact that its income share is only 40%. Rice cultivation contributes only 36% of the overall income inequality.

2.3.5 Development planning

Bangladesh has had three decades of development efforts at lifting the economy out of its miserable poverty. The country has followed the course of planned development since 1973, which has seen five 'Five Year Plans' (FYP)s [1973-1977, 1981-1985, 1986-1990, 1991-1995 and 1997-2002] and two interim Two Year Plans [1978-1980 and 1995-1997]. Every plan targeted an average annual GDP growth rate of 5+ per cent but physically achieved about 4 per cent. In spite of the large inflow of foreign assistance to augment meagre domestic resources, the planned efforts for development have not been able to free the economy from the low growth pitfall.

Keeping in view the changing structure of the global economy, the Fifth Five Year Plan (VFYP) [1997-2002] has been prepared within a flexible framework. The plan places the market at the centre but, at the same time, attaches due importance to the appropriate role of the government and the public sector, as required to fulfil the constitutional obligations of the State for raising the standards of living of all citizens of the country. Greater part of GDP growth is expected to come from the private sector. As an added dimension, the plan departs from the concept of central planning in a significant way and puts major focus on local level participatory planning and integration of local level development programmes/projects with those at the national level.

Total outlay of the Fifth Plan is projected to be Tk. 1,959.52 billion. Of this, the major share (56%) is anticipated from the private sector (Tk. 1,100.58 billion), while the rest would come from the public sector.

Table 2.8 Financing of the VFYP outlay (at 1996-97 prices)

(in billion Tk.)

Items	Public sector	Share (%)	Private sector	Share (%)	Total	Share (%)
Plan size	858.94	100.00	1100.58	100.00	1959.52	100.00
Domestic resources	527.72	61.44	992.04	90.14	1519.76	77.56
External resources	331.22	38.56	108.54	9.86	439.76	22.44

About 78% of the planned outlay would be derived from domestic resources, while the remaining 22% would come from external sources like aid, donations and loans.

Table 2.9 Sectoral distribution of the VFYP outlay (at 1996-97 prices)

(in billion Tk.)

Sectors	Public sector	% share	Private sector	% share	Total	% share
Agriculture	202.67	23.60	119.86	10.89	322.53	16.46
Industry	11.79	1.37	298.78	27.15	310.57	15.85
Housing and Construction	49.82	5.80	180.02	16.36	229.84	11.73
Power and Gas	114.40	13.32	37.73	3.43	152.13	7.76
Transport and Communication	145.54	16.94	118.87	10.80	264.41	13.49
Trade and Others	334.72	38.97	345.32	31.38	680.04	34.70
Total	858.94	100.00	1100.58	100.00	1959.52	100.00

Table 2.9 shows the total distribution and share of distribution of the different investment sectors of the economy. In conformity with the overall objectives of the Plan and greater role of the private sector in a market economy, the public sector resource allocation has been determined to address the sectoral priorities concerning interventions for supply of basic needs, poverty alleviation, productive employment generation, human resource development and development of economic and social infrastructures. Accordingly, agriculture, water resources, rural development, energy, health and education have been given high priority in the public sector (GPRB 1998).

Chapter Three

Land Use Complex of Bangladesh with Reference to Rajshahi

3.1 Land use - The concept

3.1.1 Land

Davis (1976) postulated that a comprehensive and useful definition of land is of legal derivation. He adopted the definition "any part of the earth's surface which can be owned as property, and everything annexed to it, whether by nature or by hand of man". So the issues of ownership and things affixed by nature or by human beings to the land are extremely important. Land has been characterised by immobility, finiteness and also by such physical and climatic characteristics as topography, soil, subsurface structure and composition, minerals, oil and gas, and by alternative and combined uses.

The issue of land ownership has been stressed by Mather (1986), where he has attempted to discern a cycle in which an ancient pattern of communal control or ownership of land gave way to individual private property rights. More recently, individual rights in land have become subject to increasing influence from central and local governments, reflecting a growing community concern about land and a changing attitude towards it. The usefulness of land can be described in many different ways; it is perhaps better regarded as a resource base rather than a resource in itself. However, land can be of use, very broadly, as: an ecosystem, a space and as a landscape.

Since the financial ability to purchase land and the consequent right to influence or control land use may bring considerable power to those who possess it, control of land and land use has been and remains a politically contentious issue (Rhind and Hudson 1980).

3.1.2 Land use

Confusions often arise between land use and land cover, as they sound very similar and closely linked. Land use has been viewed by Turner and Meyer (1994) as a concern primarily of social scientists, where the term denotes human employment of the land, or to be more specific, of a land-cover type, the means by which human activity appropriates the results of net primary production (NPP) as determined by a complex set of bio-physical and socio-economic factors (Skole 1994, Stomph *et al.*, 1994). Land use is influenced by the physical nature of land and its location, by available capital and its distribution, by the availability and cost of labour and also by the socio-political climate in which they operate (Libby 1974, Mather 1986). Land uses include settlements, cultivation, pasture, rangeland, recreation and so on. Land-use change at any location may involve either a shift to a different use or an intensification of the existing one.

On the other hand, land cover, a concern principally of natural sciences, denotes the physical state or form of the land surface (Mather 1986) and can be identified visually by traditional ground-based survey or by remote-sensing techniques. It embraces, for example, the quantity and type of surface vegetation, water and earth materials. Land-cover changes can be of two major modes: conversion, which involves a change from one cover type to another e.g. from grassland to cropland; and modification that is, alterations of structure or function without a wholesale change from one type to another (Skole 1994), thinning of a forest, for example. Land-use change is likely to cause some land-cover change, but land cover may change even if land use remains unaltered.

The driving forces for land use/cover change have been summarised broadly as socio-economic and environmental issues (Ojima *et al.* 1994). Socio-economic issues have further been disaggregated into political, economic and demographic factors by Mcneill *et al.* (1994), the latter encompassing population and income (Sage 1994), technology (Grubler 1994), political-economic institutions (Sanderson 1994) and culture and cultural changes (Rockwell 1994). Houghton (1994) has offered an excellent account of worldwide extent of land-use change over the previous decade, the century and even several millennia, where he has proclaimed that 'deliberate land-use change is intended to support the human enterprise but may instead reduce this capacity'.

Land use can be characterised as a constantly changing people-land relationship and balance (Davis 1976).

3.2 Land ownership in Bangladesh

In ancient times up to the advent of the British rule in undivided India, the ownership of land belonged to the individual who cleared jungle and made it fit for cultivation. Possession of land preceded the ownership (Ahmad 1995). At later stages, land was usually held and cultivated by communities, where the communities used to pay taxes to the king through its head. In 1793, the Permanent Settlement Act, enacted by the British rulers, vested that responsibility in the newly created *Zamindars* (Hussain 1995). This act introduced private property rights, whereby the *zamindars* became land-owners in perpetuity and thence, agricultural land became fragmented. The *zamindars* took possession of large parcels of land, prior to which individual land holding was not in vogue.

After independence from the British rule and subsequent partition of British-India in 1947, the *zamindari* system was abolished through the 'East Bengal State Acquisition and Tenancy Act' in 1950 (Siddiqui 1981), which also imposed ceilings on cultivable and homestead lands per household (Ahmad 1995), which in present day Bangladesh stands at 8.09 ha per person.

3.2.1 Land distribution

Despite the above restriction, the distribution of land in Bangladesh is highly skewed. 20% of the households own almost 70% of the land. On the other end, 55% of rural households are functionally landless[1] (Table 3.1).

Table 3.1 Percentage distribution of rural households by size of land

Size of land (ha)	Owned land		Operated land	
	HES 1995-96	HES 1988-89	HES 1995-96	HES 1988-89
Landless	5.5	3.5	0.4	1.0
0.004 - 0.016	12.4	14.7	12.7	15.3
0.017 - 0.190	37.1	34.7	35.8	34.7
0.200 - 0.390	11.8	10.8	14.8	11.0
0.400 - 0.990	19.0	18.4	21.3	19.3
1.000 - 2.990	12.0	14.4	13.5	15.7
3.000 and above	2.2	3.5	1.7	3.0
Total	100.00	100.00	100.00	100.00

Source: BBS 1998a

It can be visualised from Table 3.1 that in both the survey years and under both the categories (owned and operated), the smaller size class of 0.017 - 0.190 ha ('marginal', as often referred to by others) had the highest concentration of households. The number of landless households has increased under the owned category but decreased under the operated one during this seven year time span. The remaining five landholding classes show similar trend during this period: percentages of households in 'marginal' and 'small' (0.20 - 0.99 ha) classes have increased, indicating upward land mobility, while those under 'medium' (1.00 - 2.99 ha) and 'large' (3 or more ha) classes have declined registering land fragmentation and downward mobility. The former incidence takes place through purchase of land by

[1] This figure is for the third category or 'functionally' landless. In Bangladesh, households with less than 0.2 ha land are considered functionally landless. First category landless are the ones with no land at all and second category landless are ones with homestead but no other land (BBS 1999b).

means of savings chiefly from adoption of HYVs, as identified by Huda and Rahman (1997), while the latter occurs due to existence of the Muslim law of inheritance plus population growth (Siddiqui 1994) followed by distress sales.

Current average size of land ownership per farm household in Bangladesh is 0.7 ha (BBS 1998b), which has declined from 0.8 ha in 1986 (Hossain 1988), while cultivated land per farm is only 0.6 ha. These holdings are subdivided into an average of about ten fragments (Brammer 1990). Because of the smallness of the holdings, scientific agricultural measures are very difficult to implement (Hasan and Mulamoottil 1993). Moreover, an inequitable pattern of land ownership results in underutilised resources (Boyce and Hartmann 1981, Rahman and Ali 1984). This entails that the large land owners do not always cultivate their farms to the full possible extent, while the small land holders overcultivate their small parcels of land, resulting in decreasing yields.

3.3 Land tenurial system

The system of tenure of land in the country determines the legal status of the customary relationship between land, cultivators and others who are interested in land (Ahmad 1995). The landowners themselves can till the land or they can give lands to others to till for them under certain conditions. These are roots of different tenure groups in Bangladesh. Three types of land users namely, owner cultivators, owner-cum-tenant cultivators and pure tenant cultivators are available in the country. Table 3.2 shows the existing tenancy status in Bangladesh agriculture from the latest agricultural census (1996) and compares the figures with those from a similar survey a decade back (1984).

Table 3.2 Distribution of existing tenancies in Bangladesh - 1996 and 1984.

Type of Tenancy	No. of Households	Percentage of Households	Land Operated (ha)	Percentage of Land
Owner Cultivator	11,807,551	66.23 (62.58)	4,896,003	59.0 (58.5)
Owner-cum-Tenant Cultivator	4,206,072	23.60 (36.04)	3,221,775	38.8 (40.9)
Tenant Cultivator	1,814,595	10.17 (1.38)	175,566	2.2 (0.6)
All	17,828,218	100.00	8,293,344	100.00

Source: compiled from BBS 1999b.

Note: figures within parentheses in the third and fifth columns are those from 'Bangladesh Census of Agriculture and Livestock 1983-84'.

In 1996, 8.3 M. ha land was under cultivation (56% of total land of 14.84 M. ha). Owner cultivators constituted the largest tenancy group in both the survey years and tilled the highest proportion of cultivable land. However, the most common form of tenancy relationship in Bangladesh is share-cropping, the sharecroppers being the landless and marginal farmers mostly and the system providing a permanent or additional source of income (Husain 1985) to the croppers.

3.3.1 Share-cropping

In most places, the landowner gets half of the production, while the '*bargadar*' (share-cropper) cultivator, after providing all the inputs, gets the other half. In a few places, the '*tinbhaga*' (three-share) system operates, where the production is divided into three equal shares against land, labour and inputs. The landowner gets one-third of the product, while the 'bargadar' gets one-third for labour and the remaining third goes for inputs (Hasan and Mulamoottil 1993). Sharecropping in Bangladesh is constrained by several problems: lack of access to institutional credit facilities, discouraging use of modern inputs (Zaman 1973) and hindering agricultural productivity, leading to inefficient use of scarce resources (Mandal 1981, Momin 1991). Huq *et al.* (1992) emphasised the need to implement the 'tinbhaga' system throughout the agricultural community of the country while Husain (1985) suggested it was desirable to modify the terms and conditions of the existing system in favour of the sharecroppers through government initiatives backed by a legal code.

3.4 Land utilisation trend in Bangladesh

Bangladesh is an extremely land-scarce country. With a total area of 14.4 M. ha, inland and estuarine water surface area occupies 0.9 M. ha, leaving a land area of 13.5 M. ha. The total farm area was estimated as 9.2 M. ha in the last agricultural census in 1996.

Table 3.3 presents the major components of land utilisation in Bangladesh for the last two and half decades. Net cropped area (NCA) was estimated to be 7.85 M. ha in 1996-97, which has declined from 8.25 M. ha in 1971-72, corresponding to a 0.2 per cent annual decline over the twenty five year period. Total area classed as forest stood at about 2.16 M. ha; since much of the Unclassed State Forests (USF) are either grassland or scrub, actual area under tree cover is about 1.4 M. ha. Although forest cover dropped in the first two decades, it increased during the nineties, probably because afforestation and conservation activities have gained momentum during this latter period.

Table 3.3 Land utilisation pattern in Bangladesh over a twenty five year period

Years	Forest area	Not available for cultivation	Culturable waste (a)	Current fallow (b)	Net cropped area
1971-72	2.23	2.67	0.30	0.85	8.25
1981-82	2.11	2.75	0.25	0.55	8.58
1991-92	1.90	3.97	0.62	0.35	7.98
1996-97	2.16	3.92	0.52	0.39	7.85

Source: BBS 1997a, BBS 1998b

Note: 1. All areas are in million ha.

2. The above five components add up to the total land area of Bangladesh.

3. (a) Culturable waste is the area suitable for cultivation but lying fallow for more than one year;

(b) Current fallow is the area already brought under cultivation but not cultivated during the reference year.

Land area not available for cultivation has leaped by 50% from 2.67 to 3.92 M. ha, which is taken up by the village homesteads, urban areas, roads, embankments, sandy beaches etc. In Bangladesh, every new village homestead is being built on crop land. More than 85% of the total population live in about 68,000 villages of less than 200 families each. Within each village, there may be several clusters of homesteads (hamlets), i.e., a number of huts built around a courtyard and surrounded by trees, all contained on a raised platform, with or without ponds, and individually owned. Each homestead takes up more space than it actually needs. Quazi (1978) suggested rural land use planning with reorganisation of the basic settlement, the village, as the only possible solution. The existing scattering must be stopped and a process of agglomeration into compact settlement units be initiated. He concluded by emphasizing a new system of land ownership, that is, 'land reform' to accomplish this.

Area culturable but not yet cultivated is classed as 'culturable waste land'. This includes grazing grounds, scrub patches, village commons etc., which was estimated to be 0.52 M. ha. Current fallow (within the total area of farm holding) was 0.39 M. ha (BBS 1998b). Although area suitable for cultivation has decreased, this has been compensated by increase in area brought under cultivation. This new area under cultivation, which has been diverted either from some other use, or, brought in to cultivation from fallow/scrub land, has increased by a little over 50% over the period.

3.4.1 Cropping pattern

Currently in Bangladesh, about 53% of the 14.85 M. ha of land is under cultivation (NCA) (Table 3.4), which was 60% in 1986-87 (Hasan and Mulamoottil 1993). However, land cultivated three times a year has increased from 5% to 7% over a ten year period, while double cropped land has increased by only 1% (25% to 26%) over the same period. As a consequence, overall cropping intensity has also increased by some 10% to 1.74 (from 164% to 174%), which has further been increased to approximately 1.80 towards the end of this current decade (Hussain and Hossain 1998). This intensification has been effected by the introduction of the technology of the green revolution (Naher 1997), i.e., chemical fertiliser, HYV seed, water and pesticide treatment, which had rather influenced cropping pattern changes (Alam and Abedin 1996).

Table 3.4 Cropping pattern in Bangladesh over a five year period

Years	SCA (a)	DCA (b)	TCA (c)	NCA (d)	ToCA (e)	CI (e/d)
1992-93	3.00	3.87	0.99	7.86	13.71	1.74
1993-94	2.93	3.85	0.96	7.73	13.49	1.74
1994-95	2.93	3.86	0.96	7.74	13.53	1.75
1995-96	3.19	3.52	1.09	7.81	13.52	1.73
1996-97	2.91	3.94	1.00	7.85	13.80	1.76
Average	2.99 (20)	3.81 (26)	1.00 (7)	7.8 (53)	13.61	1.74

Source: BBS 1998b

Notes:

1. SCA is single cropped area (a), DCA is double cropped area (b), TCA is triple cropped area (c), NCA is net cropped area (d) and ToCA is total cropped area (e).
2. NCA (d) = (a) + (b) + (c)
3. ToCA (e) = (a) + 2(b) + 3(c).
4. CI = cropping intensity
5. figures within parentheses in the last row are percentages of the total land area of Bangladesh, adding up to 53%; the remaining 47% include forest area, area not available for cultivation, culturable waste and current fallow.

3.4.2 Land utilisation in Rajshahi and Bangladesh

The comparative picture of land utilisation patterns of Bangladesh and Rajshahi has been depicted in Table 3.5. It can be seen from the table that area not available for cultivation is relatively high in Rajshahi region. Nonetheless, net cropped area in Rajshahi is comparatively much higher, which can possibly be attributed to a scant coverage of forest area. Higher NCA has resulted from a greater cropping intensity. Zaman (1998) has asserted that the Barind, i.e., the Rajshahi region has performed well in terms of agricultural productivity by utilisation of its irrigation potentials.

Table 3.5 Land utilisation pattern of Bangladesh and Rajshahi, 1996-97

Land use type	Bangladesh [M. ha] (%)	Rajshahi [M. ha] (%)
Not Available for Cultivation	3.92 (26)	1.09 (32)
Forest Area	2.16 (15)	0.02 (0.5)
Culturable Waste	0.52 (3)	0.06 (2)
Current Fallow	0.39 (3)	0.09 (2.5)
Net Cropped Area	7.85 (53)	2.19 (63)
Total Area	14.84 (100)	3.45 (100)
Cropping Intensity	1.76	1.84

Source: Compiled from BBS 1998b

3.5 Land use changes

Due to population pressure on land in the country, the people are using land intensively for different purposes. Ahmad (1995) has presented a detailed account of land use change in Bangladesh between 1969 and 1986. A similar type of calculation was carried out by the author and presented here using the figures for 1996-97 based upon the latest statistical pocketbook of Bangladesh. The combined result has been furnished in Table 3.6.

The table shows that the amount of forest land during the first period (1969-86) decreased by about 12 percent from 2.24 M. ha to 1.98 M. ha but increased by about 8 percent during the second period (1986-96). The amount of settlement and other built-up lands like roads, homesteads, buildings etc. increased by 25 percent and by a further 19 percent during these two periods. But the change in agricultural land over the earlier years was a mere 1 percent, gradually declining by just 8 percent over the latter years. The reason behind this is that the population during this period has increased to almost double and a large amount of agricultural land has been used by the additional people for various purposes. On the other hand, a large amount of uncultivated land like forest land, hilly land etc. have been brought under cultivation by this ever-increasing population for survival.

Table 3.6 Changes in land use from 1969-70 through 1996-97 in Bangladesh

Land use types	1969-70 M. ha (a)	1986-87 M. ha (b)	Change (%) (a) to (b)	1996-97 M. ha (c)	Change (%) (b) to (c)
Agricultural land	9.40	9.50	(+) 1.1	8.77	(-) 7.7
Forest land	2.24	1.98	(-) 11.6	2.16	(+) 8.3
Settlement and other built up land*	2.63	3.29	(+) 25.1	3.92	(+) 19.1

Source: compiled from Ahmad (1995) and BBS (1999b)

(*not available for cultivation)

Moreover, if we consider the three components of agricultural land, i.e., culturable waste, current fallow and net cropped area, it can be found that this decline in agricultural land has been caused by an almost two fold increase (96%) in the area occupied by culturable waste. Causative to a lesser extent, the coverage of current fallow and net cropped area have been reduced by 1 percent and 11 percent respectively. It should be mentioned here that the 8.3 M. ha land in Table 3.2 is operated land, while the land area of 8.7 M. ha in Table 3.5 and Table 3.6 is operated (i.e., agricultural) and other lands. This would help to clarify any confusion arisen from mention of different land area in different instances.

3.5.1 Factors affecting change in land use

The amount of agricultural land has been increased in the Chittagong (SE) and Khulna (SW) regions owing to formation of alluvium *char* land (newly accreted land) in the rivers and sea shores of these regions and also by accelerated sedimentation in the southwest due to the commissioning of Farakka Barrage on the Ganges by the Indian government (Mirza 1998). Bangladesh-Netherlands joint 'land reclamation project' has enhanced new land development in the coastal regions of the south (Shahjahan 1995).

On the other hand, agricultural land decreased to the tune of 2% in Dhaka (central) and Rajshahi (NW) regions, mainly due to urban expansion in the fringes of these two major cities (Alamgir 1993) and also due to river bank erosion around the Brahmaputra-Jamuna floodplain (Haque 1992).

3.6 The Forest Scenario

3.6.1 Condition of forests and their distribution

The forest sector of Bangladesh is in a state of crisis (Rashid 1991). In the past 20 years, the stock of trees in the forests has been depleted very rapidly. Large areas, which were formerly forests have been illegally converted into crop lands (although official statistics does not reveal it). The Forest Department (BFD) has made continuous attempts at reforestation and afforestation to recoup these losses, but recent forest inventories have shown that more than half of these plantations have failed. Due to rapid growth of population, the pressure on forest resources has increased very substantially.

Thus Bangladesh was possessing an alarmingly small and shrinking productive forest base (GPRB 1987) during the late eighties. In the early nineties, an estimated 2.53 M. ha of the total land of the country was designated "forest land" [reduced to 2.16 M. ha in 1996-97][2], out of which 2.25 M. ha was government owned and 0.27 M. ha was privately controlled homestead forest land (ADB 1992). Out of 2.25 M. ha of government forest land, 1.53 M. ha is national forest under the purview of the BFD and the remaining 0.72 M. ha is virtually barren, which lies under the control of Local District Government Councils in the Chittagong Hill Tracts comprising the three hill districts of Rangamati, Bandarban and Khagrachhari. Table 3.7 shows distribution of forest area by legal and ownership status.

[2] For ease of discussion, the figures from the 'Forestry Master Plan 1992/93' will be used instead of current figures, which lack details in a number of contexts. However, current figures will be mentioned within parentheses wherever they are available.

Table 3.7 Distribution of forest area by legal and ownership status (M. ha)

Category of Forests	Area	Percent
State forest lands		
Under control of FD		
Reserved forest	1.37	54.15
Acquired forest	0.01	0.40
Vested forest	0.02	0.80
Protected forest	0.04	1.60
Transferred *khas* (revenue) land	0.09	3.55
Total under BFD	*1.53*	*60.50*
Under control of district administration		
Unclassed state forest	*0.72*	*28.45*
Private forest lands		
Homestead/village forest	*0.27*	*10.65*
Others		
Community forest plantations of various kinds	*0.01*	*0.40*
Total	**2.53**	**100.00**

Source: ADB 1992.

It should be mentioned here that, while figures on the amount of designated forest land vary somewhat, there is less precision and availability of estimates on total forest and tree cover in Bangladesh (GPRB 1987). However, a more recent estimate by FAO (1999) shows that Bangladesh had a forest cover of 7.8% in 1995, as compared with 18.7% of South Asia and 26% of world coverage.

Table 3.8 Region-wise distribution of forests in Bangladesh.

	Forest type	Location (districts/region)	Area (M. ha)	% of forest area
i.	Mangrove forest (*Tropical evergreen*)			
a.	Sundarbans forest	Khulna, Satkhira	0.57	3.90
b.	Coastal forest	Cox'sbazar, Chittagong, Barisal, Patuakhali	0.10	0.68
ii.	Hill forest (*Tropical moist evergreen*)			
a.	Managed forest	Chittagong, Cox'sbazar, Sylhet and other eastern Parts	0.67	4.59
b.	Unclassed State Forests	Rangamati,Bandarban, Khagrachhari	0.73	5.00
iii.	Sal forest (*Tropical moist deciduous*)	Dhaka, Tangail, Mymensingh, Dinajpur And other north-western Parts	0.12	0.82
iv.	Private forest			
a.	Village forest	All over the country In homesteads	0.27	1.85
b.	Tea and rubber gardens	Sylhet, Moulovibazar, Cox'sbazar	0.07	0.48
	Total	**38 districts**	**2.53**	**17.32**

Source: ADB 1993

The government forest land of the country is unevenly, and rather oddly, distributed (Bose 1998). BBS (1998b) reports that 26 districts out of 64 of Bangladesh have no forest at all. The table (3.8) implies that most of the forest areas are located in the north-east, south-east and south-western border parts of the country. Only a scant amount is situated in the central and north-western parts of Bangladesh.

3.6.2 Forest cover

Much of the state forest land in Bangladesh is barren of tree vegetation. Classified and unclassified forest land merely designates government-owned land once covered by forests. Today, it signifies an administrative or legal category, not truly areas with treed forest cover (ADB 1993).

Table 3.9 Estimated tree-cover in major forests of Bangladesh

Forest type	Location	Approximate area (ha)	Estimated tree-cover (% of area)
Mangrove forest	South-east and south-west	600,000	75
Tropical Evergreen and Semi-evergreen forest	Eastern belt	600,000	50
Tropical Deciduous forest	Central and north-western plains	125,000	25
Homestead forest	Throughout the country	270,000	80

Source: Khan 1998.

Khan (1998) quoted the above figures based on an estimate made by BARC in 1991 which shows that paradoxically the homestead forests, owned by private individuals on small scales, had the highest tree coverage and supportively supplied 85% of all wood requirements of the country (Douglas 1982). On the other end, most parts of Inland Sal forests (tropical deciduous forests) have been reduced to virtually scrub lands with only 25% tree coverage, perhaps due to its easiest accessibility among all government managed forest types, leading to encroachment and successive deforestation mainly for agricultural purposes. On an average, density (percentage tree cover) in state forests stands at about 57% (ADB 1993).

The Forestry Master Plan for Bangladesh developed by the Asian Development Bank (ADB 1993) revealed that only about 6% of Bangladesh's total area contained reasonable quality forest vegetation (medium to good density) on state forest land.

3.6.3 Forest types and important species

3.6.3.1 Natural forests

The natural forests of Bangladesh have been broadly classified into four major categories, whose account is provided below in brief along with important species occurring in each category.

<u>Tropical Evergreen Forests</u>

Lofty, dense, evergreen trees, often 30-45 m or more high, form the bulk of the main canopy which is perhaps rather less continuous. Dipterocarps are predominant and a few giants often project above the general level. The number of species is very great and the mixture very intimate, only a few species forming small consociations. The middle and lower canopies are particularly dense, evergreen and varied. Canes and other climbers are abundant and epiphytes of all sorts are numerous. There is typically a ground cover of evergreen shrubs, herbaceous vegetation being scarce and grasses absent (Champion 1936).

Two variations within this category are found, chiefly on the basis of dominant height and species composition: tropical wet-evergreen and tropical mixed-evergreen (Das 1990). The former has an upper storey of some 30 m in height and composed of mainly chapalish (*Artocarpus chaplasha*), telsur (*Hopea odorata*), chundul (*Tetrameles nudiflora*) etc. Lower strata in these forests are formed by trees such as pitraj (*Aphanamyxis polystachya*), nageswar (*Mesua ferrea*), toon (*Cedrela toona*), kamini (*Murraya exotica*), horina (*Panicovia rubiginosa*) etc. The second type reaches an average top-height of 45 m and consists of garjan (*Dipteocarpus* spp.), which often grows to a height of 60 m and a diameter of 1+ m, civit (*Swintonia floribunda*), narikeli (*Sterculia alata*), chundul etc. The second storey is of trees such as kamdeb (*Calophyllum polyanthum*), raktan (*Laphopetalum fimbriatum*), chapalish and nageswar, while the third storey consists of smaller trees like jiyal (*Lannea grandis*), haritaki (*Terminalia chebula*), gamar (*Gmelina arborea*), jarul (*Lagerstroemea speciosa*) and chhatim (*Alstonea scholaris*).

Tropical Semi-evergreen Forests

This type is very variable and difficult to define except in comparative terms, being intermediate between the tropical evergreen and moist deciduous forms but usually including groups or patches fairly typical of both. It includes both evergreen and deciduous trees – the former predominating in intimate mixtures, but with a definite tendency to gregarious occurrence. Buttressed stems are common features of both types of species. Climbers are often heavy. Bamboos may or may not be present (Brandis 1906, Champion 1936). This type of forest is sometimes referred to as tropical-moist-deciduous-riverain and open deciduous forests (Rashid 1991).

Main trees in this type of forests are kadam (*Anthocephalus cadamba*), pitali (*Trewia nudiflora*), shimul (*Salmalia malabarica*) and dipterocarp species from the evergreen class and champa (*Michelia champaca*), chikrasi (*Chukrassia tabularis*), koroi (*Alibizia* spp.), toon (*Toona ciliata*), aksi (*Dillenia pentagyna*) etc. from the deciduous class.

Tropical Moist Deciduous Forests

These forests are more commonly known as sal (*Shorea robusta*) forests, being dominated by this gregarious species. Sal is generally more aggressive than any of its associates or competitors in coppicing power, resistance to burning, regeneration under burning and grazing, adaptability to soil and site conditions and longevity

(Champion 1936). The sal typically forms high forest in which it constitutes 60 to 90 percent of the top canopy which is 25 to 35 m high (Troup 1921). Sal coppices in Bangladesh are known as *gazari*. Actually the sal forests in Bangladesh consists entirely of this gazari, which is perhaps of the worst quality as far as growth is concerned (Rashid 1991).

In the central plains of Bangladesh, common associates of sal are aksi/ajuli, kumbhi (*Careya arborea*), bahera (*Terminalia belerica*), jiyal (*Lannea grandis*), kaika (*Adina cordifolia*), chapalish (*Artocarpus chaplasha*) etc. (Troup 1921, Rashid 1991). A shrubby undergrowth of semi-evergreen species is usual, but cane and bamboo are almost completely absent. In the northern plains, most of the species are common to the previous zone with some lesser occurrence of shonalu (*Cassia fistula*), kurchi (*Hollarhina antidysenterica*) (Khan and Alam 1996), palash (*Butea monosperma*) shimul (*Bombax ceiba*) etc.

<u>Mangrove Forests</u>

These forests occur in the coastal areas, which are flooded at every high tide with brackish water, and is an evergreen closed high forest of 30 m or so in height. They often consist of two to three storeys. The most outstanding features of this type of forest are the pneumatophores (breathing roots) of *Sonneraticeae* and stilt roots of *Rhizophoraceae* (Pearson and Brown 1932, Champion 1936) and viviparous germination common to most species, enabling them to survive and regenerate in such water-logged habitats.

The Sundarban forest at the southern end of the Ganges-Brahmaputra delta, which continues westward into West Bengal State of India, is the largest single-tract mangrove forest of the world. Two fairly distinct regions can be demarcated as 'freshwater' forest and 'moderately saltwater' forest. In the former type, sundari (*Heritiera fomes*) constitutes 50-70% of growing stock, followed by gewa (*Excoecaria agallocha*). Other trees associated with this area are bain (*Avicennia officinalis*), dhundul (*Carapa obovata*), kankra (*Bruguiera gymnorhiza*) - all of which are non-gregarious. Along the streams, two palms are most abundant - golpata (*Nipa fruticans*) and hantal (*Phoenix paludosa*), and also the willow-like keora (*Sonneratia apetala*). In the latter type, sundari diminishes, gewa increases and goran (*Ceriops roxburghiana*) gradually predominates as one moves south-westward (Ahmed 1957), and forms the common understorey.

3.6.3.2 Plantations

Plantations of exotic species have a long history in the area now constituting Bangladesh. The most successful species is teak (*Tectona grandis*), which was introduced at Kaptai (Chittagong district) in 1871. Chittagong teak is considered as next best only to the Burmese teak. Valcav and Scoupy (1972) have demonstrated excellent (then) performance of teak in Bangladesh while Haque and Osman (1993) have showed that teak performs well in mixed plantations. The big-leaved mahogany (*Swietenia macrophylla*) is another most successful exotic, which was first tried at Kaptai in 1891 and has since been planted extensively throughout Bangladesh. Pyinkado (*Xylia dolabriformis*) is another slow-growing exotic hardwood species, which has bright prospects to flourish in Bangladesh (Kamaluddin 1979).

A number of fast growing exotic tree species have been introduced in Bangladesh, mostly for poles, small timber or fuelwood purposes. Among them, *Eucalyptus camaldulensis* and *Acacia auriculiformis* have the largest coverage and have been studied extensively by Rashid (1970), Kamaluddin and Bhuiyan (1985), Ara and Yahya (1990), Islam *et al.* (1999) – to name a few. *Acacia mangium* is the next important fuelwood species (Latif *et al.* 1985, Osman *et al.* 1993). Another exotic species, *Paraserianthes falcataria*, has been planted on large scale in the Sylhet forest division for pulpwood purposes (Latif *et al.* 1997).

In the coastal afforestation sites of south-east Bangladesh coast, appreciable area has been planted with keora (*Soneratia apetala*) and baen (*Avicennia officinnalis*), with smaller area of a few other mangrove species.

Table 3.10 Forest division/location wise plantation area

Forest type	Forest Division/location	Plantation area (ha)
Mangrove/littoral forests	Sundarbans RF	–
	Noakhali CA	34,223
	Patuakhali CA	9,848
	Bhola CA	12,420
	Chittagong CA	20,042
	Total littoral forests	76,533
Hill forests	Kassalong RF, CHT North	22,376
	Rainkhiong RF, CHT South	18,759
	Sitapahar RF, CHT South	3,740
	Chittagong	14,143
	Cox's Bazar	19,084
	Sylhet	17,871
	Total hill forests	95,973
Sal forests	Dhaka	3,099
	Mymensingh	9,147
	Tangail	3,631
	Dinajpur	2,249
	Rangpur	1,746
	Rajshahi	1,214
	Total sal forests	21,086
All types (grand total)		**193,592**

Source: BFD 1999

Plantation figures as presented in Table 3.10 show that almost 50% of plantation has been established in the hill forests, mostly with slow-growing exotic timber species like teak and mahogany, with a lesser coverage of fast-growing exotics. About 40% of plantation has been created in coastal afforestation (CA) areas, while the remaining 10% has been devoted to reclamation of sal forest areas with fast-growing exotics like eucalypts, acacias and sissoo (*Dalbergia sissoo*) mainly.

3.6.4 Growing stock

The trees that must be reserved somewhere in the forest to continue production (of wood and other forest produce) are the growing stock, whose quantity and condition determines the volume of wood to be grown in the future (Smith 1986). Table 3.11 shows the growing stock of different forest types of Bangladesh in 1991, when an inventory was undertaken for preparing the Forestry Master Plan. It can be comprehended from the table that the bulk of the growing stock (54%) occurred in the village groves, which coincides with findings of many other authors in different aspects of Bangladesh forestry situation. The next most significant stock (27%) cropped up in the managed hill forests. The most serious state of stock was in the Sal forests of central and northern plains.

Table 3.11 Growing stock of different forest types - 1991

Forest type	Growing stock	
	(M. m^3)	m^3/ha
Mangrove forest (Tropical evergreen)		
Sundarbans	13.19	23.14
Coastal afforestation	5.05	50.50
Hill forest (Tropical evergreen and semi-evergreen)		
Managed forests	28.23	2.65
Unclassed state forests	na	na
Sal forest (Tropical moist deciduous)	1.13	9.42
Village forest	54.68	202.52
Total	102.28	59.12

Source: ADB 1993.

The forest resources assessment studies of the FAO, undertaken in 1980 and 1990, contain various forest statistics of Bangladesh and the growing stock figures shown in Table 3.12 have been adopted from them, which shows a declining trend over the years.

Table 3.12 Growing stock of Bangladesh forests in different years (M. m^3)

Forest types	1980	1985	1990
Mangrove	21.7	21.7	-
Hill	47.6	45.0	-
Sal	1.8	1.3	-
Total	71.1	68.0	59.2

Source: compiled from FAO/UNEP 1981 and FAO 1995.

3.6.5 Deforestation

Deforestation is just one of the human impacts on tropical forests, which involves clearance and conversion. Deforestation can be defined as the temporary or permanent clearance of forest for agriculture or other purposes (Lanly 1981, Grainger 1993). It is an extreme case of forest degradation (Grainger 1998). Broadly speaking, deforestation involves depletion of forest biomass, not just tree cover (Barraclough and Ghimire 1995). The causes of deforestation are many, diverse and complex. Logging, shifting cultivation (Myers 1994), fuelwood dependency (Tole 1998), migration of human population (Mahar and Schneider 1994) and clear felling for alternative land uses are often cited as the immediate causes of deforestation. Competition for land (Pearce and Brown 1994), external debt (Kahn and McDonald 1995), undervaluation of forests, market and policy failures (Osgood 1994), population pressure (Rudel 1994), poverty and inequality (Westoby 1989) have all been suggested as ultimate causes of deforestation (Bawa and Dayanandan 1998). Recent estimates compiled by the FAO (1993a) show that between 1980 and 1990, tropical forest cover disappeared at an average rate of 15 M. ha (0.8% of the 1980 forest cover) per year.

Forest cover losses in Bangladesh have largely remained unsurveyed or unmapped and their exact sizes and locations are not conclusively and consistently determined (ADB 1993), except for some global and regional level periodic estimates made by the FAO. Scattered accounts of the problem can be found in a few individualistsic attempts. Bawa and Dayanandan (1998) has analysed the data derived from the *World Resources 1994-95* (WRI 1995) and shown that Bangladesh has the highest annual deforestation rate of 3.28% among the tropical Asian countries, preceded only by Jamaica (5.29%) and Haiti (3.95%) among all tropical countries with high deforestation rates. Palo and Lehto (1996) have also come up with similar conclusion by modelling annual deforestation rate (1981-90) over percentage forest cover in 1990.

There has been general consensus over the causes of deforestation in Bangladesh as agricultural land clearing, principally shifting cultivation, organised and forced encroachments, grazing, illegal felling for commercial purposes and fuelwood collection for domestic and commercial cooking and brick-burning (Ahmad 1987, ADB 1993, Hasan and Mulamoottil 1994). A further exploratory study by Salam *et al.* (1999) has identified 'illegal sale by BFD officials' as a major cause of forest cover loss in the hill forests of Bangladesh, which happens to be a widely recognised factor in the mangrove forest as well. These direct causes are the effects of a wider malaise – poverty, landlessness, economic underdevelopment, inappropriate forest policies and regulations, uncertainties in land tenurial arrangements and socio-political instability.

3.6.6 Production of forest produce

Output of forest products from Government reserve forests (RF) is shown in Table 3.13. Out of nine major timber and non-timber forest products (NTFP), five have shown a declining trend over the period, while three products have shown an increasing trend. Timber production has increased by 26% from 1991-92 to 1994-95, perhaps due to improved management of industrial plantations (pulp plantations in Rangamati Hill district and the Sundarbans). Firewood, the second most important forest produce from Government forest land, has followed a declining trend (decreased by 70% from 1992 to 1996). Among the NTFPs, only sungrass (*Imperata cylindrica*) has shown an increase in production over the years. This increase presents two conflicting implications. On the one hand, it denotes a further overall degradation of land designated and treated as forests (Garrity *et al.* 1997, Otsamo 2000). On the other, its diverse uses and economic benefits have been well documented and endorsed by a number of studies (Skerman and Riveros 1990, Turvey 1994, Shah *et al.* 1996, Potter 1997). Both the implications of increasing sungrass coverage (about 3% of land area) are crucial for Bangladesh and need further exploration. Honey, a highly nutritious food item (319 Kcal/100 gm) and wax, which is used as raw material in a number of production processes, have both declined in yield from the forests. Bamboo, also known as poor man's timber, has registered a 50% increase in production from 1992 to 1993, but has since been dropping in production, as Banik's study (1994) revealed a 2% annual average reduction of natural bamboo forests. Cane, a highly valuable furniture and weaving material, has shown an irregular trend in production.

Table 3.13 Output of forest products (from reserve forests)

Product	Unit	1991-92	1992-93	1993-94	1994-95 (p)	1995-96 (p)
Timber	000 m^3	187	230	191	236	na
Firewood	000 m^3	368	189	268	162	106
Golpata (a)	000 m.ton	72	67	68	64	62
Bamboos	000 no.s	80000	119206	90466	73251	65760
Sungrass (b)	000 bundles	458	1016	1092	2146	na
Honey	m.ton	159	182	107	90	109
Fish (c)	m.ton	4715	5528	5093	5328	na
Wax (d)	m.ton	44	36	26	1	1
Cane	000 rft.	2379	655	2983	na	1

Source: BBS 1997a

Notes: (a) leaves of the golpata (*Nipa fruticans*) tree, which is extensively used as thatch material in the Sundarbans area and also marketed to other rural places.

(b) the whole leaf-stalk of sungrass (*Imperata cylindrica*) is widely used as thatch material in and around places of its growth, mainly Chittagong and Sylhet regions.

(c) fish caught from rivers or other water bodies within designated forest areas.

(d) natural wax extracted from beehives, after removal of honey.

(p) provisional figures.

na not available.

3.6.7 Forest administration and management of forests

3.6.7.1 Forest administration

National forests of Bangladesh are administered by the Bangladesh Forest Department (BFD or simply, FD), which is one of the wings of the Ministry of Environment and Forests (MOEF), the other wings being the Department of Environment (DOE), Bangladesh Forest Industries Development Corporation (BFIDC) and Bangladesh Forest Research Institute (BFRI).

The departmental structure of FD is hierarchical. The department is headed by a Chief Conservator of Forests (CCF). At FDs headquarter, the CCF is assisted by three Deputy Chief Conservators of Forests (DCCF), responsible for development planning, management planning and forest extension respectively. Each DCCF is supported by an ACCF (Assistant Chief Conservator of Forests). Reporting direct to CCF is also a Conservator of Forests (CF), who, with the assistance of two ACCFs, is responsible for general administration and wildlife.

FD's field operations, consisting of six Circles headed by CFs and concerned with territorial forestry, come under the CCFs direction. Each Circle consists of several Forest Divisions, which normally coincide with administrative districts, and is under the charge of a DFO (Divisional Forest Officer); there are 37 Forest Divisions in the country at present. Divisions divide into several Forest Ranges, controlled by Forest Rangers (FR), who in turn are in charge of several beats, each under a Deputy Ranger (DR) or Forester (ADB 1993) (see Appendix 3.1).

3.6.7.2 Management of forests

The natural forests of Bangladesh fall under three major categories and are managed by three distinct management or silvicultural systems, viz.

Hill forests - clearfelling followed by artificial regeneration
Mangrove forests - selection cum improvement
Inland sal forests - coppice with standards

3.6.8 Government forest policy

Forestry policy development in Bangladesh dates back to 1894 when the British India's first forestry policy was formulated. This policy emphasized the maintenance of forests in hilly areas for the preservation of climate and physical conditions to protect the cultivated land in the plains from floods, siltation, soil erosion etc. Little attention was paid to the protection and sustainable management of forests (FAO 1993b). That policy was re-oriented in 1955 to place more importance on forest improvement by creating plantations, improving timber harvesting, initiating forest management plans, management of private forests and wildlife management. A review of policy in 1962 intensified management to make forestry a commercial concern. Utilisation of forest produce was to be made more efficient in order to reduce rotations and regeneration speeded up to keep pace with increased harvesting. Irrigated plantations to produce industrial wood, soil conservation and watershed management, and tree cultivation in saline and waterlogged condition were brought into focus.

The policies of the 1962 revision were quite suited to those areas in present-day Pakistan, but in 1971, the newly liberated country of Bangladesh had its own priorities and unique conditions. The Government of the People's Republic of Bangladesh (GPRB) therefore declared a new and pragmatic National Forest Policy in July 1979, in light of management aspects discussed at the first National Forest Conference in 1977. Several key areas were addressed to promote overall development of the sector and the country, which included: preservation of climatic and physical conditions, recognition of essential NTFPs, soil and water conservation strategies, modern technology for afforestation and preservation of wildlife.

In the meantime, initiatives have been taken to orient the policies to meet demand of time periods, particularly in consideration of tackling the natural hindrances and rapidly depleting forest resources owing to numerous socio-economic factors. As part of this attempt, the Government has undertaken formulation of the national Forestry Sector Master Plan (FSMP), covering the 20 year period from 1995 to 2015. Proposals and suggestions were put forth in the FSMP to amend the 1979 policy. Thus came up the National Forestry Policy 1994. Broad objectives of this latest policy are the following (ADB/UNDP 1995):

a. to meet the basic needs of the present and future generations and to ensure greater contribution of forestry to national economic development, 20% of the total land of the country, in addition to all un/underutilised land will be brought under plantations;
b. creating employment opportunities to strengthen rural and national economy;
c. conserving natural floral and faunal habitats to foster biodiversity;
d. agricultural sector will be strengthened by extending support to the aspects related to forestry;
e. national responsibilities and agreements will be fulfilled with regard to global warming, desertification and control of trade or commerce of wild birds and animals;
f. illegal encroachment, tree-felling and poaching activities will be prevented through the participation of local people;
g. effective use of forest goods at various stages of processing will be encouraged;
h. afforestation programme on both public and private lands will be implemented by encouraging and assisting people.

Statements of the 1994 Forest Policy have been presented in Appendix 3.2.

3.6.9 Major issues before FD

Conserving ecological processes is critical for Bangladesh and its extremely diverse species compliment. The regulation of these processes by micro-organisms, animals and humans has impacts on the complex relationships within and between species, habitats and ecosystems. This diversity is substantially threatened, particularly through man-induced changes.

Past and present forest resource use and exploitation patterns, if allowed to continue, will result in further severe depletion of growing stock and reduced varieties of flora and fauna. These past patterns are not sustainable. The net results of all the plantations over the last 100 years in Bangladesh is negative, as is the traditional approach of the FD in designating forest reserves for revenue generation while not contributing to providing basic needs for local population. The productivity of forest management techniques requires a dramatic increase. How can these be achieved, given the existing severe social and institutional constraints?

Just a few critical issues that the FD needs to pay special attention to are:

- social equity has to be attempted seriously through participatory mechanisms;
- participation of people in planning, implementing, monitoring and evaluating will have to be ensured;
- benefit-sharing of participants will have to be addressed more efficiently;
- biomass production and development of NTFPs will have to be considered;
- institutional mechanisms for environmental management will have to be strengthened.

Chapter Four

Social Forestry in Bangladesh with Particular Reference to The Thana Afforestation and Nursery Development Project (TANDP)

4.1 Conceptual framework of social forestry

Before the advent of the term social forestry, many instances in the past in different countries indicated people-oriented tree growing or forms of communal forestry, practised by communes. Examples are found from China, India, Sri Lanka, Ethiopia, Senegal, Mali, Malawi (FAO 1986) and European countries like Switzerland (Roberts 1990, Briones 1995) and others.

The term social forestry was used for the first time in the IX Commonwealth Forestry Conference held in India (1968), when Jack Westoby proposed a distinction between 'production forestry' and 'social forestry' as below:

Table 4.1 Distinction between production forestry and social forestry

Production forestry	Social forestry
Forestry which aims at producing wood for industrial and household purposes.	Forestry which aims at producing a flow of protection and recreation benefits for the community.

This distinction, however, omitted some core elements of social forestry like the provision of fuelwood, fodder, poles and other bare necessities of rural communities.

4.1.1 Origin of 'Social Forestry'

Social forestry was originally envisaged as a response to the various problems brought about by widespread loss of trees and forest cover. 'Social forestry' programmes involved growing of trees beyond the boundaries of the reserved forests wherein only reservation has remained and forests have vanished (Ramaswamy 1988). Under such circumstances, large-scale tree planting efforts were underway in the Philippines, India and elsewhere, to supply raw materials to pulp-mills, providing farmers with loans at nominal terms and ensuring a minimum market price.

Perhaps with the knowledge of the side-effects of such an approach, the World Bank and other international aid agencies found it necessary to launch the programme differently. Thus, the World Bank's forestry sector policy paper of 1978 (World Bank 1978) spelled out the need to promote forestry as a means of providing for the broader needs of the rural people and especially the poor. This shift in emphasis was reflected at the 'VIII World Forestry Congress' at Jakarta in 1978 (Eighth World Forestry Congress 1978). The Food and Agriculture Organisation too did not lag behind. Its 1978 paper on 'forestry for local community development' commendably stated:

> The objective is to raise the standard of living of the rural dweller, to involve him in the decision making processes which affect his very existence, and to transform him into a dynamic citizen capable of contributing to a wider range of activities than he was used to and of which he will be the direct beneficiary. ... Its ultimate objective is not physical but human. The physical goals, which will be set, are really means towards achieving the objective of enhancing the lives of human beings (FAO 1978).

Another impetus in the movement was the initiative by the International Development Research Council [IDRC] (Bene *et al.* 1977) that led to the creation of the International Centre for Research in Agroforestry [ICRAF] to promote research and training in agroforestry. That was the boom time for international funding. By the early 1980s, over 130 major programmes were initiated in some 50 countries, at a cost of over US$ 750 million.

Some experts assume a slightly different viewpoint on the origin of social forestry. They rather want to claim the revitalisation (Mallik *et al.* 1995) of an age-old practice, however differently it may have been addressed during ancient times, dating back to the same period of time just discussed above, that is late 1970s. They advocate the revival of participatory forestry as a result of the failure of industrial forestry to maintain both ecological and economic sustainability, particularly in the overpopulated developing countries (Svedin 1979, Comte 1980, Singh *et al.* 1985, Arnold 1987, Adhikari 1990, Lohmann 1990). Recently, the developed countries have also been examining the feasibility of social forestry as a land management alternative (Duinker *et al.* 1991) for similar reasons to those for the developing countries, but differing in a number of features as clearly elucidated by Mallik and Rahman (1994).

4.1.2 Attempts to define 'Social Forestry'

So far, there is no universal definition of social forestry (Arnold 1992). FAO (1986) described social forestry as,

> '... a term used for any type of industrial, conservation or community forestry project which tries to maximise benefits for the residents'.

The term social forestry is often used interchangeably with 'community forestry' or 'village forestry' (Arnold 1983) or 'forestry for local community development' (FAO 1978), 'rural development forestry' 'community based forestry' or more comprehensively as 'forestry for sustainable rural development' (Ford Foundation 1998).[1] Community forestry, which provides the umbrella for social forestry, was defined by FAO (1978) as:

> '... any situation which intimately involves local people in a forestry activity ... embraces ... woodlots ... for local needs, through the growing of trees at the farm level to provide cash crops and the processing of forest products at the household, artisan or small industry level to generate income, to the activities of forest dwelling communities ... excludes large scale industrial forestry ... which contributes to community development solely through employment and wages ... does include ... services which

[1] Those interested in inquiring further into the distinction between 'community forestry', 'social forestry', 'farm forestry', 'agroforestry' and other similar, terms may consult Gulati (1990), Cabarle (1991) Hobley (1996) and Wiersum (1999 p. 81).

encourage and assist forestry activities at the community level ... does embrace most of the ways in which forestry and the goods and services of forestry directly affect the lives of rural people'. Thus, individual households, women and men farmers and other people, as well as those involving a community as a whole, perceived community forestry as an all encompassing activity.

'Social forestry' encompasses a broad range of tree- or forest-related activities that rural landowners and community groups undertake to provide products for their own use and to generate local income. They include farmers growing wood to sell or to use as firewood. They also include communities or individuals earning income from the gathering, processing, and selling of minor forest produces such as fruits, nuts, herbs, basketry materials, honey and vines. Finally they may also include governments or other groups planting trees on public lands to meet local village needs (Gregersen *et al.* 1989). Another key aspect of social forestry is that the local people assume (part of the) management responsibility (Pardo 1985), from which they derive direct and indirect benefits through their own efforts.

However differently it may be defined or viewed, a consensus has hitherto been developed as to its meaning. The many references to social forestry programmes explicitly recognise that these projects are designed to trigger cultural change in the behaviour of a large number of people with respect to the planting and protection of trees (Cernea 1988). Said otherwise, these programmes are deliberately directed not merely toward the ultimate end of growing more trees, but also toward influencing an intervening variable: people's attitude toward trees and people's interaction with respect to trees.

Many authors have drawn lines of differentiation between conventional forestry and social forestry (Westoby 1987, Shah 1988, Roberts 1990, Hyde 1992), which can be summarised as follows:

Table 4.2 Social forestry as compared to conventional forestry

Conventional forestry	Social forestry
1. Mainly based on long rotations	1. Managed on short rotations
2. No involvement of local communities	2. With involvement and active participation of local communities
3. Based on single use (timber, pulp etc.) trees	3. Diffused in small bits and with multiple uses (fuelwood, fruits, small timber etc.)
4. Social functions are subordinated to the commercial ones.	4. Social issues are of prime concern while commercial functions are treated in subsidiary mode.

These, however, include bits of defining characteristics and also some incidental consequences, e.g. rotation. The idea here is to show how one differs from the other.

4.1.3 Some key features of social forestry systems

FAO (1978) outlined three major aims of all social forestry systems as:

- provision of fuel and other goods to meet basic needs at rural household and community level;
- provision of food and environmental stability necessary to sustain such food production;
- generation of income and employment in the rural community.

A primary feature of, and also a basic determinant of success of social forestry projects, is high degree of direct participation of concerned people (Sen and Das 1987, Shingi and Seetharaman 1990), particularly those who need the outputs, in all programme phases from design through implementation and monitoring and evaluation. However, Cabarle (1991) has rightly noted that, although based on a collective management for the common good, social forestry programmes work best when individuals gain, especially the poorest among the poor. The other participants in social forestry systems are government institutions (e.g. departments of forestry, agriculture, environment), international agencies and non-government organisations, providing different inputs and impetus at various stages. Nonetheless, caution has to be taken when involving external agencies, as things may go awry in the name of 'helping the poor' (Svedin 1979, Hekstra 1985, Shiva 1987).

In social forestry, the prime issues are not technical but social and economic, for example:

- changing the roles of villagers, technical officials, administrators at various levels;
- integrating tree growing into land use, involving interaction at community and other levels between forestry, agricultural and livestock specialists and practitioners;
- recognising and providing effectively for forestry's role in food production and security (de Montalambert 1987, quoted in Roberts 1990).

Land tenure arrangement is another critical factor in developing any social forestry project. Legal rights, whether written or otherwise, must be clearly known to the participants for the success of any such scheme (Pant 1979). Rao (1985) has claimed however that a social forestry programme can be successfully implemented under all types of landownership arrangements.

The spatial scale of social forestry programmes is relatively small. Due to small scale of operation and low-wage labour, social forestry in developing countries has been a labour-intensive, agro-horti-silvopastoral system (Douglas 1983, Vergara 1985). In such circumstances, capital requirements are low, while labour is supplied from the community being encouraged by the mechanism of benefit-sharing.

4.1.4 Social forestry and rural development

Rural development is a complex, dynamic process, and our understanding of potential roles of forest resources within this process is still evolving (Laarman and Sedjo 1991). The 'lessons learned' from social forestry and other such strategies for resource development in rural areas suggest that the rural poor must be integrated in all phases of the development process - not just as target beneficiaries, but as active participants (Levine *et al.* 1986). People's participation has been underscored as a key strategy for rural development (Oakley and Marsden 1984). Gowen *et al.* (1994) asserted that the criteria for effective rural development should be based on three general goals viz., increased productivity, improved sustainability, and distribution of benefits. All three goals of rural development allow us to perceive forests as assets.

While classical forestry involving natural forests and plantations has got its own long-term role in the environmental, ecological and economic development of any country, social forestry, as an emerging field, has been gaining attention of all development planners and practitioners. Such attention arises owing to its potential for improving the well being of the disadvantaged and poorest sections of the society (Raghavan 1991). Social forestry has three general facets of impact:

- ecological, e.g. by adding nutrients to the soil and by ensuring ground cover, thereby reducing soil erosion-loss;
- economic, e.g. by producing small timber and fuel products, thereby reducing pressure on natural forests;
- social, for instance, by generating fellow feelings and by enhancing social equity.

These benefits that human society gets from trees, have been well brought out in the workshop on planning self-help fuelwood projects, organised by FAO in 1987. Appendix 4.1 elucidates the functions of trees in agricultural and livestock development. Keeping those beneficial aspects in view, it was comprehended that social forestry can act as an effective means for practising and achieving rural development. Scherr (1997) has rightly asserted the potential contribution of social forestry or agroforestry to rural welfare. Such contributions include satisfaction of subsistence needs (fuel, food, building materials), substitution for purchased farm inputs (animal fodder, live fencing, green manure), opportunities to supplement cash income through sale of raw or processed tree products, and social issues (amenity planting, shade, privacy).

Also, timber trees may be used as stores of value for household savings and as means to meet contingencies without placing significant demand on households' scarce cash resources (Chambers and Leach 1989). Chambers *et al.* (1989, p.20) have provided an excellent account of this contributory role of trees in rural development. Gordon *et al.* (1999) view trees and forests as effective potential tools for poverty alleviation, since many opportunities arise from use of specific forestry practices (such as social forestry and agroforestry) to enhance the economic and spiritual well-being of local poor people. Some form of government support is, however, almost always needed for all forms of participatory afforestation (Arnold 1984), and can be highly crucial in ameliorating barriers to people's participation.

4.1.5 Negative aspects of social forestry programmes

Numerous problems have been encountered with social and community forestry (Sawyer 1993). Many developing countries are in the process of shifting to capitalistic modes of production in rural areas. As a result, land has been privatised and the concept of community spirit almost made redundant. In many areas, the willingness of rural communities to become involved in establishing community plantations has been minimal. Weak community organisation, for example, in recently settled areas, can also be a problem. Ownership of common land is another big issue in this respect. Stakeholders often lack right over land, resulting into subdued responsibilities affecting goals of social forestry programmes (Bass 1999, Gajaseni 1992).

Many social and community forestry programmes appear to be exacerbated existing social inequality, as exemplified by the World Bank Social Forestry programme in Karnataka, India (Shiva *et al.* 1985). Romm (1989) has discussed the shift from agricultural crops to tree crops by wealthier farmers on land of their own, adversely affecting local employment and food crop productivity.

Such programmes may also cause differences in perception. A government or forestry department may foresee an impending fuelwood scarcity. Local people, on the other hand, might not need to look so far ahead. Differences also arise on the issue of species selection. While local people prefer multipurpose indigenous species that they are familiar with, programmes tend to impose monoculture with donor-preferred species. This has entailed the shift of social forestry schemes to have broader focus, aiming to provide not only fuelwood but also other necessities such poles, fodder, food and farming materials.

Clearly, many of the negative effects referred to here stem from inadequate consultation with local people and a lack of appreciation of cultural, social and religious perceptions of forests, on the part of planners and foresters alike.

4.2 Participatory forestry in Bangladesh

The forestry situation in many developing countries like Bangladesh is deteriorating continually. The rate of destruction of forest resources is high for recent attempts at rehabilitation, and as such, restoration to original status (refers to that of about 30 years back) are practically impossible. The growing population is frustrating the current efforts for rehabilitation; both for land and for products, and, as a result, investment and efforts tend to be a near-total waste. Under such distressing circumstances, a participatory/social forestry programme as a self-defence mechanism has been felt necessary, *inter alia*, on three pressing accounts, viz.

- readily create resources at the users' level;
- alleviate rural poverty through tree growing activity;
- create 'buffer zone' resources to save the traditional forestry from the destruction of the hungry population.

To be very realistic in the context of Bangladesh, the total forestry activity should have a participatory forestry bias because of the unique status of population magnitude (specially in terms of population density) and meagre quantum of forest land with seemingly uncontrollable protection problems. It must be borne in mind that efforts to create new wealth and arrest depletion of existing resources will be difficult, unless and until people themselves resolve to protect such resources at their own understanding of the overall situation and the benefits they will have from participatory forestry programmes (Bhuiya 1993).

4.2.1 Scope/prospect for participatory forestry in Bangladesh

- The country has about 3,500 km of highways, 16,000 km of secondary District Council roads, 10,500 km of tertiary Thana and Union Parisad roads, 2,900 km of railroads, 5,600 km of navigable rivers and coastal embankments and about 2 million large and small ponds with prominent high banks. The marginal land available along the slopes and banks of these diked structures amounts to about 80,000 ha, which can be appropriately used for participatory tree planting.

- The 10 million rural homesteads of the country cover about 0.27 million ha of marginal land, which has bright prospect for both quality and quantity enrichment of homestead tree/plant resources.

- There exists another 50,000 ha of private degraded hilly and undulating potential forest land in the greater Chittagong, Comilla, Sylhet, Mymensingh, Dhaka, Rangpur, Rajshahi and Dinajpur districts, having high productive potential under a social forestry land management programme.

- The 156 tea gardens of the country compose an area of 114,000 ha, of which 64,000 ha is lying idle without protective coverage. Participatory forestry programmes on this unused land could bring about marked socio-economic improvement of tea garden labourers as well as additional income for the owners.

It can thus be comprehended that 10.4% of the country's land could be brought under participatory forestry programmes and if the productive potential of this land could be developed and harnessed, it could dramatically change the production scenario of both forestry and agricultural sectors (ADB 1993).

4.2.2 Participatory forestry in national development plans

The national development plans in Bangladesh are termed 'Five Year Plans' (FYP). They briefly review the economic development achieved during the preceding plan periods and descriptively illustrate economic policy of the nation in all broad sectors covering a period of five financial years (FY). The first FYP was launched in July 1973, followed by a two year plan for 1978-80. The next three FYPs were designed and implemented till 1995. The current (fifth) VFYP comprises the FYs 1997 – 2002.

In all the FYPs and the interim development plans, forestry has been taken into account as a significant contributor to the national economy and substantial amounts have been allocated for the development and maintenance of this sector. The First FYP (1973-78) focused on resource development and exploitation of natural forests. It was during the period of the Second FYP (1980-85) when the realisation took place of the ever-increasing pressure on land for agriculture on the one hand and increasing demand for fuelwood and timber on the other. Great emphasis was thus laid on the development of rural/village forestry to help alleviate those dismal situations (GPRB 1980, 1985). Social forestry as a development programme got underway from the Third FYP (1985-90), occupying a remarkable position among the eight forestry development programmes. The budget allocated for social forestry programmes was Tk. 1170 million (30% of the total budget for forestry development) for those five years (GPRB 1985).

The fourth plan (1990-95) recognised the village/rural forests as the most important forest resources of the country supplying the bulk of forest products from a relatively small area of land (GPRB 1990). Keeping in view the scarcity of land of an acute nature, landless and marginal farmers were organised under the social forestry development programme for tree cultivation on presently un/under-utilised government land. Besides the forestry executing agency/authority (FD) and Thana Parishads, NGOs were brought into the scene, mainly to assist in group formation and communal activities related to tree planting and maintenance. 26% of the forestry outlay (the total forestry outlay being Tk. 8450 million) was set aside for rural forestry.

Participatory forestry continues to be a key element of Government forestry activities during the current FYP (1997-2002), occupying the second largest share (18%) of state forestry budget (GPRB 1998). Sub-sectors of participatory forestry have been singled out as: agroforestry, woodlot and farmland afforestation; strip plantation; and seedling distribution. During this fifth plan, extension activities and NGO involvement have been specifically enhanced.

4.2.3 NGO involvement

Non-Governmental Organisations have been engaged in economic upliftment of the country since its independence in 1971. The initial NGO involvements were confined to relief and rehabilitation activities. Their broad view of rural development and poverty alleviation followed diverse routes, from group formation to rural credit, rural banking, microfinance, agricultural development and later on, to more specific issues like livestock/poultry development and forestry development. Some of the NGOs have active participatory forestry programmes and the activities include nursery raising, seedling production and distribution, and strip plantation, which have often been supported by food aid made available through the World Food Programme (Rasheed 1995).

Bangladesh Rural Advancement Committee (BRAC) is one such NGO having elaborate programmes for social forestry involving three components viz., nursery construction, plantation and agroforestry farms. BRAC's mulberry production scheme is another form of participatory forestry, where destitute rural women are trained in the art of sericulture and silk production (Rahman 1996). Another national NGO with specific programmes of participatory forestry is Proshika, which operates over 40% of the country. Its components of participatory forestry include homestead plantation, strip plantation and forest protection, the last one being specially acclaimed (Lewis 1994). *Polli Unnayan Shangstha* (POUSH) is yet another NGO with active tree planting programmes on private lands as well as strip plantations. Among the international NGOs, Swiss Development Cooperation (SDC) is the leading body initiating its Village and Farm Forestry Programme (VFFP) some 12 years back and transforming the local rural environment in areas where it was first launched. 'Crop field agroforestry' is the innovation of SDC which has gained considerable popularity (Roy and Siddique 1997, Hocking 1998). Cooperative for Assistance and Relief Everywhere (CARE)-Bangladesh and Mennonite Central Committee (MCC) also have some social forestry programmes of their own.

4.2.4 Past activities

The history of an institutional approach to community forestry in Bangladesh is directly linked to the introduction of forest extension services in the forest department. Forest extension in Bangladesh started as early as 1967 when two forest extension divisions in the FD were created with headquarters at Dhaka and Rajshahi districts. The activities remained confined to establishment of nurseries and training centres in some district headquarters and in some important centres. But this did not bring about any change in the outlook or attitude of the extension personnel in terms of establishment of demonstration models and motivation of people in general. No thought was given to the use of marginal land through marginal people, not to speak of covering the encroached and denuded lands available in the government forests. The villages also remained uninvolved in forestry programmes.

4.2.4.1 Start of community forestry programmes (Betagi-Pomora)

The first community forestry programme in the country was started in 1979 at Betagi of Chittagong District in a *khas*, denuded hilly forest area, as land was not available in the government forests (*Khas* land means non-forest land owned by the Government Revenue Department). The main architects of this program were Professor Abdul Alim, the then Conservator of Forests - Chittagong Circle, Mr. Mahabub Alam Chashi, the founder of *Shwanirvar* (self-reliant) Movement and Professor M. Yunus, the founder of *Grameen Bank*.

As the program was one of a self-reliant type, the inducted farmers were not supposed to receive any outside grant of any kind. The *Krishi* (local agricultural) Bank agreed to give credit provided that *Grameen Bank* workers would supervise the transaction. Thus initial capital required by the participating farmers was arranged. Each family was allotted a 4 acre plot for practising forestry activities, in addition to their homesteads. The tenurial right has been given in the joint names of husband and wife resulting in no separation of participating couples (Quddus *et al.* 1992, Akhter and Sarker 1998).

4.2.4.2 Development of forest extension service (1980-87)

With the increasing appreciation of extension services, four new extension divisions were created in early 1980. A project for mainly developing forest extension service was implemented between 1980-81 to 1984-85. This project achieved a success of producing about 50 million seedlings, planting 1620 km of roadside, rail tracks and embankments.

4.2.4.3 Community Forestry Project (1982)

Social or participatory forestry in Bangladesh got started with an ADB financed community forestry project. The main project activities were financed by ADB (US$ 11 million) while the technical assistance was given by UNDP (US$ 2.09 million). The project period was 1982 to 1987 in seven greater north-western districts. The main objective of the project was to increase supply of fuelwood, timber, edible fruits, fodder and other products. The project was designed to act as a catalyst by creating community awareness with permanent institutional capacity (Ganguly 1995).

The main components of the project were:

1. Establishment of strip plantations, fuelwood plantation, agroforestry farms.
2. Replenishment of homestead forest.
3. Establishment of a forestry school at Rajshahi.
4. Institutional support.

Outcome of the Project

The community forestry project as the prime social forestry project in Bangladesh was an overall success in terms of people's participation and plantation establishment. It will serve as a benchmark for integrating people in forestry in Bangladesh.

4.2.4.4 Thana Afforestation and Nursery Development Project (TANDP)

As a follow-up of the community forestry project and GPRB funded forest extension phase two projects, a unified project named "*Thana Bonayan and Nursery Prokalpa*" has been drawn up covering the country except the Chittagong Hill Tracts and the Sundarbans. The entire project was decided to be executed by FD from 1991-92 financial year and it came to an official end in June 1997.

The primary objective of the project was to arrest depletion of the tree resources of the country in general and the forests of central and northern regions in particular. The project component activities were:

a. enrichment plantation on 16,000 ha depleted sal forests.
b. strip plantation over 15,747 km roads and highway, railroad, embankments and feeder roads.
c. agroforestry plantation on 3,000 ha in encroached areas within the *sal* forest tract.
d. 1000 ha of plantation on fallow land outside Bangladesh Water Development Board (BWDB) embankments.
e. establishment of 345 new thana nurseries, further development of 9 FENTCs (Forestry Extension and Nursery Training Centres), upgrading 36 FENTCs and maintenance of 95 existing FENTCs.
f. training of some 76,123 individuals including village leaders, NGO workers, private nurserymen, FD staff, DAE (Department of Agricultural Extension) Block supervisors, Thana officials, social and extension workers, political leaders etc.
g. establishment of 100 private nurseries in rural areas, by encouraging entrepreneurs with training and financial assistance.

Benefit Sharing Mechanism

Keeping in view people's active participation and community involvement and provision for reasonable incentives for such participation (in order to ensure desired success) a benefit sharing mechanism has been approved by the ECNEC (Executive Committee of National Economic Council) and adopted by the NPCC (National

Project Co-ordination Committee). Under the TANDP, the benefit sharing mechanism followed the pattern:

Table 4.3 Benefit sharing mechanism of the TANDP

Project Component	Beneficiary (% of share)	Forest Department(% of share)
Final Products		
Agroforestry	50	50
Woodlot	40	60
All other components	50	50
Intermediate Products		
All components	100	0

Source: adopted from ADB 1992.

4.2.5 Progress of community forestry

The nature and extent of participation by prospective beneficiaries in afforestation activities has been often limited. In some cases beneficiary groups have not been properly organised. There has been a lack of clarity and follow up regarding benefit sharing agreements. It appears that the target population, i.e., the rural underprivileged (landless labourers, marginal farmers and women) have not been included to the full extent possible in many of the groups. Because of a top-down managerial approach, the decision-making role of beneficiaries in strip plantation, woodlots and agroforestry components has been minimal (Bhuiya 1997). Although the FD has widened the scope of its social/community forestry activities, it has yet to engage in most cases rural people as partners in planting, managing and benefiting from trees. Local people are often unaware of the aims of strip tree plantation and benefits to be derived from participating in this activity.

On-going or recently completed projects:

1. The FRMP (Forest Resources Management Project), which is a 7 years long project starting from 1992-93 under the auspices of the World Bank has an important participatory/community forestry component.

2. Afforestation activities under WFP (World Food Programme) assistance began in a small way on an experimental basis in July 1988 and have subsequently developed into a full scale FFW (Food for Work) sector program. NGOs are the main executing agencies under the technical guidance of the Ministry of Environment and Forest (MoEF) and Forest Department.

In addition to the above mentioned ones there are also some subsidiary programmes, which include:

i) afforestation and settlement in the Unclassed State Forests of Chittagong Hill Tracts – (3rd phase) (1995-2000)

ii) Development of pulpwood plantation in the Unclassed State Forests of Chittagong Hill Tracts (2nd phase) (1995-2000)

iii) Extended Social Forestry Project (1995-1997)

iv) Coastal Green Belt Project (1995-1999)

v) Coastal Embankment Rehabilitation Project (1996- 2003).

4.3 Thana Afforestation and Nursery Development Project (TANDP)

4.3.1 Background of TANDP

Due to the steadily increasing gap between diminishing supply and increasing demand for timber, fuelwood and other forest produce, the country has been experiencing a gradually increasing shortage of these commodities. The acute shortage of fuelwood resulted in extensive use of cow-dung and crop residues as cooking fuel. Cow-dung could be used as highly valued organic manure and crop residues should have been used as both cattle-feed and organic manure. Due to lack of alternative sources of cooking fuel in rural areas, they are going to be worst hit by fuelwood crisis in the years to come.

As about four-fifths of total wood and bamboo produce in the country comes from villages, any solution to the problem of woody materials shortage must involve augmentation of the depleted tree resources of rural areas of the country. Through the experience gathered from implementation of the 'Community Forestry Project' in the seven north-western [greater] districts during 1981-87 period, the FD was convinced that the development of tree resources in rural areas and marginal lands with active participation of local communities would provide the best approach to ensure improvement of tree resources and increased supply of woody materials. It was therefore proposed to take up this project covering the entire country (except the Sundarban mangrove forest and Chittagong Hill Tracts) for raising trees under loan assistance from the ADB.

4.3.2 Rationale and objectives of the project

Biomass[2] fuels account for nearly 85 per cent of all energy consumed in Bangladesh. Of this 85 per cent, agricultural residues (paddy husk, jute stalks and bagasse) account for 65%, wood fuels (fuelwood, twigs, dry leaves and branches) for 10%, and animal dung for the remaining 25% (GPRB 1985). Agricultural residues and animal wastes should have been used as valuable organic manure and also the former as cattle-feed. Thus, with a view to divert these two resources to their desired use and increase the supply and availability of woody fuel materials, afforestation projects have been undertaken in the country. Such efforts have proved to be unsuccessful in the past due to the traditional policing nature of the FD staff. Thus, participatory forestry practices, involving local people in forestry activities, have been adopted since the early 1980s. TANDP has been brought into reality on two fundamental grounds, viz.

- increasing wood fuel supply within the rural areas;
- integrating local people into government forestry activities.

The primary objective of the project was to improve the land use practices in the project areas and, by doing so, increase the production of biomass fuels and utility timber in the country through raising the productivity of poor, un/under-productive forest lands. Furthermore, by helping to arrest the overall loss of tree cover in the country, the project would contribute towards environmental amelioration. The project would also stimulate and intensify tree production on marginal land and homesteads. All of these objectives were pursued by closely involving landless agricultural labourers and marginal farmers.

In addition to the above, the project would also supply timber for small and cottage industries, fruits and fodder as well as other minor forest products essential for nutritional balance in rural diets such as leaves, pods, nuts or pulses. This would bring an improvement in the housing and furnishing standard of the people, upgrading their quality of life. The project is expected to raise community awareness for forestry development and create a permanent institutional capacity for forestry extension within the existing Government set-up.

4.3.3 Targets of the project

The project is designed to reach some specific targets through the implementation of the following project components:

i. <u>Rehabilitation of degraded sal forests by enrichment planting/woodlot plantations</u>: establishment of 21,055 ha of pure stands on degraded but unencroached sal forest stands in the central and north-western districts.

ii. <u>Agroforestry plantations</u>: 4,200 ha on degraded and encroached forest land in the project areas.

[2] Biomass – a general term covering trees and tree components, crop residues and animal wastes (White and Plaskett 1981, Howes 1987).

iii. Strip plantations: 17,272 km of plantation along highways, railway lines, embankments, feeder roads etc.

iv. BWDB plantations: 1,282 ha of block plantations on Bangladesh Water Development Board embankments.

v. FENTC (Forest Extension Nursery Training Centre): a network of 92 functional FENTCs will be in place in Bangladesh to serve the purposes of
- providing planting materials to the public;
- training lower level FD staff, project participants, private nursery operators, local community leaders
- assisting institutions, organisations and private individuals in tree planting.

vi. Thana nurseries: establishment of nurseries in all the 346 thanas within the project area, in order to develop a regular and permanent nursery base to supply seedlings to all concerned agencies, as well as to disseminate knowledge of plantation and nursery techniques.

vii. Institutional plantings: planting of seedlings in the premises of educational and religious institutions, office compounds and other available public lands.

viii. Training: training will be done primarily in Bangladesh on various aspects of social forestry for village leaders, DAE block supervisors, foresters, malis (nurserymen), thana officers, FD officers (trainers' training), local seminars for high and mid level officers. A limited number of senior project staff will also be trained in neighbouring countries.

ix. Consultants: for the efficient execution and management of project programmes, particularly components like training, agroforestry and extension communication, expatriate expert services would be required during the early years of project implementation. The project thus proposes provision for expert services covering a total period of 101 Man-Months (MM) (Training specialist – 36 MM; agroforestry expert – 41 MM and communication expert – 24 MM).

x. Monitoring and evaluation: the scheme proposes the establishment of a M&E cell within the FD to collect data for monitoring the progress of the project, to test experimental designs for project implementation, assess acceptance of the participatory forestry programmes and models by the participants, evaluation of each year's achievement against targets, and suggest modification and/or improvement in the designs.

xi. Information and publicity cell: an information and publicity cell will be set up in the project headquarters at Dhaka FD for raising public awareness and motivation towards participatory forestry activities.

xii. Institutional support: provision for: incremental[3] FD and Thana staff; support facilities such as staff housing, vehicles and equipment; communication support; monitoring and evaluation; and consulting and training services.

4.3.4 Some other important features of the project

i. Project period: 1987/88 through 1994/95 (financial year[4]).
[participants and plantations of 1991/92 have been studied in the current work]

ii. Investment cost of the project:
  a) Original cost estimate: 1626.41 m.Tk.
  (FE 287.20 m.Tk and LC 1339.21 m.Tk). [as of January 1989]
  b) Revised cost estimate: 1969.8 m.Tk
  (FE 105.58 m.Tk and LC 1864.22 m.Tk) [as of December 1993].
  [note: FE – foreign exchange, LC – local currency]

[3] Staff who will be employed through the project fund, rather than the regular Government fund.
[4] A financial year starts on July 1 and ends on June 30.

Source and amount of financing of the project:

	amount (m.Tk)	source	type
a) Local cost of the project:	235.00	GPRB	grant
	1629.22	ADB	project aid
b) Foreign exchange cost:	105.58	UNDP	grant

iii. Mode of recovery of the cost of project: by disposal of trees grown in the different plantations.

iv. Economic life of the project: 32 years

v. Year of normal capacity output: 7^{th} year (i.e., rotation of plantations)

vi. Type of project: this is a 'Y' type project, which is a productive but non-revenue earning project. It gives rise to tangible outputs and benefits which do not accrue directly to projects themselves but to other parties. e.g. irrigation projects.

vii. Administration and Management of the project: The Ministry of Environment and Forests (MoEF) was the sponsoring agency of this countrywide project. The executing agency of the project was the FD under MoEF. An officer of the rank of Deputy Chief Conservator of Forests (DCCF) / Conservator of Forests (CF) was designated as the full-time Project Director (PD) with headquarters in Dhaka and was responsible for the proper implementation of the project. The Divisional Forest Officers (DFO) located all over the project area were responsible for field implementation of the programme. The DFOs reported their activity performance to their concerned CFs, who, in turn, reported to the PD. The PD was accountable to the Chief Conservator of Forests (CCF) for project implementation and submitted all relevant monitoring and performance reports to the CCF, who, in his turn, submitted those to the MoEF, the Planning Commission and other concerned bodies.

The fund for execution of the project was placed with MoEF and was disbursed to the PD through the CCF. The PD operated the project fund and, on the basis of the project proforma and requisitions by the DFOs, allocated funds required for execution of the project programmes to the DFOs through the respective circles' CFs.

The project management undertook enrichment planting (woodlot) and agroforestry plantations in the FD managed degraded sal forests. Landless people (meaning rural poor owning less than 0.20 ha of land) were involved in raising, maintenance and protection of the enrichment plantations and on this account they were granted usufructuary rights under a bilateral agreement (sample copy of agreement/deed enclosed in Appendix 4.5.1). Landless and encroachers (falling within the category of landless) were included in the agroforestry programme on denuded forest land through a similar usufructuary agreement (sample copy enclosed in Appendix 4.5.2).

Strip plantations were raised on marginal strip lands along roads, highways, railway, embankments, feeder roads and on public lands available outside the roads and embankments, by associating the rural poor/adjoining land owners under a mechanism of benefit sharing. To ensure effective participation of the people and to afford all round socio-economic development of the participants, reputable NGOs with experience in tree plantation and group formation activities were involved to act as catalysts.

The FD nurseries known as FENTC were continued to be maintained and improved/renovated by the FD. The FENTCs were used as training bases for imparting training to a host of clients envisaged to be trained under the project including the project participants, FD staff, NGO workers, village leaders, teachers, farmers and private nurserymen, DAE staff etc.

viii. Incentives and benefit-sharing mechanism: Keeping in view the vital role of people's participation in a project like this, a benefit-sharing mechanism has been designed in consultation with the land owning agencies and beneficiaries, which was approved by ECNEC on 22.7.87 and received by the NPCC. The final success of social forestry programmes depends on enthusiastic participation and co-operation of the people involved. A large portion of project area lies outside government forest lands along roads, railway, embankments and other marginal land. Hence direct and willing involvement and participation of local community in planting and upkeep is a prerequisite for the successful execution of the project. People would neither participate nor co-operate unless they have an assurance of production sharing benefits.

The design of benefit-sharing for agroforestry and woodlot components of the project has been discussed in section 4.2.4.4 and copies of the 'agreement/deed' have been appended in Appendix 4.5. For 'strip plantations', except feeder roads on government lands, participating members of public and communities were allowed to collect all intermediate products, such as fruits, grass, inter-crops, dry/dead branches/twigs and pulses (from arhar [*Cajanus cajan*] being planted as a nursing crop as well as a live fence to prevent cattle grazing). After harvesting, the final produce would be shared in the following proportion (Table 4.4).

Table 4.4 Benefit sharing mechanism for strip plantations

Beneficiaries	Highways, major roads, railway (%)	Feeder roads (%)
1. Participating farmers	65	65
2. Forest Department	10	5
3. Land owning agency	10	-
4. Collaborating NGO	10	10
5. Local Union Council	5	20

Moreover, to stimulate people's participation and ensure their co-operation, incentives in the forms of seeds (agricultural, horticultural and vegetables), chemical fertiliser, tools and implements and even some cash for land clearing were also given to the agroforestry participants.

Chapter Five

Basic Needs - A Review of Literature

5.1 Introduction

The World Employment Conference of ILO, held in June 1976, was the emerging point of the much discussed and later thoroughly explored paradigm of the "Basic Needs Strategy". The idea of basic needs, which was relatively new at that time, had evolved out of the growing concern over the past decades about the increasing poverty and inequality in the Third World[1]. The conference strongly emphasised, among other things, the satisfaction of basic needs of each country's population and as prescribed by Lisk (1977), within the time horizon of one generation.

Any programme may be defined as a basic-needs activity if it incorporates some or all of the following features (Ghai 1980):

i. It raises the income of the poverty groups to specified levels over a given period through employment creation, asset redistribution and productivity-enhancing measures;
ii. It makes a direct contribution to the achievement of the targets established in respect of core basic needs such as nutrition, health, education, housing and water supply;
iii. It increases production of other basic goods and services purchased by low-income groups from their disposable incomes and by public sector and communal agencies;
iv. It promotes decentralisation, participation and self-reliance.

These activities neither necessarily fall into mutually exclusive categories nor are incompatible with each other.

A basic needs approach is concerned with the access of different target groups – defined not only according to income, but also in terms of relevant sex, age, social and locational factors – to the goods, services and production inputs required to

[1] The present 144 or so developing countries of Asia, Africa, the Middle East and Latin America. These countries are mainly characterised by low *levels of living*, high rates of *population growth*, low levels of *per capita income*, and general economic and technological *dependence* on *First*

achieve minimum standards of living (Ahmed and Freedman 1982). For the poor, the opportunity to avail themselves of essential services involves economic accessibility equally importantly as physical access.

The crucial question in realising basic needs strategies concerns the effort to include those areas, people and their requirements which tend to be excluded from the existing benefits of growth and especially from existing distributive programmes. However, the achievement of much more inclusive coverage is difficult, partly because of its political implications and partly because of the types of decision making and calculations that would be required (Schaffer 1978). Sen (1987) states that the 'basic needs approach', in addition to attempting to fulfil the basic needs of the people, also pays attention to aspects of social achievements that go well beyond the growth of GNP only.

The basic needs approach is concerned with removing mass deprivation. This approach is designed to improve, first, the income earning opportunities of the poor; second, the public services that reach the poor; third, the flow of goods and services to meet the needs of all the members of the household; and fourth, participation of the poor in the ways in which their needs are met (Streeten 1979). All four pillars must be built on a sustainable basis. In addition, basic needs must be met in a shorter period and at lower levels of earned income per capita, than would have been achieved via income expansion associated with growth alone. When weighing between the objectives of reducing inequality through redistribution or meeting basic needs, it has been supported that meeting basic needs should get a higher priority in societies where people's level of living is low, for two main reasons. Firstly, most people would rightly regard meeting basic needs more important than equality; and secondly, meeting basic needs is a more operational goal than equality.

Household livelihood security has been identified as adequate and sustainable access to income and other resources to meet basic needs (Frankenberger and McCaston 1998). The risk of livelihood failure determines the level of vulnerability of a

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(economically advanced capitalist countries) *World* and *Second World* (socialist countries) ***economies*** household to income, food, health and nutritional insecurity. Therefore, livelihoods are secure when households have assured ownership of, or access to, resources, including reserves and assets, and income-earning activities to offset risks, ease shocks and meet contingencies. British government's Department for International Development (DFID) aims to improve the lives of poor people and to strengthen the sustainability of their livelihoods (Carney 1998). To this light, DFID views livelihood comprising the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base. An earlier interpretation of sustainable livelihood by Chambers (1988) was '... adequate stocks and flows of food and cash to meet basic needs ... on a long-term basis'. Among the objectives of SRL (Sustainable Rural Livelihood) are the provisions for access to financial resources vis-a-vis employment (Ahmed 1995), education, nutrition and health, and infrastructure – all of which are core elements of a basic needs strategy, as discussed in greater detail in the following section (5.2). Furthermore, the issue of reducing poverty by meeting basic needs of the poor is inherent in the model of sustainable development (Hediger 2000, World Bank 2000, Roy 1998, WCED 1987).

The basic needs approach represents a radical departure from conventional development strategies (Ruttan 1984). The evolution from *growth* as the principal performance criterion, via *employment* and *redistribution*, to *basic needs* is an evolution from abstract to concrete objectives, from a preoccupation with means to a renewed awareness of ends, and from a double negative (reducing unemployment) to a positive (meeting basic needs) (Streeten and Burki 1978). Ruttan further commented that the advocates of the basic needs approach emphasised the evidence that expenditure on education can be viewed as an investment that contributes to economic growth, and that expenditure directed at improving nutritional and health status and reducing population growth rates should also be viewed as high put-off investments. Although economic growth often overshadows other objectives, policy makers are constantly trying to find sustainable options (Munasinghe 1993). They seek to

(Todaro 1989, Dickenson *et al.* 1996).

maximise the net welfare of economic activities while maintaining the stock of economic, ecological, and socio-cultural assets over time and providing a safety net to meet basic needs and protect the poor.

The cost-of-basic-needs method is one of the two main methods (the other being the food energy intake method) for measuring poverty/computing poverty lines in the developing countries. Many researchers like Ravallion (1994) and Ravallion and Sen (1996) have explored use of the cost of basic needs method and Wodon (1997) has actually proved the superiority of the method over the food energy intake one with empirical evidence from Bangladesh.

5.2 Elements of basic needs

Several attempts have been made to categorise the elements of the basic needs bundle in one way or another. One approach suggests classification as life-sustaining needs, life-supporting needs, life-enhancing needs and life-enriching needs (Vittachi 1976); deficiency needs, sufficiency needs and growth needs (McHale 1975); private consumption goods and public utility services (ILO 1976) and personal consumption or biological needs, access to public goods and services, and access to economic opportunities (Lisk and Werneke 1976).

Basic needs were defined as including first, certain minimum requirements of a family for private consumption: adequate food, shelter and clothing (Todaro 1989), as well as certain household equipment and furniture; and second, essential services provided for and by the community at large, such as safe drinking water, sanitation, public transport and health, educational and cultural facilities (ILO 1976, Ghai *et al.* 1977). A basic needs oriented policy also implies the participation of the people in making the decisions which affect them (Green 1978). In all countries employment enters into a basic needs strategy both as a means and as an end. Employment provides an income to the employed and it gives a person the recognition of being engaged in something worth his or her while. Making employment more humane and satisfying is also an element of a basic needs strategy.

Broadly speaking, basic needs are not confined to only material needs but embrace other dimensions such as fundamental human rights and freedom, participation, self-reliance, self-esteem etc. Freedom indicates the liberation from servitude of such forces as nature, ignorance, other people, misery, institutions and dogmatic beliefs. Self-esteem, that is, a sense of worth and self-respect, of not being used as a tool by others for their own ends, is a universal component of a good life.

Being development oriented, the basic needs strategy may include only material needs or it may also comprise more fundamental human needs and rights. It may appear that concentrating on material basic needs provides a focus and objectivity to the strategy whereas in the latter case, the concept may become vague, elastic and even more arbitrary. Whatsoever, with respect to material basic needs components, one can either work with a fairly extensive list of the items that might enter into a basic needs basket or concentrate on a "core" of basic needs. The extensive list has the advantage of bringing into its net most of the consumption items of low-income groups, which in turn can gear the economy to produce such goods and services. The alternative approach of a core list of basic needs goods and services has the merit of highlighting deprivation in the most critical areas and concentrate efforts on attaining targets in these areas.

5.3 Indicators of basic needs

Indicators of basic needs incorporate an admixture of food, clothing, shelter, health, education and water and sanitation (Ghai *et al.* 1977, Horn 1993). The major item of basic needs which in most poor countries could also be designated as the dominant item is food, which is indicated by number of calories and quantity of proteins absorbed per person per day. Clothing gives physical protection against the elements of nature and satisfies the cultural needs of the population and can be indicated by the ingredients of clothing that are regarded as absolutely necessary to preserve decency, expressed in metres of cloth and number of shoes per household. Shelter provides protection against exposure and safety when needed and can be indicated by number of persons per room or, per housing unit or, sq. m per room. Health services serve to ensure a certain life expectancy, eliminate mass diseases and provide medical facilities in case of disease and illness; indicators may include age-specific mortality and morbidity rates or simply weight for age or height for age. Education enables an individual to participate fully in society and may be indicated by inputs used, enrolment rates, number of schooling years, results of education received. Water and sanitation, required for drinking, cooking and for maintaining personal hygiene, are indicated by access in distance terms and number of households to be served by a water source, e.g. a tubewell.

One important advantage of some basic needs indicators is that they automatically incorporate distributional considerations, as not found in income-based measures of development (Brent 1990). For example, if literacy rate is increased, this inevitably means that the distribution of education has improved, seeing that the proportion of beneficiaries has increased (Hicks and Streeten 1979). Some indicators are better than others for showing the distribution of basic needs deficiencies since they are constructed on an either-or, have-have not basis. Thus measures such as literacy, access to clean water, and primary school enrolment can be used to indicate the percentage of population having basic needs deficiencies in each of these important sectors. Measures such as life expectancy, infant mortality and average caloric consumption are less informative since they average the statistics of both rich and poor.

In general, output measures are better indicators of the level of welfare and basic needs achievement than the input measures. Measures such as infant mortality and life expectancy indicate the degree to which basic needs have been fulfilled, rather than the resources expended. However, input measures, such as doctors per 1000 or school enrolment rates also have their uses, since they reflect government intention, commitment and efforts to provide public services.

5.4 Targets for basic needs

Within a basic needs approach, target setting is of crucial importance and a most important attribute of any worthwhile target is its credibility (ILO 1976) i.e., neither too high nor low and also not so easily and quickly attainable that people may feel it unworthy of striving for. It is essential that the people whose basic needs have to be met should participate in determination of those needs, rather than having them handed down from above. Such attempts to involve the people in the setting of basic needs targets would provide a welcome stimulus to the establishment of such organisations that can express the views and aspirations of the poorest population groups, especially those in rural areas. This is more so because the rural poor are usually the most deprived ones and needs special attention to let them satisfy their basic minimum needs.

The satisfaction of people's basic needs through government services implies the setting of targets by which policy may be oriented and performance measured (Richards 1981, 1982). In principle, targets for government services can be set in terms of broad, higher level objectives; or the effectiveness of simple input goals in achieving some output objectives. The three common characteristics which basic needs targets should share are that they should be:

i. set in a dynamic manner although expressed in absolute terms;
ii. expressed where possible in terms of outputs rather than inputs (or a mix of the two) and of improvements in personal well-being rather than the coverage provided;
iii. the predictable results of programmes which are known to be effective.

The first point implies that the basic needs targets should be flexible enough to match the needs of a particular time, oriented to satisfy the members of a community or any individual at certain unforeseen circumstances, particularly during periods of distress.

5.5 Strategies to meet basic needs

ILO (1976) also suggested that the fulfilment of physical basic-needs targets in the poorer countries of the world certainly cannot be achieved by a redistribution of goods currently produced. Not only must the structure of production change, but the total amount produced must also rise over time. For this reason, it should be stressed that a rapid but sustainable rate of economic growth is an essential part of a basic needs strategy. The following section discusses in further detail the relationship between sustainable development and economic growth, as well as with basic needs. Part of the necessary increase in output would come from making use of currently underemployed and unemployed labour resources and linking them with a better allocation of capital, and part through the redistribution of productive resources. Fuller employment would thus be a means of producing more goods and simultaneously of acquiring the purchasing power to gain access to them. Another broad approach is to raise the incomes of the poverty groups faster than the average by a redistribution of income as well as growth; the growth rates required under this second approach would be less high and would normally be more realistic than in the first approach, but there might be great difficulties, political and other, in implementing policies for redistribution. The basic needs strategy is one of the few development strategies emphasising poverty elimination (the others being employment-oriented strategies, "redistribution with growth" etc.). These approaches have some of their underlying themes or principles common with each other, but they are significantly different as well, as has further been illustrated by Lisk (1977).

The data on a basket of consumption goods are typically derived from household expenditure surveys, or simply discussion with knowledgeable persons to draw up a list of essential goods and services needed by low income groups; the various JASPA (Jobs and Skills Programme for Africa, 1977a, 1977b) reports have attempted to derive basic needs basket and income by similar practical methods.

Berg (1980) has suggested a few strategies to reduce malnutrition, depending on the universal acceptance that among all human needs, the need for food is perhaps the most basic. Accelerated growth in the incomes of the poor and in food production play fundamental roles in efforts to meet nutritional needs. Similarly, there must be rapid increase in food supply to meet increases in population and in per capita incomes. New attention would also be needed to develop nutrition oriented agricultural production policies and programmes. Basic needs generally remain unmet, not because public expenditure on them is insufficient, but because it has been misdirected and because it does not benefit all population groups (Burki 1980). Therefore, in the high priority sectors of basic needs like nutrition, education and health, major emphasis should be placed on redirection of efforts within sectors. In addition, special efforts should be made to reallocate these resources so that they reach the poorer segments of the society.

5.6 Basic needs versus adjustment programmes

Haq (1980) emphasised that 'meeting basic needs' is primarily a national decision. The international community can neither define nor dictate basic needs targets of a particular nation. Without a national commitment to eliminating mass poverty, no amount of international concern can succeed in providing for the basic needs of the world's poorest.

On the contrary, the structural adjustment programmes (SAP), variously known as structural adjustment lending (SAL) by the World Bank and structural adjustment facility (SAF) by the IMF, are basically mechanisms of financial interventions, which are imposed upon the governments of the developing world, by the two dominating donor-cum-lending institutions. SAPs proliferated in the early 1980s, as one country after another in the South was afflicted by a lethal combination of high interest rates and falling commodity prices. Along with the loans from these multilateral agencies to cover balance-of-payments deficits and budget deficits came conditions. These required governments to comply with targets for reducing budget deficits, liberalising import restrictions, deregulating internal markets, and promoting exports (Oxfam 1995). The stated objective has been to support export-led recovery. More recently, the World Bank and the IMF have asserted that SAPs constitute an integral part of a poverty-reduction strategy geared towards 'employment-intensive' growth.

But what SAPs or ESAPs have actually caused is greater misery to the already suffering poorer countries, except for a few cases of economic growth. Devaluation of a country's currency is the first ill effect. This makes a country's exports cheaper on the world market (CAFOD 2000). Despite this, poor farmers are forced to grow cash-crops in place of essential food-crops, fetching them lesser than expected revenue and making them starve at times. Negative impacts like these have been registered by Stewart (1991) and Marquette (1997). Harrigan and Mosely (1991) have even identified a negative correlation between SAL and investment. Even the World Bank has had to accept that SAPs have failed the poor, with a special burden falling on women and children (World Bank 2000, Oneworld 2000).

5.7 Criticisms of the basic needs approach

The basic needs approach to development had also earned a chorus of criticisms and allegations that it lacks scientific rigour; is anti-growth and consumption oriented; is a recipe for perpetuating economic backwardness, neglecting industry and favouring antiquated technology; assumes away class and group conflicts and tends to give the impression that poverty elimination is all too easy (Ghai 1978). Ghai in this article has also attempted to disprove these allegations stressing that the basic needs strategy, being a poverty focused one, should opt for traditional technology providing as much employment as possible within the shortest possible time.

A paradoxical feature of the basic needs approach is a high rate of social time discount for the near future[2], which reflects the urgency of meeting basic needs soon, subject to maintaining indefinitely the achieved satisfactions (Streeten *et al.* 1981). This indicates to minimise the time required to provide everyone with the basic needs basket of goods and services on a sustainable basis. The condemnation lies in the fact that such a strategy might imply an absolute bar on the pursuit of any other objective, which no government could be expected to support.

5.8 Conclusion

Kuzmin (1977) described the basic needs concept/strategy as the one integrated approach, based on a commitment to coherent and compatible policies in fields like economic, social, cultural, environmental etc., and at all levels. If the social objectives of the basic needs approach are to be realised, they need to be supported by a sound economic strategy, which should aim, in particular, at promoting the utilisation of national resources. In this way, the satisfaction of basic needs, while remaining one of the chief social goals of development, may also serve as an economic stimulus to increased productive employment and income generation.

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[2] Because this suggests the use of discounting in basic needs analysis, arguments against which have been furnished in Chapter 7.

Chapter Six

Appraisal of Participatory Forestry Projects – A Methodological Review

This chapter presents a detailed background of project appraisal through cost-benefit analysis (CBA) and its variants, with their application to social forestry projects. The types of CBA and the methodologies are explained and discussed. It is divided into several parts to describe the various important aspects.

6.1 Project appraisal: an introduction

Projects are considered as the basic building blocks of development, representing the smallest investment unit which can be separately evaluated at all levels and analysed at all depths independently (Little and Mirrlees 1974). Usually, the success of a project rests on the economic environment in which it is undertaken, the institutional arrangements for its implementation and its financial viability (ODA 1988).

The origins of project appraisal can be traced back to *An Inquiry into the Nature and Causes of the Wealth of Nations* by Smith (1776, in Kula 1996), whose main message was that the pursuit of self-interest with the development of market opportunities is the key to economic growth which would lead to a great improvement in human well-being. The appraisal involves the examination of a project before it is undertaken and it is concerned with the optimisation of the capital budget. In the past three decades, project appraisal has received much attention. Formerly, its main objective was to achieve an efficient allocation of capital. Now it also looks at income distribution and environmental quality, particularly in the developing countries where the government spends huge amounts of public sector funds. The largest number of project appraisals are carried out by the World Bank (Brent 1990).

The type of appraisal depends on the point of view from which it is undertaken, i.e., from a private, economic, social or environmental point of view. This difference in point of view makes the appraisal a highly specialised task.

The outcome of appraisal helps in explicit or implicit decision-making on policies, programmes and projects. A comparative ranking of a number of projects (having costs and benefits of different magnitudes and at different timings) helps the decision-makers in selecting the best project design and the best set of projects for investment. But the decision-making is not always based on financial and economic criteria alone because the decision-makers are also concerned with the overall effects of projects that are related to other objectives, namely social and environmental. For income redistribution effects, social cost-benefit analysis is undertaken to appropriately weigh the costs and benefits accruing to the rich and the poor. Similarly, the environmental effects need a specialised appraisal technique (FAO 1979).

6.2 Methods of project appraisal

There are several methods of project evaluation. Each method concentrates on certain aspects of a project. The most common methods of investment appraisal are:

- Simplistic investment appraisal methods
- Cost-benefit analysis
- Cost-effectiveness analysis

6.2.1 Simplistic Investment Appraisal Methods

Simplistic investment methods are commonly employed by business firms. These methods include :

1) Ranking by inspection (Gittinger 1982)
2) Payback period (Gittinger 1982, Price 1989)
3) Proceeds per unit of outlay (Gittinger 1982)
4) Average annual proceeds per unit of outlay (Gittinger 1982)
5) Average income on book value of the investment (Gittinger 1982)
6) Capital output ratio (Trivedi 1987)
7) Maximum forest rent (Price 1989)
8) Rates of return (Price 1989)
9) Profit after interest (Price 1989)

One of the major limitations of these methods is that they ignore time preference. They are not comprehensive enough to include all the important aspects of project appraisal and may end up in misleading conclusions.

6.2.2 Cost-benefit analysis

Cost-benefit analysis (CBA), also known as benefit-cost analysis, has been defined as 'an economic appraisal of the costs and benefits of alternative courses of action, whether those costs and benefits are marketed or not, to whomsoever they accrue, both in present and future time, the costs and benefits being measured as far as possible in a common unit of value' (Price 1989). Cost-benefit analysis provides an objective framework for analysis of projects. CBA for the appraisal of projects has been advocated by many authors and organisations, the influential contributions in this field being Little and Mirrlees (1968, 1974), UNIDO (1972) and Squire and Van der Tak (1975) and its application in developing countries has been explored in depth by Curry and Weiss (1993), Dinwiddy and Teal (1996), Kirkpatrick and Weiss (1996) and Brent (1998).

6.2.3 Cost-effectiveness analysis

This method is particularly useful in very uncertain or risky projects. Costs of a project can be estimated fairly accurately because major costs of a project are usually incurred at the beginning of project and only minor costs are incurred towards the end. Benefits of such projects are difficult to estimate accurately. Cost-effectiveness analysis (CEA) ranks projects according to their costs and their effectiveness in achieving a goal. It involves primarily:

- defining an objective
- listing the alternatives to achieve the objective
- estimating the cost of each alternative
- defining a criterion to evaluate cost against effectiveness of the alternative methods of meeting the objective.

There are a number of items like pure public goods, which cannot easily be valued meaningfully. Pure public goods (defence, health etc) jointly benefit many people and people find it difficult to assign any value to such goods. Under such circumstances cost-benefit analysis becomes very difficult as the benefit cannot be objectively valued. CEA is very useful in such situations. The cost of providing the same level of benefits in different ways can be compared. It is also useful in such situations where the appropriate methodology to value non-market items is not available.

Based upon the steps outlined above, the least-cost technique is chosen as the most 'cost-effective' project. CEA has been said to be the simplest way of integrating basic needs criteria into project appraisal (Brent 1998). In the basic needs field, this approach has usually been adopted for nutrition schemes. Reutlinger and Selowski (1976, in Brent 1998) applied cost-effectiveness in terms of the fiscal cost of providing one extra calorie to a particular (target) group of consumers.

Although CEA is fairly straightforward, Scandizzo and Knudsen (1980) have pointed out several drawbacks when applied to basic needs: the fundamental among them is that the cost-effectiveness goal, e.g., nutritional sufficiency, may not be attainable within the financial resources at the disposal of a government. They have also come up with a methodology for dealing with these deficiencies of CEA.

6.2.4 Other decision-making methods

Cost-benefit analysis and cost-effectiveness analysis are used more widely than any other methods by governments and agencies. There are several other decision-making frameworks which are also used in project appraisal independently of or together with CBA methods. They are:

Technology based standards
Risk-benefit analysis
Environmental impact analysis
Economic impact analysis, and
Operational research techniques.

6.3 Cost-benefit analysis (CBA)

Basically, CBA is an attempt to assess the desirability of a project by comparing the benefits and costs. In fact, CBA provides a valuable framework for analysis of projects. Depending on the range of agencies involved and the type of effects, the nature of CBA varies to a great extent. Customarily, the investing and financing agencies are interested to know the return on the capital invested. CBA estimates the net beneficial effect. The relevant project costs and benefits (of many kinds, to all people, in every generation) are identified and evaluated in terms of a common value-base, e.g. market prices, efficiency prices or social prices (Brent 1998). The project is accepted if the overall benefits exceed the costs. Usually the CBA is undertaken by or for a government agency.

6.3.1 Types of CBA

Broadly speaking, CBA is of two types:

- Environmental CBA (or extended CBA), and
- Developmental CBA.

The first one is mainly concerned with the evaluation of non-market costs and benefits (e.g. environmental effects of land use). The second one deals with distortions of market prices and distributional issues and has much relevance to the Third World. It includes financial CBA (FCBA), economic CBA (ECBA) and social CBA (SCBA), which are discussed further in section 6.3.6.

Financial CBA is concerned with the assessment of profitability from the private point of view. On the other hand, the economic analysis provides information on whether or not the project would provide an economically efficient use of the resources available to society. Generally, both analyses are carried out together and as a matter of convenience, the financial analysis precedes the economic analysis. In fact, for public or mixed projects for which support comes from public money, the project appraisal should include both. The economic appraisal is mostly applied to public sector projects in the developing countries which have distinctly special features (ODA 1988).

Social CBA explicitly evaluates the distributional objectives and is the most comprehensive form of CBA which measures all types of effects (ODA 1988). However, it requires details of distribution of costs and benefits among different groups of the society.

6.3.2 Methodologies of CBA

Manual of Industrial Project Analysis for Developing Countries (OECD 1968) and *Guidelines for Project Evaluation* (UNIDO: Dasgupta *et. al.* 1972) were the first comprehensive manuals in the field of applied cost-benefit analysis for developing countries. Subsequently, the manuals were revised and further developed (Little and Mirrlees (henceforth: LM) 1974; UNIDO 1978). Now, these are the most accepted methodologies for project appraisal. The applied aspects of these methodologies were further developed by many workers according to specific requirements of developing countries (Dasgupta and Pearce 1972, Squire and van der Tak 1975, ODA 1977, 1988; Gittinger 1982).

There is very little fundamental difference between the two methodologies viz. LM and UNIDO (ODA 1988). In respect of shadow pricing of tradable goods, or tradable contents of non-tradable goods by reference to border price, both methodologies are similar. Irvin (1978) has described UNIDO method as a variant of the LM method rather than an alternative.

In the LM method emphasis is on trade efficiency whereas the UNIDO method focuses on domestic consumption in the hands of the average individual. The justification for using a domestic consumption numeraire is based on the fact that consumption is the ultimate goal for investment.

6.3.3 The numeraire in CBA

The common unit of value is referred to as the 'numeraire' in cost-benefit analysis. Both the project costs and the project benefits are measured in terms of their contribution to the economy. They must be expressed in a common unit of value. The two prominent forms of numeraire in CBA, widely used by multinational agencies are: the aggregate consumption numeraire (UNIDO), and foreign exchange at border prices (LM). Both are expressed in domestic currency. The foreign exchange numeraire requires that non-traded goods are valued in terms of their value equivalent in foreign exchange while traded goods are valued in their direct impact on foreign exchange. The 'uncommitted public income in terms of foreign exchange' is the numeraire in LM methodology. This is also adopted by Squire and van der Tak (1975), Bruce (1976), Scott *et. al.*, (1972) and Little and Scott (1976). Lal (1980) assumes that both private and public savings are equally valuable and expresses the numeraire as 'savings expressed in foreign exchange'. Dasgupta *et. al.* (1972) define their numeraire as average consumption measured in domestic currency. Hansen (1986) emphasises 'critical consumption' rather than 'average consumption'. The critical consumption is the level of consumption at which the government would be indifferent about letting the private sector consume that unit of foreign exchange rather than the government keeping it as public income. UNIDO (1978) advocates the use of domestic currency available for an average individual as the numeraire. However it is convenient both in terms of computation and application if the numeraire is taken as 'the value at present-day prices of domestic currency used for consumption by citizens having the mean income level for the country' (Price 1989).

A numeraire should be selected, not on the basis of some pre-conceived notions but with due regard to the nature of the investment project, the investing agency and the beneficiary. For instance, for appraisal of a government forestry project using non-traded material and labour inputs, and producing a non-traded output, expressing all values in convertible foreign exchange (LM numeraire), will involve a lot of unnecessary calculations. The use of UNIDO numeraire, i.e., expressing all values at domestic prices, appears to be a better approach in this case. Conversely, if a project involves international trade, LM numeraire appears to be a natural choice.

The selection of the currency of a country as the numeraire is not sufficient. It must be specified (UNIDO 1978, Price 1989) with respect to:

- base year, i.e., value of the currency with respect to inflation,
- convertibility of the currency in domestic and international markets,
- use of income from the project: consumption or investment
- ownership of the currency: government or private

Since afforestation projects in developing countries use mainly non-traded goods and surplus labour to produce goods for local consumption, the domestic currency (e.g. Bangladeshi Taka) in the average consumer's hand should be selected as the 'numeraire' for such appraisal.

6.3.4 Criteria of profitability in CBA

A suitable criterion to measure the profitability (of an investment and/or relative profitability of each of several incompatible or competing investments) is critical for computing the true value of revenues and costs accruing at different times (Gittinger 1982, Price 1989). The criteria are grouped into discounting and non-discounting types.

6.3.4.1 Non-discounting criteria

Some of the non-discounting criteria have been mentioned in section 6.2.1. The undiscounted measures of project worth share a common defect, as they do not account adequately for the timing of the benefit stream. Therefore, "...some common undiscounted measures of project worth can be misleading..." (Gittinger 1982). According to Squire and van der Tak (1975), these are inaccurate indicators of economic profitability.

6.3.4.2 Discounting criteria

The discounting criteria fully account for the time value of money. The cash flows accruing at different times can be compared by discounting. However, it is fundamental to derive the equivalent value of each cost or revenue at the chosen point in time. The discounting methods are described below:

6.3.4.2.1 Present value of costs (PVC) or, least cost analysis

Present value of costs is measured as follows:

$$PVC = C_n (1+r)^{-n} \qquad \text{.......... eq. (6.1)}$$

Where C_n = annual investment and/or, operation/maintenance cost in year n, and
r = discount rate

Mutually exclusive technologies having the same benefits but differently shaped cost curves can be compared by this criterion.

6.3.4.2.2 Net present value

Its synonyms are net present worth (NPW) or net discounted revenue (NDR) or net discounted cash flow. The NPV indicates the increase or decrease in return which is obtained by computing the sum of all revenues, suitably discounted, minus the sum of all costs, suitably discounted. The formula is as follows:

$$NPV = \sum_{t=0}^{t=T} \frac{R_t}{(1+r)^t} - \sum_{t=0}^{t=T} \frac{C_t}{(1+r)^t} \qquad \text{.......... eq. (6.2)}$$

where R_t = revenue at any time t or, quoted sometimes as B_t = benefit at any time t
C_t = cost at time t
r = discount rate
T = length of complete production cycle or rotation

NPV may be expressed as per unit of any production factor, e.g. land, labour, etc. or, for the whole project. Being a present equivalent of future values (usually at year zero), it provides a conclusive ranking of projects. It accepts projects with positive NPV only. It is used to compare mutually exclusive technologies with different flows of cost and benefits. Because of its absolute nature, it cannot be used to rank alternatives, which are not mutually exclusive (independent), e.g., the NPV of a small-scale highly attractive project may be lower than a large-scale, marginally acceptable project. This criterion is widely used by forestry and business enterprises, by government institutions, financial institutions and international development agencies (Price 1989).

6.3.4.2.3 Benefit-cost ratio (BCR)

Benefit-cost ratio (BCR) is computed by dividing the present value of revenues by the present value of costs. It is computed as follows:

$$BCR = \frac{\sum_{t=0}^{t=T} R_t \Big/ (1+r)^t}{\sum_{t=0}^{t=T} C_t \Big/ (1+r)^t} \qquad \text{.......... eq. (6.3)}$$

Projects having a ratio of more than 1 are generally acceptable. BCR also needs a suitable rate of discount to calculate the ratio between the discounted benefits and discounted costs. According to Mishan (1975), it is a variant of NPV. However, it is not a common criterion for project appraisal in developing countries (Gittinger 1982). In the case of mutually exclusive projects, the investment choice may be erroneous.

6.3.4.2.4 Net benefit-investment ratio (N/K ratio)

The benefit-investment ratio (N/K ratio) denotes worth of the net benefits divided by the present worth of the investment. The formal selection criterion is to accept all projects with a ratio of 1 or more. According to Gittinger (1982), it is the most suitable and very reliable criterion for ranking of independent projects except in the most extreme cases.

6.3.4.2.5 Internal rate of return

The rate of discount which makes the discounted cash inflows and discounted cash outflows equal (i.e., NPV = 0) is known as the internal rate of return (IRR).

IRR = the value of r that makes:

$$\sum_{t=0}^{t=T} \frac{R_t - C_t}{(1+r)^t} = 0 \qquad \text{.......... eq. (6.4)}$$

It refers exclusively to the investment's internal ability to generate a rate of return. In other words, it represents the upper limit for cost of capital to be invested on the project. The computation of IRR is by trial and error. The decision rule for acceptability of a project is IRR greater than the externally defined discount rate.

IRR is considered a useful measure of project worth, particularly in business circles for promoting the fastest return from limited funds. It can be used to summarise the economic result of a project (Squire and van der Tak 1975). Among compatible investments, it selects investments in descending order while among incompatible investments, the investments with the highest IRR is selected (Price 1989).

The World Bank uses IRR for practically all its financial and economic analyses of projects (World Bank 1994). Most of the other international financing agencies also use this criterion (Gittinger 1982). But IRR cannot be used to measure the relative merits of mutually exclusive projects in a correct manner. It is not useful for comparing the economic merits of alternative projects in economic analysis either.

6.3.4.2.6 Sum of discounted consumption flows

This criterion was evolved by Kula (1981) and subsequently applied to forestry decisions (Kula 1986). However, it has not attracted widespread support.

6.3.4.3 A comparison of discounting criteria

The indicators of discounting type are better because they take into account the time dimension (a crucial aspect of project management). In general, the NPV, BCR and IRR criteria are well recognised and most commonly used measures of profitability. For the truly independent projects (with no operative constraints), these three criteria may give similar results. But the ranking of projects may differ.

Usually, the IRR accepts and rejects the same set of investments as NPV and BCR. But the IRR and BCR do not favour large size projects or projects involving long occupation of a site. The ranking of projects by NPV and BCR may also differ (Price 1989). In the case of independent projects, the rankings are not important. When the projects are not independent (i.e., mutually exclusive), the ranking becomes quite crucial. For such projects, the NPV criterion is preferable and always reliable. It provides the appropriate decision rule for both independent and non-independent projects.

There are many experts including Gittinger (1982), Price and Nair (1984), Price (1989) and Brent (1990) who are critical of IRR. On the other hand, some experts prefer the IRR criterion (Foster and Brooks 1983, Schallau and Wirth 1980). Criticisms of IRR include its sensitivity to the time phasing of benefits, the size of capital outlay and the problem arising out of multiple roots (Feldstein and Flemming 1964, Dasgupta and Pearce 1972, Price and Nair 1984, Price 1989).

Price (1989) asserted that, "IRR is only the solution of an equation, and leaving mere equations to determine the weight to place on future events is a grave abrogation of human responsibilities". Moreover, it does not give correct advice mainly because it ranks the projects irrespective of the market rate of interest. The BCR criterion is also misleading and suffers from many ambiguities (Gittinger 1982). It does not indicate the quantum of net benefit.

Thus, the NPV is the most useful criterion to assess the desirability of all kinds of project. However, the IRR can provide some additional information. Sometimes, the IRR is used as an alternative to the NPV criterion. BCR is an important criterion under the situation of budget constraints (Price and Nair 1984, Brent 1990). Like the ODA (1988), many others also have recommended the use of NPV as the decision criterion in economic appraisal. According to Price and Nair (1984) and Price (1989), NPV per unit area is the best criterion for the appraisal of forestry plantations. Nonetheless, one should take caution while using NPV and IRR in ranking projects, since IRR rankings are not always consistent with NPV rankings (Klemperer 1996).

6.3.5 Discount rate

It is now well known that the value of a given sum of money at two different points in time is not equal. In other words, the value of a Taka received today is not the same as the value of a Taka received one year later. Therefore, a suitable allowance for the time value of money is essential. The process of discounting which is the reciprocal of compounding allows future costs and benefits to be expressed in terms of present values. In mathematical terms, it reverses compounding. In discounting, a present equivalent of future value is computed by dividing the future value by $(1+r)^t$, where r is the discount rate and t is the time in years.

There are several reasons why benefits accruing in future are given a lower value than present day benefits. It is mainly because the early benefits can be reinvested for further profit earning. The delay in accrual of benefits causes a loss of interest. On the other hand, an early benefit becomes more valuable for any project.

Usually in any long-term project the bulk of investments are made in the early years of the programme, while benefits normally start in later years. Assessing the project's true worth is possible only by computing the values of all cash inflows and outflows (occurring at different points in time) at a common point in time, usually the year zero. To make a comparison between the costs and benefits, all costs and benefits are brought back to a common denominator (present values) by applying a discounting procedure to eliminate the differences in the loss of interest.

The discount rate is the most crucial parameter in the evaluation of afforestation projects. A high discount rate favours early exploitation and low discount rate favours investment in long-term afforestation projects. The question of the appropriate discount rate for public project appraisal has been a subject of extensive controversy. The objective estimation of the discount rate for project appraisal is very complex. Apart from theoretical and practical problems in estimation, it involves ethical and social issues.

It has been suggested that the appropriate discount rate can be estimated by studying governmental choices of individual public projects as it represents government policy with respect to the desirability of consumption at different times (UNIDO 1972, Harou 1985). The lowest rate of return of projects accepted in the past indicates the upper limit of the social discount rate.

6.3.6 Account of the types of CBA

6.3.6.1 Financial cost-benefit analysis (FCBA)

Financial CBA is used to assess the commercial (or financial) profitability of a project. It is undertaken from the point of view of specific entities involved in a project. Considering the monetary returns expected by such entities from investment of their funds (resources) in a project, it uses market prices to measure the money profit accruing to them. It also provides information on when funds will be required (outflow) and when receipts (inflows) can be expected. It analyses the changes in the financial position of each main type of participating agent.

The financial analysis is essentially taken for the following purposes:

a. to determine the financial viability of a project or enterprise;
b. to assess adequacy of a financing plan for new projects or business;
c. to advise the method of improving the viability of a project or enterprise;
d. to plan and control project enterprise operation.

In the case of financial CBA, the market interest rate is used as the discount rate for computing the NPV. But it is quite difficult to find a single figure for market interest rate, which varies from time to time depending on the types of investments and types of borrowers and lenders (Trivedi 1987).

6.3.6.2 Economic cost-benefit analysis (ECBA)

A project which appears profitable for a particular individual or organisation, is not necessarily beneficial for the society as a whole. In the EBCA, the entity from whose point of view the analysis is being carried out becomes society as a whole rather than a specific entity (or entities) within the society. The main concern is what society gives up and what society gains from a project. It is usually oriented toward the allocation of capital. It is "... a type of policy analysis in which the socio-economic advantages and disadvantages of policy alternatives are quantified in one unit of measurement" (van den Doel 1985).

There are two approaches to ECBA:

(i) shadow pricing and
(ii) effects method.

The first method is the most common and preferable one. The second one (developed in France) is commonly used for French-aided projects (FAO 1979).

Shadow pricing in EBCA involves adjustment in the financial analysis on several points to indicate the withdrawal and addition of real resources (products, land, labour, capital) to the national economy. Also it disregards the transfer payments (taxes, subsidies, loans and debts) and tries to neutralise the distortions in price due to an imperfect market system. The market prices are suitably adjusted to reflect the true value of products/services/resources for the society. The adjusted prices are called 'accounting prices' or, 'shadow prices' or, 'efficiency prices'. Some cost items are also added to change a financial analysis into economic analysis, namely cost of extension, education, administration costs, etc. as far as they are not borne by private entities. The shadow price used for foreign exchange is a means of directly incorporating the balance of payments objective in the economic analysis. The shadow prices of labour reflect the conditions of unemployment, favouring the use of labour in cases where there is substantial unemployment (Sharawi 1997).

In ECBA, a project is accepted if those who gain from the project can theoretically compensate those who lose. However, no distinction is made between treatment of the losers and the gainers. In fact, the marginal utility of income is implicitly taken to be equal for different income levels and actual compensation is not considered necessary. Thus the distribution of benefits and costs among the members of society is not considered in the EBCA because the analysis assumes that the existing distribution of income is perfect from society's point of view (Kanshahu 1996).

6.3.6.3 Social cost-benefit analysis (SCBA)

In the SCBA, the main idea is to determine the expected changes in terms of social organisation and living standards of people. It focuses on social aspects of the production system, which will be created or sustained by implementing any project for the welfare of the people.

According to Little and Mirrlees (1974), the actual receipts and actual expenditures are not an adequate measure of the social benefits and social costs, respectively. So the SCBA tries to measure the social effects of projects (Dasgupta *et al.* 1969, Squire and van der Tak 1975). Ideally all projects should be appraised based on the social costs and social benefits. In reality, however, it is difficult to achieve because of complexities of data requirements and computations.

In SCBA, the inter-personal income distribution and inter-temporal income distribution are considered very important. The value of change of income is dependent on the marginal utility that is assigned to the different income levels. Therefore, the concept of diminishing marginal utility is applied in SCBA to derive the shadow prices. SCBA emphasises a more equitable distribution of income and wealth for providing a better standard of living, especially to the weaker sections of society and the use of scarce resources of the nation for the maximum possible benefit to the present and future generations.

The financial and economic data provide the basic input to which adjustments are made for determining the social profitability of the project. The efficiency prices undergo further adjustment, resulting in 'social prices' which reflect values attached to distribution of income between rich and poor groups in the society and between consumption and investment in general (Squire and van der Tak 1975).

The discount rate in SCBA is taken as either the consumption rate of interest (UNIDO 1978) or the accounting rate of interest (Little and Mirrlees 1974). It reflects the rate of change in value of the numeraire, and varies from programme to programme and from country to country.

SCBA has gained greater significance during the nineties because governments in many developing countries are making huge investments of public funds for developmental activities, which have significant impact on large sections of the society. There is an urgent need for full justification of these projects from the social angle.

SCBA is useful in assessing the desirability and viability of projects from the viewpoint of income redistribution. But a difficulty in the application of the SCBA concept is the computation of the distributional weights. Moreover the subjective perception of social benefits and costs, involving a large element of human judgement, may be unrealistic and erroneous. Thus appraisals which explicitly use income distribution weights are seldom implemented. However, this does not mean that the current income distribution is appropriate.

6.4 Treatment of inflation in project appraisal

Price stability is essential for stability in economic life. Inflation is an increase in price level over time. In a market economy, producers take decisions on production according to the demands of their products. Therefore, any changes in price will ultimately influence the production decision.

Inflation affects the estimation of cash flow as below:

- The estimation of project's cash flow involves the estimation of future rates of inflation i.e., future prices of individual inputs and outputs. If all the prices change at the same rate, the decision will not be affected. Conversely, if the prices of input and output change at different rates, such changes in relative prices should be predicted explicitly, instead of adjusting the discount rate (Price 1991).

- It is expected that in the presence of inflation in a economy, the money rate of return on market investment is likely to rise along with general price trend $(1+m) = (1+r)(1+i)$, where m is money interest rate, r is real interest rate and i is inflation rate).

Generally, cash flow is estimated at constant prices assuming that inflation will affect both costs and benefits equally. It allows the analyst to avoid making estimates of future inflation rates (Gittinger 1982). It is easier to carry out project appraisal in these current prices, but the discount rate must then be expressed in current prices after adjusting a money-based rate for general inflation.

6.5 Income distribution

Projects tend to affect distribution of income. Should projects be used as investments to redistribute income or should the issue of distribution of income be left to the tax structure? Musgrave (1969) argues that projects should be judged only on efficiency grounds and that taxation should perform the redistribution objective. But in practice, it is difficult to devise a tax structure targeted specially to the beneficiaries or losers of the project. The excess tax burden on tax-payers may result in loss of efficiency in the economy.

ECBA accounts for aspects relating to allocational efficiency for the economy as such. However, the social welfare of a country cannot be measured in terms of economic growth alone. What needs to be critically examined is how the gains or losses in the economy are distributed amongst people because equal cash flows to individuals at different levels of income and at different points in time have different values. The distribution aspect has both inter-temporal and intra-temporal (or inter-personal) dimensions. SCBA addresses this aspect of projects. Inter-temporal dimensions involve relative weighting of present consumption and future consumption (present savings) of individuals at the same consumption level while intra-temporal dimensions absorbs relative weighting of benefits of a project to individuals at different consumption levels. The most common system of giving weights to different groups comes from utility of income functions.

It is also possible to estimate the costs and benefits to different groups in society separately and let the policy makers assign appropriate weights to different groups.

6.6 Some alternative approaches to project appraisal

6.6.1 Logical framework approach to project appraisal.

The US Agency for International Development (USAID) adopted the logical framework (LF) method in 1971. Now, it has become a dominant method for appraisal of projects supported by USAID. The LF requires the specification of project goal, purpose, inputs, outputs and assumptions about the project environment. It provides a common vocabulary oriented to generic feature of a project for analysis by a multi-disciplinary team (Clements 1995). LF method permits, but does not require, a cost-benefit analysis and/or cost-effectiveness analysis (CEA). Cost-benefit analysis is rarely used in the LF method and CEA has been used in about 23 % of USAID projects. Most initial decisions are made on the basis of the policy perspective of the individual country and the focus of the project.

6.6.2 Basic needs approach

In the late 1960s, economic growth was synonymous with development while in the late 1970s development was defined in terms of both growth and distributional aspects. Many developmental economists (e.g. Hicks and Streeten 1979) have questioned the validity of the use of growth and income distribution as indicators of development in project appraisal. They emphasized the non-income dimensions of welfare of individuals. The non-income indicators include certain essential or basic needs required for the well-being of people. It was found (Hicks and Streeten 1979) that the correlations between basic needs indicators (viz. expectation of life at birth, percent of required calorie consumption, infant mortality, primary enrolment, literacy, average person per room and percent of houses without piped water) and GNP per capita for developing countries were notably low as compared to those for pooled data which included all countries.

To incorporate the basic needs concept in project appraisal Harberger (1978, 1984) recommended treatment of basic needs as a public good. The consumption by the poor generates direct benefits for the poor and indirect benefits for the rich. Hence, consumption by the poor is referred to as a public good. Scandizzo and Knudsen (1980) emphasised the market determination of food consumption which depends on the consumption behaviour of both the rich and the poor rather than on the consumption of the poor alone.

Nair (1981) has developed a methodology to assign weighting to benefits according to their contribution to basic needs fulfilment. The market value of a good is multiplied by a basic needs conversion factor (BNCF) for that good. In the case of income, only the basic needs component is considered. Nair treats all labour costs and part of staff salary as basic needs income. All goods and income below the basic needs reference lines are given weighting of one. The basic needs criterion for selection of alternatives is to maximise (Nair 1981):

$$[b_g\,(GE - SCg) + b_i\,(IE - SCi)]\,/\,N$$

where GE is the basic need value of the goods, IE is the basic needs value of income, SCg is the basic needs opportunity cost of goods, SCi is the basic needs opportunity cost of income, b_g and b_i are weights for aggregation of goods and income balance sheet and N is the project life. The basic needs effect is evaluated at two stages:

1. Preparation of separate balance sheets, for goods produced and income generated for all alternatives and their weighting according to their basic needs component
2. Shadow pricing goods and income in terms of their basic needs component.

The weakness of this approach lies in the fact that real society does not exist in two clear groups: 'haves' and 'have-nots' (Trivedi 1987). In short, the basic needs approach is essentially an alternative to the distributional weight (Harberger 1978) or simply an income weighting scheme (Ray 1984).

6.6.3 Capabilities approach to project analysis (CAPA)

The concept of 'capabilities' as a basic requirement for well-being has been developed by Sen (1981, 1985). Clements (1995) has developed the capabilities approach to project analysis (CAPA) based on Sen's notion of 'capabilities'. This approach focuses directly on human development index (HDI) scores. The method uses HDI scores for handling distributional aspects and employs CBA methods for the rest of the analysis.

The CAPA is more informationally demanding than CBA. Apart from estimating a project's economic benefits, the CAPA also inquires about the capability standard of the beneficiaries, and how the project augments them. The CAPA permits impact comparisons between social sector projects (health, nutrition, drinking water etc.) and investment in energy or industry.

6.7 Application of CBA in appraisal of forestry projects

6.7.1 General background

"...planting trees, growing them tall and strong, and felling them at maturity is irrelevant unless these actions promote desired objectives..." (Price, 1989).

Forest economics has always been concerned with the harvest of timber and management decisions. The forests were mainly seen as a vital resource for the production of raw materials to meet the increasing demands of modern development without acknowledging the innumerable non-commercial uses. But the awareness of forestry's contribution to socio-economic development has undergone substantial change over the past 40 years (Westoby 1962). The old perception began to receive heavy criticism in the 1970's.

It is quite true that the potential of forestry to meet development objectives is limited by the demands of rural population due to their dependence on forests, particularly for fuelwood (Douglas 1983, Westoby 1987). As a result, it has been lately recognised that the real life complexities of forests often include various other goods and services which can be valued too.

It is also realised that capital-intensive projects do not benefit the rural poor. Therefore, an assessment of public-sector forestry projects on a purely commercial profitability basis provides an insufficient evaluation measure (Pant 1975). If only timber values are considered, forest plantations can seldom compete with other investments either industrial or agricultural (Pant 1975, Hyde and Newman 1991, Whitby and Adger 1983). On the other hand, Sedjo (1983) found that the majority of plantation forestry undertaken in different parts of the world were feasible on the basis of plantation management costs, stumpage price estimates and biological considerations.

In many projects, the proportion of non-marketed benefits is highly diversified and widely dispersed in nature. But there are no market prices for many of these products to equate with. So, it is difficult to account the actual value of these benefits from forests (Chatterjee 1985). In many cases, overall social benefits may prevail over the more easily quantifiable values of costs and benefits (Romm 1981).

In general, the objective of forest appraisal has been to achieve an efficient allocation of capital. The appraisals in forestry are usually based on a number of assumptions about the choices of species, site quality, rotation age, volume productivity, management type, uses, marketability of the products, etc. The principal idea has been to estimate the value of the growing stock and to indicate the positive and negative effects on the capital investment.

Gradually, forest management has become more and more public-oriented. The use of appropriate economic tools including CBA has become common to analyse a wide range of forestry projects (FAO 1979, Nautiyal 1988, Price 1989, Hyde and Newman 1991). Depending on the correctness of methodology in identifying various items, CBA provides a superior tool for appraisal of forestry projects (Price and Nair 1984). In the past few years, the focus of forest appraisal has gradually shifted towards the economic and social aspects, involving income distribution and environmental effects. In particular, the appraisal of social forestry projects including community forestry, agro-forestry and farm forestry has received much attention in the developing countries.

6.7.2 Use of CBA in appraisal of social forestry projects

The estimation and prediction of volume of trees has been the main aim of traditional forestry management in many developing countries. This is based on the concept of the normal forest and sustained yield criteria. There is no account for economic implications, which are significant all over the countries.

The implementation of various schemes in developing countries are undertaken on the basis of "top down" approach (Price and Nair 1984). Moreover, the application of forest economics has remained negligible in the management of forests. However, in the past few years, particularly with the idea of attracting donor agencies for financial support, the programme of social forestry has received considerable attention from forest economists to help make rational decisions about the different options, so as to ensure that scarce resources are spent in the best possible way. Now the use of CBA has become a routine practice to assess the potential of most of the foreign aided social forestry projects in the poor countries as well as in the developed world.

Unfortunately, the appraisal of social forestry projects is mainly based on financial criteria involving the IRR alone. In the majority of the projects, the contribution of non-market benefits, including social and environmental values of plantations, has been neglected while carrying out the appraisals. Moreover, these projects predominantly give priority to the timber value of trees rather than the minor forest products. Looking at the diversified nature of forest functions (especially the socio-economic role of forests), a comprehensive CBA is vital to establish the real values of social forestry projects (Khan 1992).

It is held that the implementation of social forestry programmes will create a number of financial, economical, social and environmental effects (Sharma 1996). Social forestry projects, being long-term activities, aim at producing a variety of goods and services for the benefit of society in the future years. The supply and demand of forest products, together with the rural economy, have serious impacts on the economic aspects of social forestry (Chatterjee 1985).

The main characteristics of social forestry projects that affect the CBA are the long gestation period, non-marketability of many products/services, and multiple use of plantations. The nature of benefits and costs of social forestry plantations depends on the priorities and objectives of the policies/programmes and varies greatly from country to country. More precisely, they are project-specific, varying from place to place. Usually, the marketable products of social forestry plantations are estimated, valued and compared with the costs of achieving them. Non-marketable and intangible benefits (erosion and water control, adequate village subsistence) and costs (requirements of village participation) receive only a supplemental consideration. There are many products that cannot be sold on a market, e.g. diminishing of erosion, or providing recreation opportunities, improvement of soil, reclamation of wastelands, shelter-belt effect, shade effect, etc. Many of these products affect the people and society (positively or negatively).

Srivastava and Pant (1979) have reviewed and analyzed the use of CBA at length in assessing and comparing the social forestry projects in India. They consider that CBA is inadequate to measure the impacts of social forestry projects, which mainly aim to bring a social change by ensuring a more equitable distribution of income along with decentralisation of decision-making power. Though the techniques of CBA have become quite advanced, it is doubtful whether social and environmental impacts of social forestry projects can be valued in an adequate way (Romm 1981).

In view of the above mentioned points, the social forestry programme for the community may seem to be financially unacceptable because of various underlying factors (degraded land, protection problems, technical and managerial deficiencies, etc.). But a realistic approach in SCBA may help to reveal that it is in the public interest to continue the scheme as it would serve the objective of providing forest produce to the rural communities who are heavily dependent on such products. The framework developed by Sharma (1990, in Sharma 1996) by complementing GP (Goal Programming) with SCBA to incorporate socio-economic aspects of social forestry may be taken as a sound evaluation strategy. Kapp (1998) has criticised the widely used ex-ante financial CBA to plan or evaluate small holder forestry activities, on the ground of using opportunity costs and discount rates. He maintains that optimisation can find the most profitable resource allocation over a chosen period and correspondingly, the maximum increase of family welfare. He recommends a wider use of the 'with-and-without project' CBA and optimisation models to address conservation and rural development issues in an integrated manner.

Chapter Seven

Basic Needs Evaluation: A Theoretical Structure

The methodology for a project evaluation depends on the objectives of the development strategies. Thus, a methodology appropriate for one development strategy need not be relevant and appropriate for other strategies. When a project is oriented towards the basic needs strategy, one needs to examine the project's impacts with respect to fulfilment of the basic needs. Since the existing evaluation methodologies are based on the growth strategy or a variant of that, it is questionable whether they would be appropriate for evaluating projects under the basic needs strategy.

This chapter therefore examines the suitability of cost-benefit analysis (CBA) for basic needs evaluation and outlines an alternative methodology. Section 1 examines the suitability of cost-benefit analysis in the context of basic needs evaluation. The salient features of the work done hitherto on evaluation of basic needs impacts are discussed in section 2 and a brief description of basic needs evaluation as described by Singh (1995) in his attempt to improve upon Nair's (1981) approach is given in section 3.

7.1 Application of CBA in basic needs evaluation

The growth strategy of development differs radically from the basic needs strategy in that it does not incorporate the concepts of product and factor mix which are two important considerations in the basic needs strategy (Bequele and Freedman 1979). Since CBA is based on the growth strategy and its variant (redistribution with growth), it can reasonably be assumed that CBA is unsuitable for evaluation of the basic needs strategy.

However, before discarding the cost-benefit technique as inappropriate for evaluating basic needs impact, two aspects needs to be examined. The first aspect is the reason why the technique itself is not appropriate. The second aspect is the feasibility of extending the scope of available methodologies to incorporate the principles underlying the basic needs strategy.

7.1.1 Inappropriateness in the CBA technique

The consideration of the choice of product mix is ignored in CBAs. The basic justification for the neglect of product mix is the assumption of the open economy in which income can be readily converted to the desired basket of basic needs goods. However, it is not applicable in the closed economy which prevails in many of the developing countries. In these countries where the basic needs of the majority are not being met, confidence can not be placed on the ability of the market to allocate resources for producing essential goods (Nair 1981). In other words, if the supply within an area is highly inelastic, increased demand will not be met by increases in the supply of the goods demanded. In fact, at the extreme, prices will rise and no extra goods will be produced, leaving the consumer no better off. Thus, CBA does not consider the product mix which is an important aspect as far as basic needs is concerned.

Even in terms of SCBA's consideration of the factor mix, there are still two conceptual problems in applying the methodology within the basic needs strategy. These two problems concern (a) the group-specific distributional weights and (b) the social value of public income. The former indicates the relative benefits to the individual at different consumption levels and values of changes in consumption are assessed in terms of their income. Thus the value of a group-specific weight depends on the elasticity of the marginal utility of income. This is defined as the proportional rate at which the marginal utility of an additional unit of income declines with proportional increases in the level of income (UNIDO 1978). The group specific weight will be larger for those who have less income.

Although in SCBA, through the group specific distributional weight, projects help the relatively poor people, it does not deal specifically with the extent to which a project is providing for basic needs (Harberger 1984).

The second conceptual problem in consideration of factor mix in SCBA concerns the estimation of the social value of the aggregated discounted consumption generated by a unit of investment. Derivation of the parameters involved in estimation of the social value of public income in the context of basic needs is criticized on the grounds that, it takes into account the aggregated discounted consumption which is also contrary to the assumption underlying in basic needs (Squire and van der Tak 1975, Scott *et al.* 1976).

7.1.2 Feasibility of extending the scope of CBA

In order to overcome the above problems of SCBA, there has been some attempt to extend its scope by suggesting goods specific weights (UNIDO 1978, Veitch 1978). This additional stage of analysis is termed merit want analysis (Nair 1981), where it is recommended that goods should be given a merit want premium. In other words, when meeting basic needs is an objective, basic needs goods will attract higher weightings. The merit want analysis, however, has also been criticized on two grounds.

Firstly that no specific method has been prescribed for deriving the goods specific weight and secondly that merit want analysis is an additional stage of analysis which often increases complication, particularly when mutually conflicting assumptions are introduced at different stages. Prescribing an additional stage rather than devising an alternative approach may increase the scope for misuse of CBA (Nair 1981).

Thus CBA, even with its amendments, exhibits certain shortcomings when directed towards basic needs evaluation. There is a need therefore for a methodology which can facilitate the analysis of the project with proper consideration of the choice of the product and factor mix with specific regard to basic needs fulfilment. The next section deals with the salient features of the approaches developed for the evaluation of projects designed to meet basic needs.

7.2 Basic needs evaluation: the various technical approaches

The basic needs strategy has been discussed by many workers, for example, ILO (1976, 1977), Sukhatme (1977), Streeten (1979), Harberger (1978, 1984), Leipziger (1981), Srinivasan (1984), Stewart (1985), Teekens (1988) and Roy and Clark (1994). However, the methodology for basic needs evaluation has been relatively little explored until recently. Nevertheless, two approaches can be identified, the cost-effectiveness approach and Nair's basic needs approach. The former is fairly limited in application scope. However, both are discussed below.

7.2.1 Cost-effectiveness approach

In this approach, a project is appraised in terms of how cheaply it can provide benefits gauged according to a poverty indicator. This least-cost approach was adopted by Reutlinger and Selowsky (1976) of the World Bank in evaluating the fiscal cost of providing one extra calorie to a particular group of consumers. Pinstrup-Andersen and Caicedo (1978) have used this approach to compare the consequences of income distribution policies on the calorie consumption of different income groups.

Although the cost-effectiveness approach is a simple means of project evaluation, Scandizzo and Knudsen (1980) point out that it is an inadequate method for basic needs evaluation particularly on the grounds that it only permits the ranking of projects with a single basic needs indicator. It does not allow the comparison of projects having different basic needs indicators, for example, one targeted to raise the calorie level and another targeted to achieve a certain percentage of literacy in a country. Scandizzo and Knudsen (1978) have also remarked on another shortcoming of the cost-effectiveness method that, within the limits of government resources or the limits of time frame, it might not be possible to achieve the target of assuring to all consumers the satisfaction of basic needs.

7.2.2 Nair's basic needs approach

Nair (1981) rejected the application of CBA in basic needs analysis and developed a full fledged methodology for basic needs analysis. His approach aims to identify the impacts of land use alternatives in terms of both the production of basic needs goods (goods effect) and the generation of basic needs income (income effect).

These two objectives are examined by preparing two separate balance sheets referred to as the goods balance sheet (or net goods effect) and income balance sheet (or net income effect) respectively. The former indicates the net impact of the project on the supply of basic needs goods while the latter assesses the net impact of the project in terms of generation of basic needs income. To rank the projects, these two effects are aggregated by assigning weights. Basic needs consumption at market prices is used as the numeraire. Costs and benefits accruing at different periods of time are not discounted on the assumption that the utility of basic needs goods do not change over a period of time, particularly in the case of the low income groups, unless there is a drastic change in their consumption patterns. The criterion for comparing alternative options is chosen as:

$$\mathbf{BNV} = [\, b_g\,(GE - Sc_g) + b_i\,(IE - Sc_i)] \,/\, N \qquad [7.1]$$

where BNV is the net annual aggregated basic needs value;

GE is the goods effects;

IE is the income effect;

Sc_g is the social cost of project incurred in the production of basic needs goods;

Sc_i is the social cost of project incurred in the generation of basic needs income;

b_g is the aggregation weight for the net goods effect or goods balance sheet;

b_i is the aggregation weight for the net income effect or income balance sheet;

and N is the project life.

BNV, like the NPV, indicates a worthwhile project if its value is positive and enables projects to be ranked in order of the highest BNV. The goods effect indicates the basic needs value of the goods while the income effects show the basic needs value of the income. The basic needs value of a good is estimated by multiplying the market value of goods by the basic needs conversion factor (BNCF). The BNCF indicates the proportion of input or output which directly or indirectly enters the basic needs consumption basket and ranges from 0 to 1. Thus a BNCF value of 1 is used for the goods that are wholly used to satisfy basic needs, while a value of 0 is assigned to those which are not at all used to satisfy basic needs. Similarly, the basic needs value of income is estimated by identifying the proportion of income generated from the output as well as inputs of the project which is utilized for basic consumption needs. Nair's approach thus incorporates the concepts of both the product mix and the factor mix with on-off (1, 0) distributional weights.

The double weightings, one at the stage of the social valuation of goods and income in terms of basic needs fulfilment and the other at the aggregation stage, allow the decision maker to evaluate the alternatives after deciding what relative weight should be put on the aggregate basic needs value of output relative to the aggregate basic needs value of income. Within the above conceptual framework Nair's approach can be divided into the following steps:

1. Identification of basic needs goods for the country or region.
2. Estimation of basic needs income for the country or region.
3. Identification, quantification and valuation of goods at market prices produced by the projects.
4. Social valuation of goods in terms of basic needs fulfilment (goods effect).
5. Social valuation of income in terms of basic needs fulfilment (income effect).
6. Social costing of projects incurred in the production of basic needs goods and generation of basic needs income.
7. Estimation of net goods effect (goods balance sheet) and net income effect (income balance sheet).
8. Estimation of aggregation weights for net goods effect and net income effect.
9. Aggregation of net goods effect and net income effect and choice amongst the projects.

Figure 7.1 below shows Nair's basic needs evaluation procedure in more detail.

From the foregoing discussions of available approaches, it is clear that Nair's approach is the only approach which outlines the detailed methodology for basic needs evaluation. However, although Nair's methodology appears conceptually sound, there are some problems in its practical application. Nair himself admits that,

"....Problems in deriving the various parameters, especially in respect of the country with a weak data base, would be one of the serious objections in making the approach practically useful. Refinements are required to improve the usefulness of the technique" (Nair 1981, p. 263).

The next section discusses the practical and conceptual shortcomings of Nair's methodology and modifications as suggested by Singh (1995).

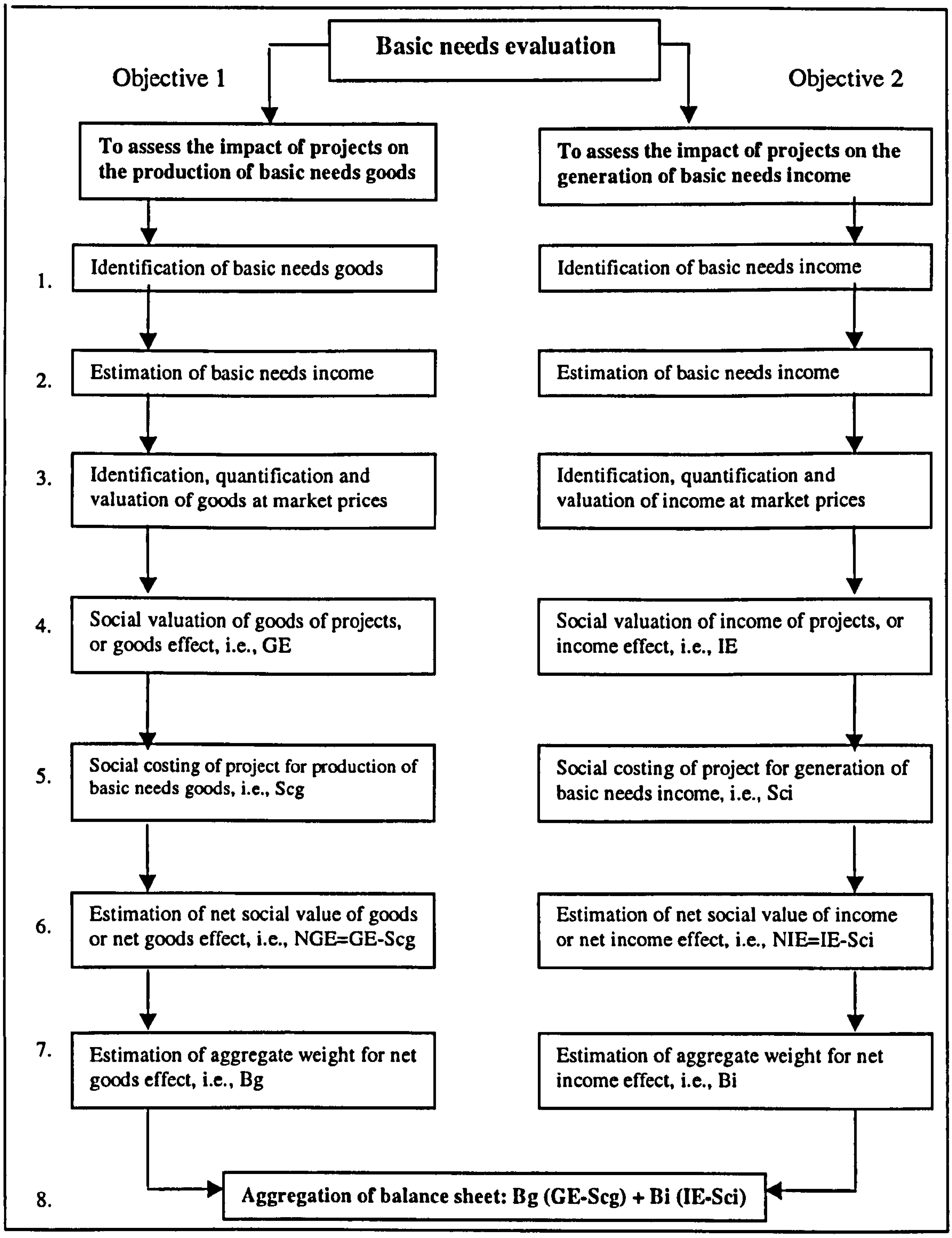
7.3 Steps of basic needs analysis

This section elaborates the basic steps outlined in the previous section.

7.3.1 Identification of basic needs goods for a region or country

As discussed in Chapter 5, basic needs are defined as the quantities of goods and services which can be regarded as essential to maintain a minimum standard of living (ILO 1976 and 1977). These are divided into private consumption goods such as food, clothing and shelter and the public utilities services such as health, education and transport (Burki and Haq 1981).

Figure 7.1 Steps of basic needs evaluation



Source: Singh 1995.

Consumption of basic needs goods varies within the country due to a number of factors such as the variation in socio-economic and political condition, as well as variation in price structure and activity status of the population. The implications of all these conclude that, there is a need of a suitable methodology to identify the basic needs goods in a particular situation.

Apart from falling victim to the above criticisms Nair's approach of basic needs analysis does not deal with the identification of the basic needs goods and services. He himself admits that,

"...here the precise method for identifying the consumption level of basic needs goods and services is not dealt with and emphasis is given to the methodology on the assumption that the basic needs baskets and basic needs income have already been identified." (Nair 1981, p. 98).

This means the basic needs goods and basic needs income in Nair's approach are based not on primary data, but on an average estimate made from the published literature at the national level which does not necessarily apply to a specific region of the country.

7.3.2 Estimation of basic needs income for an average family for a region or country

Production of basic needs goods alone is however not a sufficient condition for fulfilment of basic needs. Consumption can take place only if goods are accessible, which primarily depends on the income at the disposal of the households providing the necessary purchasing power.

Basic needs income is defined as the adjusted value of basic needs goods obtained both from the monetised and non-monetised sector which are used for basic consumption needs. It excludes the values of essential public services such as health care, education and sanitation on the assumption that these will be provided free by government as a public good (GPRB 1998). Thus basic needs income can be expressed as:

$$BNI = \Sigma\,(Qg * Pg) + \Sigma\,(Qng * Png) \qquad [7.2]$$

where BNI is basic needs income;

Qg is quantity of gth good;

Pg is price of gth good;

Qng is the quantity of gth good obtained from non-monetised sector and

Png is the imputed price of gth good obtained from non-monetised sector.

In order to overcome the above shortcomings the following improvements have been suggested by Singh (1995) in the context of a land use project.

a. Conduct a household survey of rural poor to identify their consumption pattern.
b. Identify each item under food and non-food categories in order to prepare a complete basic needs basket.
c. Take into account the goods derived from the non-monetised sector such as fuelwood freely collected from forest, valued in terms of the time and effort expended in their collection.
d. Assess the extent to which the current food basket meets physiological requirements and then adjust to meet any shortfall. The calorie availability gives an easy way of adjustment.

These issues applied to the current area of study are dealt with in detail in Chapter 13.

7.3.3 Identification, quantification and market valuation of goods produced from projects

Identification, quantification and market valuation of goods produced from the projects are done in similar fashion to that for financial cost-benefit analysis discussed in Chapter 6. Market prices are used to arrive at comparable values for different goods and services. Using market prices as a first approximation in basic needs analysis is justified on the following grounds:

1. Market prices represent the values at which goods and services are actually exchanged between individuals and groups in society, hence basic need income is based on market prices.
2. Market prices are used in the early stages of all conventional methodologies (Little and Mirrlees 1968, UNIDO 1972).

7.3.4 Social valuation of goods in terms of basic needs fulfilment (goods effect)

The valuation of goods in terms of basic needs fulfilment is carried out to assess the impact of a project on the production of basic needs goods. At this stage, the extent to which a good produced from the project is a basic or non-basic good, i.e., one which is or is not used to meet basic needs is gauged by the researcher. This gives the BNCF for that good or service. Following this, the market prices of goods are multiplied by the BNCFs. Thus the social value of goods or goods effect can be mathematically expressed as:

$$\mathbf{GE = \Sigma Qg * Pg * BNCFg} \qquad \textbf{[7.3]}$$

where GE is the goods effect;
Qg is the quantity of gth good;
Pg is the market price of gth good and
BNCFg is the basic needs conversion factor of gth good.

The BNCF can be readily derived in the case of directly consumed goods, but it is difficult for those goods which go through a series of processing to reach the final consumption stage. Estimation of the BNCF for these goods requires a high degree of disaggregation so as to estimate the distribution between basic and non-basic uses. This implies that it is necessary to know the end utilisation pattern of its products. For example, in the case of *Ceriops roxburghiana*, a mangrove tree species of the Sundarbans (Kamaluddin 1984), the wood is widely used locally as the fuelwood for cooking. In such a case the utilisation is primarily for fulfilment of basic needs and a BNCF value of 1 would be appropriate.

With *Dipterocarpus turbinatus*, however, a quality timber species of the hill forests of Bangladesh, the wood is mainly utilised for making railway sleepers or, for high quality furniture (Kamaluddin 1984). In both cases the wood is not directly used by the poor people and hence it is assumed that the consumption is for non-basic purposes. Thus a BNCF value of 0 would be appropriate.

Finally, *Melocanna baccifera* is a common bamboo species growing naturally in the hill forests (Banik 1994) and in village groves as well. Some 30% of the total production of this bamboo is utilised for pulp and paper making and in the construction of buildings, bridges and roads. The remaining 70% is used directly in rural areas for wall-making, cooking and heating, construction and repair of low cost houses and household and farm fencing. Thus 30% is used for non-basic needs consumption and 70% is used for basic needs satisfaction. Hence, a BNCF value of 0.70 would be appropriate for this species.

These examples suggest that it is not difficult to estimate the BNCF of goods whose end utilisation patterns are known. Where the end uses are not known, however, Nair suggests that the existing, rather than future, end uses of goods should be taken into account to estimate the BNCF of future outputs in a project. However, in the case of those goods which produce a number of intermediate use goods, estimating the BNCF becomes extremely difficult. These require examination of the different production processes undergone and the identification of the proportion that ultimately enters into the basic needs basket. The alternatives of using ready made input-output tables to identify the intermediate and final uses have been criticised, due to their being based on average and aggregated data.

Nair himself estimated BNCF's subjectively, using simplifying assumptions and admitted that

"...these values are tentative and are derived primarily to illustrate the application of the basic needs analysis" (Nair 1981, p. 300)

He did not incorporate the intermediate goods such as leaves, twigs, branches, grass, poles and minor forest products produced in the projects but suggested that:

"....considerable refinement needs to be brought about in the estimation of BNCF of intermediate goods which depend on how best the actual uses are identified" (Nair 1981, p. 260)

In order to address the deficiencies of Nair's approach in the estimation of the BNCF, the following improvements have been proposed by Singh (1995):

a. Information related to the end utilisation pattern of the goods produced by the projects should be gathered through household surveys of the rural poor as well as from official records.
b. Data related to the production of intermediate products within project should also be collected in the same ways.

Estimation of the BNCF for goods and inputs involved in the projects in the current study area are discussed in detail in Chapter 14.

7.3.5 Social valuation of income in terms of basic needs fulfilment (income effect)

Income generation in any project can be analysed from two angles. Firstly, through the revenue generated from the sale of the goods and secondly through the payments made to the owners of the various factors of production. Nair's view was that the profit from the sale of a good in a project remains with the project agency and the rest are distributed in the society in the form of payments towards the supply of the inputs. The income received by the owners of the factors of production is either saved or consumed or both. The income actually spent on basic consumption needs is taken into account for the estimation of the basic needs income. Thus the income effect measures the impact of a project in terms of the generation of the basic needs income and its distribution in the society.

The social valuation of income in terms of basic needs fulfilment is more difficult than that of the social valuation of goods, mainly due to consideration of factors of production in the former case. Nair argues that the estimation of basic needs income in the case of commonly used factors of production such as land and labour is relatively easy. Estimation of the basic needs income generated from these inputs is made by comparing the income received from the project with that of the required basic needs income (estimated for a region or country). If the income received by the owners of the factors of production is less than the required basic needs income, the entire income is treated as basic needs income. If, on the other hand, the income received by the owners of factors of production exceeds the required basic needs income, the excess income is treated as non-basic income. Savings or reinvestments are not taken into account on the simplifying, but probably realistic, assumption that most of the income saved is consumed within a short time (Mujeri *et al.* 1993).

In the case of material inputs such as fertilisers, insecticides, polythene bags, tools and implements, the estimation of basic needs income needs a detailed analysis of two aspects. Firstly, the payments should be split between factors of production and secondly they must be distributed amongst the various income groups of the society. This is important because the inputs used in the projects generate income in the process of their own production. For example, if inputs used in the projects are produced using a labour intensive technique then these inputs have substantial income effects on the project. The payments made to factors of production can be estimated by identifying the distribution of (a) the value added (b) the cost of intermediate inputs and (c) the profits amongst different suppliers of inputs. For example the production of fertiliser can be disaggregated into its various components such as in-factory cost, retail and wholesale margin, taxes and excises and subsidy and profit. The factory costs can further be disaggregated into the labour cost, the cost of material inputs and the profits. In the case of imported fertilisers, it will further include c.i.f prices of imported inputs, cost of transport, taxes and retail and wholesale margin. In order to avoid the above complications, Nair carried out the analysis on the following basis:

1. Disaggregation of the components of the factors of production is confined to the first stage of production.
2. In the case of the imported inputs payments made to the external factors of production are excluded since the recipients of these payments are beyond the economy of the domestic people.

3. For countries having a subsistence economy, such as Bangladesh, it can be assumed that savings generated by basic needs oriented projects are soon consumed and reinvestment effects are not taken into account.

To identify the basic needs income distributed among various groups of society, Nair classified the recipients of various categories of income into three groups as (1) the households (2) the corporate groups and (3) the government agencies. Huq (1984) has suggested such a classification of income recipients for the Bangladesh economy on the basis of levels of minimum calorie intake. The income directly accruing to the household was taken into account in the estimation of the income effect. All addition to income up to the basic needs income (discussed in Chapter 13) is given a social weight of one and a weight of zero is given to that which exceeds the basic needs income.

To derive the distribution of value added and other income amongst the three income groups, Nair categorised the bottom and middle income groups of households as group I, whose income is below basic needs income. The top income group of households was assumed to spend their marginal income on luxury consumption or for savings and was assigned to group II. Government agencies and corporate groups were assumed to invest the profit to earn interest. These two groups together were assigned into group III. Groups II and III are excluded from basic needs income and all payments made to group I are considered as basic needs income with a social weight of 1.

It appears from the above description that Nair weighted income equally whatever degree of poverty existed in the society. This means that the effects for households far below the basic needs income are given an equal weight to the effects on households only a little below that level. Similarly the effects on households just above basic needs income are excluded. The fact is however that the real society does not consist of two clear cut groups; rather there is a continuous spectrum from the lowest income group to the highest income and above the basic needs income and project benefits accruing to all groups need to be weighted relatively. For those below the basic needs level, if a project brings them over that level, it would not be appropriate to consider all of the income accruing to them from the project as basic needs income (Bright 2000). Attempts have been made to incorporate this adjustment into basic needs income calculations in Chapter 15.

However, this is a basic needs analysis and hence this approach, although based on certain simplifying assumptions, is conceptually sound. The only improvement needed is to update the information, although it would have been preferable to use local rather than national level data.

Chapter 15 gives the details of the procedure for estimation of the basic needs income from the inputs and the outputs involved in the projects under current study.

So far, attention from a methodological perspective has been focused on estimation and valuation of project's outputs and inputs in terms of production of basic needs goods and generation of basic needs income. There are, however, costs which have to be considered since resources devoted to basic needs fulfilment are by definition not available for anything else and certain goods which would otherwise have been produced will not be produced. The next section, therefore, examines the methodology associated with social costing of projects in terms of production of basic needs goods and generation of basic needs income.

7.3.6 Social costing of projects incurred in the production of basic needs goods and the generation of basic needs income

When resources are used in a project, the opportunity of using them in other alternatives is forgone. The net forgone value from the next best alternative use of a resource is called its opportunity cost (Mishan 1975) and this is the value used as a cost in economic and social appraisal. This is also referred to as the shadow price (Caroline and Dinwiddy 1996). Such prices when used in economic appraisal are referred to as economic or efficiency prices and those used in social or basic needs evaluation as social prices (Londero 1996). The estimation of opportunity cost of a resource involves two stages:

a. The identification of the next best alternative (i.e., alternative which gives maximum net benefits) from all possible alternatives and
b. The estimation of net social benefits from the most suitable alternative (Price 1989).

Taking identification first, ideally the identification of the most suitable alternative requires analysis for all the possible alternatives. Practically, however, this may be difficult because of time and resource constraints. Thus it is typically argued that the opportunity cost should be based on the most feasible alternatives (UNIDO 1972, Marglin 1979) rather than on all possible alternatives.

Considering the above argument the current or existing use of resources as the alternative use is adopted for purposes of estimating the opportunity cost of the resources involved. It is assumed that the existing use of resources is likely to continue throughout the project life particularly in a project of short duration. According to Nair (1981), the application of the principle of the opportunity cost in basic needs analysis should be restricted to the forgone basic needs fulfilment. In other words the opportunity cost of resources should be estimated in terms of the production of basic needs goods which is forgone and the generation of basic needs income which is also forgone. Based on the above principle, Nair used the social cost of goods and income both in the goods and income balance sheets. In the former, the social cost is based on the loss of production of basic needs goods while in latter the same is based on the reduction in generation of basic needs income. Using the social value of goods, social value of income and social cost of the project, the net goods effect (good balance sheet) and net income effect (income balance sheet) are computed as follow:

$$NGE = (GE - Scg) \qquad [7.4]$$

where NGE is the net goods effect or goods balance sheet,

GE is the goods effect or social value of goods and

Scg is the social costs of the project in terms of production of basic needs goods.

$$NIE = (IE - Sci) \quad [7.5]$$

where NIE is the net income effect or net social value of income,
IE is the income effect or social value of income and
Sci is the social cost of the project in terms of generation of basic needs income.

The social cost estimated for the net goods effect need not be identical to that for the net income effect. Diversion of land from a teak plantation, for example, may not give rise to any loss in basic goods production owing to its non-basic use, but would cause a substantial loss in income generation due to its employment of unskilled labour.

Resources used in land use projects can broadly be divided into land and material inputs such as seed, seedlings, fertilisers, insecticides, polythene bags and tools and implements.

7.3.6.1 Labour

Estimating the social cost of labour is complicated particularly in economies with surplus labour such as Bangladesh (Alauddin and Tisdell 1995). This is because the market for labour is not perfectly competitive and both unemployment and underemployment exist simultaneously (Ali 1993, BBS 1996). In economic appraisal, the wage rate is estimated on the principle of opportunity cost. The value of the net output forgone in the labourer's previous occupation is taken as the measure of its productivity. In developing economies where the unskilled labour supply is elastic, employment of unskilled labour in a project is assumed to cause no loss of production elsewhere in the economy as the labour can be readily taken from those sections of the labour force which are underemployed or unemployed[1]. Thus the wages paid do not represent the opportunity cost and hence the social cost of labour tends to be lower than the market wage rate depending largely upon the degree of unemployment.

Four different criteria have been devised for the measurement of unemployment. These are time, willingness, productivity and income. The time criterion regards a worker as unemployed or underemployed if he or she is gainfully employed for a number of days (hours), less than the days (hours) defined as constituting full employment. This criterion is usually adopted for measurement of national level employment in many countries, such as the National Labour Force Survey conducted by the Bangladesh Bureau of Statistics (BBS 1996). This is a useful criterion in measuring unemployment when there is marked seasonality in employment, as for example in the agriculture of Bangladesh.

The willingness criterion takes into account the willingness of an individual to work, irrespective of time of unemployment. Often unemployment exists when it is voluntarily chosen and an estimate based purely on the time criterion without taking into account the willingness of the individual to work would be an over-estimation of unemployment. A person may opt to remain unemployed (voluntary unemployment) if the reservation wage becomes higher than the existing wage (Harberger 1971).

According to the productivity criterion underemployment and unemployment exist when the withdrawal of workers from a sector does not affect the total production. The surplus labour theory is based on this criterion and is usually adopted for shadow wage rate estimation in cost-benefit analysis (Silva Neto 1996). The details of the estimation of the shadow wage rate are explained in the following sections.

Finally, the income criterion regards employment as a means of providing an acceptable level of living. To the extent a person's employment is inadequate to fulfil this, he can be considered as underemployed. Hence, it is argued that, underemployment exists when a person's employment is inadequate in quantitative and qualitative terms in relation to the specified norm (ILO 1966).

Nair disapproves of the criteria based on time, willingness and productivity. In support of his view he argues that the time criterion can be used only when there is a

[1] Both rates are high. Underemployment rate 34.6% and unemployment rate 16.5% of total labour

marked seasonality in employment. Most often, however, work and leisure are inseparable in a subsistence economy. In criticism of the productivity criterion, Nair argues that although the criterion is theoretically appropriate, there is no precise method for its estimation. He further adds that there is a little agreement on whether the marginal product of labour in a surplus labour situation is zero or positive. However, many would say that marginal product is likely to be positive, e.g. Collier (1975) and Yadav (1993).

Finally, Nair argued that the estimation of the marginal product of labour (or the forgone output from previous employment) fails to take into account the consumption benefit derived by persons other than workers employed in the project and states that,

"....even when the marginal product of labour is positive it is assumed that project employment does not affect basic needs goods production and basic needs income generation in the sector from which labour is withdrawn" (Nair 1981, p.154).

He suggested that the estimation of the social cost of labour should be based, not on the marginal product forgone, but on the opportunity cost of the funds involved in paying the wages to the labourers. The opportunity cost of funds depends on the uses to which the funds would have been utilised in absence of the project. The uses of funds forgone would have generated both goods effects and income effects. Thus social cost of labour in terms of basic needs fulfilment can be expressed as: (Nair 1981, p.155)

AWRg = C.Vbg

AWRi = C.Vbi

Where,

AWRg is the accounting wage rate in terms of the production of basic needs goods;

AWRi is the accounting wage rate in terms of the generation of basic needs income;

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force (GPRB 1996).

C is the market wage rate;

Vbg is the opportunity cost of investment in terms of the production of basic needs goods, and

Vbi is the opportunity cost of investment in terms of the generation of basic needs income.

Although Nair's above approach is theoretically appropriate, there are practical complexities in the estimation of the opportunity cost of the investment funds in the context of the basic needs analysis (Singh 1995). Some of the problems are described below.

The use of investment funds in a project involves a cost in terms of benefits forgone from the alternative investments (or other uses). Several models have been developed to estimate the opportunity cost of investment. According to the models suggested in the project appraisal handbooks (Little and Mirrless 1972, UNIDO 1978), the opportunity cost of an investment or social value of public income (V) is expressed as (Price 1989):

$$V = (1-s)q / (r - sq) \qquad [7.6]$$

where V is the social value of public income;

s is the marginal propensity to save (proportion of revenue which is reinvested);

q is the financial rate of return on investment and

r is the social discount rate.

Opportunity cost of investment is an important concept in both the project evaluation methodologies. The difference arises only due to the difference in numeraire in which different values are expressed. In other words, in the Little and Mirrlees methodology, consumption generated by investment is converted into its income equivalent, whereas in the UNIDO methodology consumption is the numeraire (UNIDO 1972). When expression (7.6) is used in estimation of the opportunity cost of investment, it is assumed that project investments displace only other investments. But most investments do affect current consumption also.

Marglin (1963) has modified the above method by incorporating the reinvestment of project income to estimate an aggregate opportunity cost. According to Marglin, if s (in expression 7.6) as a proportion of project income is reinvested and yields a net return of q in perpetuity then expression (7.6) becomes:

$$V = [(1\text{-}s)q \,/\, (r - sq)] \,/\, [(1\text{-}s)r \,/\, (r - sq)] = q \,/\, r \qquad [7.7]$$

This indicates that the reinvestment of income generated need not be taken into account at all. In other words, the reinvestment on the cost side and the benefit side is balanced. Hence the opportunity cost of investment can be estimated without incorporating reinvestment effects (Nair 1981).

Although expression (7.7) seems simple, the derivation of the social discount rate and the marginal product of investment poses a problem in the context of basic needs evaluation. When a zero discount rate (discussed below in para 7.3.10) is used for basic needs evaluation, the value of V (in expression 7.7) will be indicating that investment is always a good thing and consumption is always a bad one, which is not acceptable to any society.

In the face of this problem, an alternative procedure is needed for basic needs evaluation so that the values of parameters such as marginal product of investment and social rate of return can be derived without resorting to discounting. In treating the above problem, Nair attempted to devise such an alternative procedure whose salient features are given below.

Marginal product of investment, for example, requires that at any time the public sector or even private sector has a list of projects or investment alternatives from which a project will be selected when funds will be available. If all investment alternatives are ranked in descending order according to their economic profitability, the return of the last unit of investment undertaken would indicate the marginal productivity of the investment. Its value is equal to the opportunity cost of the capital which is the return on the assets forgone elsewhere by committing assets to the present project (UNIDO 1978). Such a list is unlikely to be available. Another problem arises from the empirical complexities in deriving these parameters.

The estimation of social cost of labour based on the opportunity cost of investments therefore seems to be practically unsuitable, particularly in a country having a weak database like Bangladesh.

Although Nair suggested the use of the opportunity cost of investment in estimation of social cost of labour, he himelf did not apply the approach in his study. While estimating social cost of labour as zero in his study, he concludes that

"...most of the plantation works are carried out by unskilled labour. Unskilled labour supply is highly elastic and is unlikely to affect basic needs goods production and basic needs income generation elsewhere. Hence the direct social opportunity cost of labour is assumed as zero" (Nair 1981, p.315)

It is obvious that his estimation is based on the productivity criterion (surplus labour theory) of the measurement of unemployment rather than the opportunity cost of investment. To overcome the shortcomings raised in Nair's approach it is appropriate to use the productivity and time criteria for measuring unemployment. In other words the social cost of labour can be estimated on the basis of the marginal productivity, i.e., in terms of forgone production of basic needs goods and forgone generation of basic needs income (Sharma 1990, Khan 1993). The approach seems to be more appropriate in projects where mostly unskilled and semiskilled labour are likely to be employed. In rural areas for labourers, the main alternative activity is likely to be subsistence agriculture (Januzzi and Peach 1980). The employment of such labourers in a project will therefore have a direct impact on the productivity of agriculture, which affects the basic needs fulfilment of the rural poor.

Because of peak and slack periods in the agriculture cycle, underemployment and unemployment will vary over the year. The social cost of main labour (i.e., labour required during the period coinciding with the peak of the agriculture season) is approximated by the existing market wage rate in agriculture. On the other hand, the social cost for the surplus labour (i.e., the labour required during period coinciding with slack part of the agriculture season) is approximated as zero because there is no loss of productivity in employing such labour. Thus, it is argued that social wage rate should be a function of agricultural productivity and timings of agriculture and project operations. However, it is not easy to estimate the social cost of labour when unemployment and employment vary over the year. Futhermore, there are many informal labour opportunities and division of labour due to underemployment. Due to the unavailability of full time employment for all the family members the total work hours in the family farm is shared by a large number of workers, each working less than the generally accepted norm, and hence there exists disguised unemployment.

Nevertheless, for the sake of simplicity the use of calculating costs according to the proportion of the time fully employed is a practical means of costing labour in this context. To this end, considerable work has been done on the estimation of the marginal product of labour based on the productivity and time criteria in the Indian context (Sharma *et al.* 1991 and Khan 1993). The procedure adopted by these workers can be followed as described below.

Based on the national level data on employment (BBS 1996) the rural workers in Bangladesh can be divided into two main groups i.e. the main worker (full-time workers) and marginal worker (part-time workers). The concepts of main worker and marginal worker have been adopted in this study in terms of full-time worker (FTW) and part-time worker (PTW) respectively. Main workers are those who have worked for more than 35 hours in a reference week and marginal workers are those who have either worked equal to or less than 35 hours or did not work at all in a reference week. Based on these data, the weighted average of the number of employed and unemployed days are estimated for both the groups. Then the percentage distribution of workers under both the categories is known for the particular region or division for which marginal product is estimated. It is assumed that the labourers withdrawn for the project in a particular region remain in proportion to the total labour days of unemployment in each category of workers. Then the proportion of workers withdrawn from both the groups for the project is estimated as a weighted average as follows:

$$\frac{\text{Marginal worker days}}{\text{Main worker days}} = \frac{\text{\% of marginal worker x Average no. of days unemployed for marginal worker}}{\text{\% of main worker x Average no. of days unemployed for main worker}}$$

The marginal product of both the types of workers employed in the project is estimated as follows:

$$\text{Marginal product of main worker} = \frac{\text{No. of days employed by main worker in a week}}{\text{Total no. of days per week}} \text{ x wage rate}$$

$$\text{Marginal product of marginal worker} = \frac{\text{No. of days employed by marginal worker in a week}}{\text{Total no. of days per week}} \text{ x wage rate}$$

Finally, the value of marginal product forgone by society in employing one labourer is estimated as follows:

[(No. of main worker employed days x marginal product of main worker) + (No. of marginal worker employed days x marginal product of marginal worker)] / Total number of days employed

Chapter 16 gives the detailed procedure for the estimation of the social costs of various inputs involved in the projects under current study. The next section looks at the methodology concerned with the social costing of non-labour inputs.

7.3.6.2 Non-labour inputs

7.3.6.2.1 Land

Based on the principle of opportunity cost, the social cost of land in the context of basic needs can be estimated in terms of the agricultural production forgone per unit of land (Sharma 1990). However, in the case of forest or degraded and waste land, the social cost can be estimated as the value forgone to the community who use it. In view of the difficulty of arriving at a figure for this, several workers have estimated the opportunity costs of such land as zero. For example, Little and Tipping (1972) in a study of the Kulai Oil Palm Project, Khan (1993) in a social forestry project in India and FAO (1979) in their manual for economic analysis of forestry projects have all used zero as the opportunity cost of land.

Although Nair's study did not involve degraded and waste land, he also suggested that the use of such land should have zero social value. Even if the land is degraded, however, there is likely to be some beneficial use in the absence of the project. Thus its opportunity cost depends on its productivity continuing in its existing use. Although it is difficult to find the value forgone to the society in terms of the production of basic needs goods and the generation of basic needs income, it is possible to obtain an estimate through a questionnaire survey. These aspects are dealt with in detail in context of the current study again in Chapter 16.

7.3.6.2.2 Material inputs

Like land, the social cost of material inputs such as seeds, fertilisers, insecticides and polythene bags can be estimated in terms of the forgone production of basic needs goods and forgone generation of basic needs income.

To identify the alternative use of inputs, material inputs can be divided into two groups namely (a) imported inputs and (b) domestically produced inputs. Nair argues that the estimation of the social cost of imported goods depends on the social policies of the government. For example, if the government aims to increase foreign exchange earnings through the export of certain goods, then the social cost can be estimated in terms of forgone domestic consumption. Another example of government policies can be seen in the case of the government imposing quota restrictions on the import of certain goods. For example, the restriction on the import of 'neptha' (an important ingredient in polythene manufacturing) may affect polythene manufacture and thus plantation activities, and finally may reduce the consumption of basic needs goods. In this case, the social cost can be estimated in terms of the forgone consumption of forestry goods that would have been generated through the use of polythene in plantation establishment.

In the case of domestically produced goods the social cost merely depends on the elasticity of the supply of those inputs. If the supply is inelastic, the use of such inputs in the project may adversely affect the production of basic needs goods and the generation of basic needs income elsewhere. For example, the inelastic supply of fertiliser may reduce the agricultural production and hence result in higher social costs.

Chapter 16 gives the detailed procedure for the estimation of the social costs of various inputs involved in the project under the present study.

7.3.7 Estimation of the net goods effect and net income effect

The difference between the goods effect and the social costs of projects in terms of the production of basic needs goods, measures the net goods effect and is also referred to as the goods balance sheet.

Similarly the difference between the income effect and social costs of a project in terms of the generation of basic needs income measures the net income effect and is also referred to as the income balance sheet.

The net goods effect and the net income effect are expressed as shown earlier in equations 7.4 and 7.5 respectively.

7.3.8 Estimation of the aggregation weights for the net goods effect and the net income effect

The net goods effect and net income effect of a project in themselves would give a clear picture of the actual impact of a project. However, if a choice has to be made from a number of projects, it is necessary to aggregate these two effects to give a single value based on which projects can be ranked. Mere aggregation of these two effects may be misleading and thus weightings of these effects are needed to provide a single index. This requires that the aggregation weights will reflect the relative priorities to be given to basic needs goods production or basic needs income generation. In an open economy, where there is adequate supply of basic needs goods, a relatively high weight can be given to income effects. On the other hand, where basic needs goods supply is inelastic and the economy is more closed, equal weights may be given so that goods production and income generation are balanced. Thus,

$$bg + bi = 1$$

where bg is the aggregation weight for the net goods effect and
bi is the aggregation weight for the net income effect.

According to Nair,

".... weights for aggregation can be derived on the basis of the situation as regards basic needs fulfilment that exists in the country, region or locality with which the project is concerned" (Nair 1981, p. 208).

A preliminary approach prescribed by Nair for the estimation of the aggregation weights is described as below.

$$Bg = (g-1) / [(g-1) + (i-1)] \quad [7.8]$$

$$Bi = (i-1) / [(i-1) + (g-1)] \quad [7.9]$$

where g is basic needs supply co-efficient in a region or country and
i is basic needs income co-efficient in a region or country,

"g" can be estimated by knowing the requirements for the availability of basic needs goods in a region and can be estimated either as a composite value for all the items in the basic needs basket or for individual items produced by the project. Thus:

$$g = R / S \quad [7.10]$$

where R is the requirement of basic needs goods in a region or country and
S is the availability of basic needs goods in a region or country.

Similarly, the basic needs income co-efficient can be estimated by knowing the total income needed to meet the basic needs and the existing average income of the persons concerned in a region, thus:

$$i = (n * y) / Y \qquad [7.11]$$

where n is the number of household below poverty line;
y is the basic needs income needed to fulfil basic needs consumption and
Y is the existing income of the households.

Although Nair suggested the above approach, he himself did not apply it in the analysis due mainly to the lack of required information. He assumed an equal weight of 0.5 for both goods and income effects giving the reason that in a closed economy or where there is a scarcity of supply of basic needs goods there should be equal weighting given to both goods production and income generation.

Estimation of aggregation weight needs careful examination of the situation with regard to basic needs fulfilment in a country or a region with which the project is concerned. This is possible if the necessary information is available. Over long periods of time, the values of the weights bg and bi are unlikely to remain constant. Therefore, the weights should ideally be estimated for each year on the basis of the anticipated conditions as regards basic needs goods supply and basic needs income generation. These aspects are dealt with in detail for the current study in Chapter 13.

7.3.9 Aggregation of net goods effect and net income effect and choice among alternatives

The net goods effect and net income effect represent two aspects of a project, indicating the effect on production of basic needs goods and generation of basic needs income respectively. As discussed in the last section, in order to rank the projects in terms of basic needs impact, these two effects are aggregated using the appropriate weight. The choice of the best project from a number of projects is made on the following criterion discussed earlier in expression (7.1).

$$\mathbf{BNV} = [\,b_g\,(GE - Sc_g) + b_i\,(IE - Sc_i)]\,/\,N$$

where BNV is the net annual aggregated basic needs value;
GE is the goods effects;
IE is the income effect;
Sc_g is the social cost of project incurred in the production of basic needs goods;
Sc_i is the social cost of project incurred in the generation of basic needs income;
b_g is the aggregation weight for the net goods effect or goods balance sheet;
b_i is the aggregation weight for the net income effect or income balance sheet and N is the project life.

7.3.10 Inter-temporal comparison of basic needs impact

Nair has not discounted the costs and benefits occurring at different period of time despite the fact that CBA regards discounting as an important means for inter-temporal comparison of costs and benefits. As discussed in chapter 6, discounting implies that future costs and benefits are of lower value than present costs and benefits. In social appraisal two methods are adopted to derive the discount rate. The first is based on social time preference and the second on the social opportunity cost or marginal productivity of capital. In the context of basic needs analysis however, the discounting of future consumption seems to be irrational. Some of the reasons in support of this argument are explained below.

The discount rate based on social time preference has been discussed by a number of workers for land use projects such as agroforestry and forestry (Price 1989, Harou 1985 and Kula 1988). It is a function of two parameters: elasticity of social marginal utility of consumption (income) and growth rate of per capita real consumption (Sharma *et al.* 1991). The discount rate so derived is also referred to as the consumption rate of interest (CRI) (Little and Mirrlees 1974, Squire and van der

Tak 1975, UNIDO 1978). The concept of diminishing marginal utility of consumption stresses that consumption at a low level of income gives rise to higher utility than at a higher level of income. This means discounting can only be justified when expected utility is likely to decline over a period of time with increases in income. Utility of basic needs goods are likely to remain unchanged for poor people, even with increases in income (Harberger 1984).

It is argued that decline in utility occurs not only due to time but also due to a number of other factors such as changes in tastes, changes in technology and uncertainty. However, utility in the case of basic needs goods remains more or less stable even with the change in these factors (Nair 1981). It has generally been seen that the consumption pattern of basic needs goods has undergone very little change over a long period of time particularly in and among the lower income groups. Consumption of fuel wood in developing countries such as Bangladesh is a common example. Fuelwood has been the major source of domestic energy since the dawn of human history and is still in use. There is likelihood that with increased income, tastes may change but a change in taste does not mean the change in the essential qualities of essential goods.

Another factor which may affect the utility of goods is technological change. Through technological changes it is assumed that either the quantity of goods production is enhanced or new kinds of goods are produced which may diminish the utility of existing goods. Both of these assumptions, however, seem to be less applicable in the case of basic needs goods since the share of technological change in fulfiling basic needs has been found to be very low (GPRB 1998). Machine-intensive technology has mainly been confined to the production of non-essential goods such as high quality clothes, machinery and export goods where expensive investment has been justified.

The growth rate of per capita income is the main determinant of the social discount rate. Rapid growth of national per capita income has little effect on the basic needs satisfaction of poor people. Another important aspect is that the growth in per capita income does not necessarily bring changes in utility generated by basic needs goods for all people.

The aim of using the social opportunity cost (SOC) to derive the discount rate is to identify a rate that reflects the interaction between a society's savings schedule and investment opportunities. The argument for favouring the social opportunity costs concept (Mishan 1975) however, has been contradicted due to its failure in taking into account the inter-temporal consumption preferences of the society (Feldstein 1964). Feldstein argued that opportunity cost is relevant in public investment decisions, but not for purposes of inter-temporal comparison. He also argued that sole reliance on social time preference (STP) rate may lead to a misallocation of resources. This means the exclusive use of either of the concepts is still debatable and unresolved because social opportunity cost cannot be estimated without social time preference rate.

Evidently, application of inter-temporal comparison between the quantities of basic needs goods available today and the similar quantities of goods available in future is less relevant. For example, the importance and utility value of one kg of rice or a tonne of fuelwood for poor people would be the same today as after five years unless the pattern of income and consumption undergoes major changes. The important point is that for many of the poor, they are not likely to be removed from the basic needs level during the project period, so their time preference rate should be zero.

Another key argument against discounting is the consideration of 'future generations'. Individuals' views concerning future values of public goods and services cannot be translated as a time horizon, a discount rate, or a discount function for society as a whole (Price 1993). If a resource is expected to become scarcer in future, its price should rise, offsetting the tendency to discount future values and encouraging conservation (Pearce *et al.* 1990). This mechanism, however, is effective only if the expected rate of price increase exceeds the personal discount rate. If the discount rate equals the rate of return on investment, declining consumption over time will result. This hardly occurs in case of basic needs goods for poorer section of the society.

A zero discount rate is therefore used in basic needs analysis; using time discounting as a method for identification of efficient projects is inappropriate in this context.

Further, it is also important to mention that the reliability of the methodology depends on the assumptions made in the estimation of the parameters. Problems in deriving the various parameters especially in respect of a country with a weak data base may pose a serious objection in making the approach practically useful. Therefore, what is important is to make assumptions based on as much factual information as possible so that the margin of the error can be reduced.

Chapter Eight

Data Base and Methodology for Data Collection

To apply the methodologies outlined for basic needs evaluation (Chapter 7), it was necessary to have a comprehensive database collected from both directly observed 'primary', as well as 'secondary' sources. This chapter deals with the area covered in the present study, type of data required and methodology followed for the field survey.

8.1 Coverage

The study involves the evaluation of a social forestry project in Bangladesh called the 'Thana Afforestation and Nursery Development Project' (TANDP), in terms of the project's role in the fulfilment of basic needs of its participants. Rajshahi (Civil Administrative, or simply - Civil) Division has been selected as the study area, primarily on two grounds; firstly, this is the area where the first large-scale social forestry activities were initiated during 1983-84 under the banner of ADB funded 'Community Forestry Project' and secondly, there was no previous detailed study of the impact of social forestry project on human dimensions in this region, except for some mid-term and terminal report done by the funding body, ADB. The study area as a whole will be referred to as Rajshahi Division henceforth.

TANDP is the revised name of an original project titled 'Upazila Afforestation and Nursery Development Project' (UANDP). TANDP was adopted in 1991 due to some basic administrative change implemented by the GPRB (Bhuiyan 1994).

The financial year in Bangladesh runs from July of one year to June of next year and thus bears the 1990-91 format for all government matters. The first plantation under the new title TANDP was done in 1991-92 and that is basically why the participants enrolled in this year and their respective plantations were taken into consideration in this study.

The TANDP had several components but only the participants and their plots of agroforestry (AF) and woodlot (WL) were studied, essentially because the participants of these two sub-projects could be located as individual households. The other components of TANDP namely, strip plantations (roadside, railside, canalbank/embankment plantations) were entrusted to several households in a group and that of institutional plantations (educational institutions, government offices etc.) to its authorities and others using those premises - and thus no single household could be identified as the one responsible for maintenance of such plantations. A detailed description of TANDP has already been given in Chapter 4.

The Rajshahi Division consists of 16 districts. It falls under the Bogra Circle of Bangladesh Forest Administration and comprises five Forest Divisions namely Dinajpur, Rangpur, Rajshahi, Bogra and Pabna. There is no government forest land in the latter two divisions and the forestry activities of these two divisions cover merely administrative functions and some extension activities (Rahman 1998). All plantation activities are carried out in the degraded and/or encroached government forest land of the former three divisions. So, the study was kept confined to the Forest Divisions of Dinajpur, Rangpur and Rajshahi.

These three Forest Divisions cover 11 districts, 3 in Dinajpur, 4 in Rangpur and 4 in Rajshahi. As mentioned earlier in Chapter 2, 13 agro-ecological zones (AEZs) [out of a total of 30] occur within Rajshahi Division, 10 of them even exclusively within the country. The 11 districts are distributed amongst 11 AEZs in an overlapping manner. Considering the time and resource constraints, it was not possible however to cover all the 11 AEZs and 11 districts in this study. It was therefore decided to take a suitable sample, which would provide an adequate representation of the whole Rajshahi Division.

8.1.1 The sampling methodology

Sampling is an essential element of all social investigations (Burgess 1982), except for censuses where total enumeration is undertaken. Sampling is a means by which a selection is made from the basic unit of study. It is necessary to decide the basic unit of study, whether it is a population of individuals, households, institutions, transactions or whatever (Sudman 1976). In the present study, households[1] of participating farmers in TANDP have been taken as the basic unit of study.

It is widely recognised that a well-designed and skilfully conducted sample survey is a practical way of collecting information concerning the general population or any special group of the population on an extensive range of subjects (Som 1973, Kalton 1983, de Vaus 1996). Although various sampling techniques and designs have been prescribed (Cochran 1963, Conway 1967, Moser and Kalton 1971, Jolliffe 1986) most can be assigned into one of two categories, viz., probability and non-probability sampling.

Probability sampling is essentially characterised by the fact that one can specify for each element of the population the probability that it will be included in the sample (Chein 1976), while in non-probability sampling, there is no way of estimating the probability that each element has of being included in the sample and no assurance that every element has some chance of being included[2]. Non-probability sampling is usually employed when probability sampling does not prove to be practically possible.

Probability sampling includes four main types of sampling, (a) random sampling, (b) systematic sampling, (c) stratified sampling and (d) multi-stage sampling. Random sampling ensures that each member of the sampling population has the same probability of being sampled. In systematic sampling, samples are drawn systematically after certain intervals. In stratified sampling, the population is divided into a number of strata or groups on the basis of one or more characteristics of interest. Sub samples are then drawn randomly. Multi-stage sampling includes two or more stages such as district and village. Various forms of probability sampling have been commonly applied in empirical field surveys (Khan 1993, Singh 1995, Shukla 1996, Ravindran 1998).

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[1] BBS (1998a) has defined a household for the purpose of 'household expenditure survey' as a dwelling unit where one or more persons live and eat together under a common cooking arrangement and matrimonial and/or blood relationships exist among most of the persons residing in the dwelling.

[2] For details of non-probability sampling, reference can be made to Burgess (1982) and Kalton (1983).

Rajshahi Division has 10 distinct AEZs, which can serve as strata. So a stratified, multi-stage (three stage), random sampling design was adopted to withdraw the samples of districts, villages and participants engaged in AF and WL projects. The stratification has been done on the basis of AEZs, after random selection of the samples, which has been validated by Cochran (1963). Geographical stratification, such as that based on AEZs, has specifically been advocated by Som (1973) and Cochran (1977), while multi-stage sampling is argued to allow certain flexibility of great value (Weis 1968). This method permits the selection of samples with an equal probability from all stages as well as from all strata.

The multi-stage random sampling was conducted at the district, village and participant stages respectively. Then the sampled districts were assigned to respective AEZs, the number of which stands at five out of ten (i.e., a 50% representation of the existing AEZs of Rajshahi).

8.1.1.1 Sampling at the district stage

All the 11 districts covered under the 1991-92 AF and WL plantings were arranged alphabetically. A 50% (approximately) sample of districts was selected randomly using the table of random digits from L'esperance (1971). Thus a total of 5 districts were selected out of 11 districts[3]. The selected districts were:

(i) Dinajpur falling under both OHPP and NEBT zones;

(ii) Rangpur, Lalmonirhat and Nilphamari under TMF zone and

(iii) Naogaon under both LBT and HBT zones (Table 8.1).

8.1.1.2 Sampling at the village stage

A complete list of all the villages covered under the AF and WL plantations of the sampled districts was obtained from the Divisional Forest Offices. The names of the

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[3] Six districts could have been selected for getting greater accuracy and representation of the total population of participants , but it could not be done mainly due to time constraint. So, the author had to be content with five districts with a 45% sampling intensity.

villages were arranged alphabetically. In order to represent all the districts appropriately, a uniform sample of 20% of the villages under 1991-92 plantation was withdrawn randomly from each of the sampled districts. This gave rise to a total of 32 villages from the 5 sampled districts (Map 8.1).

8.1.1.3 Sampling at the participant stage

Names of all the participant enlisted in 1991-92 under AF and WL plantations under the sampled villages were collected after consulting the 'deed-of-participation' between the individual participant and the FD. The names were then arranged alphabetically under each sampled village, which constituted the sampling-frame. Adopting the same random sampling procedure, a uniform sample of 20% of the participants was selected from the list of participants in each of the sampled villages. This provided a total sample of 180 participants split equally between AF and WL projects. Thus the final sample consisted of 5 districts, 32 villages and 180 participants, 90 each from AF and WL projects. A complete list of sampled districts, villages and number of participants under the two schemes is presented below in Table 8.1.

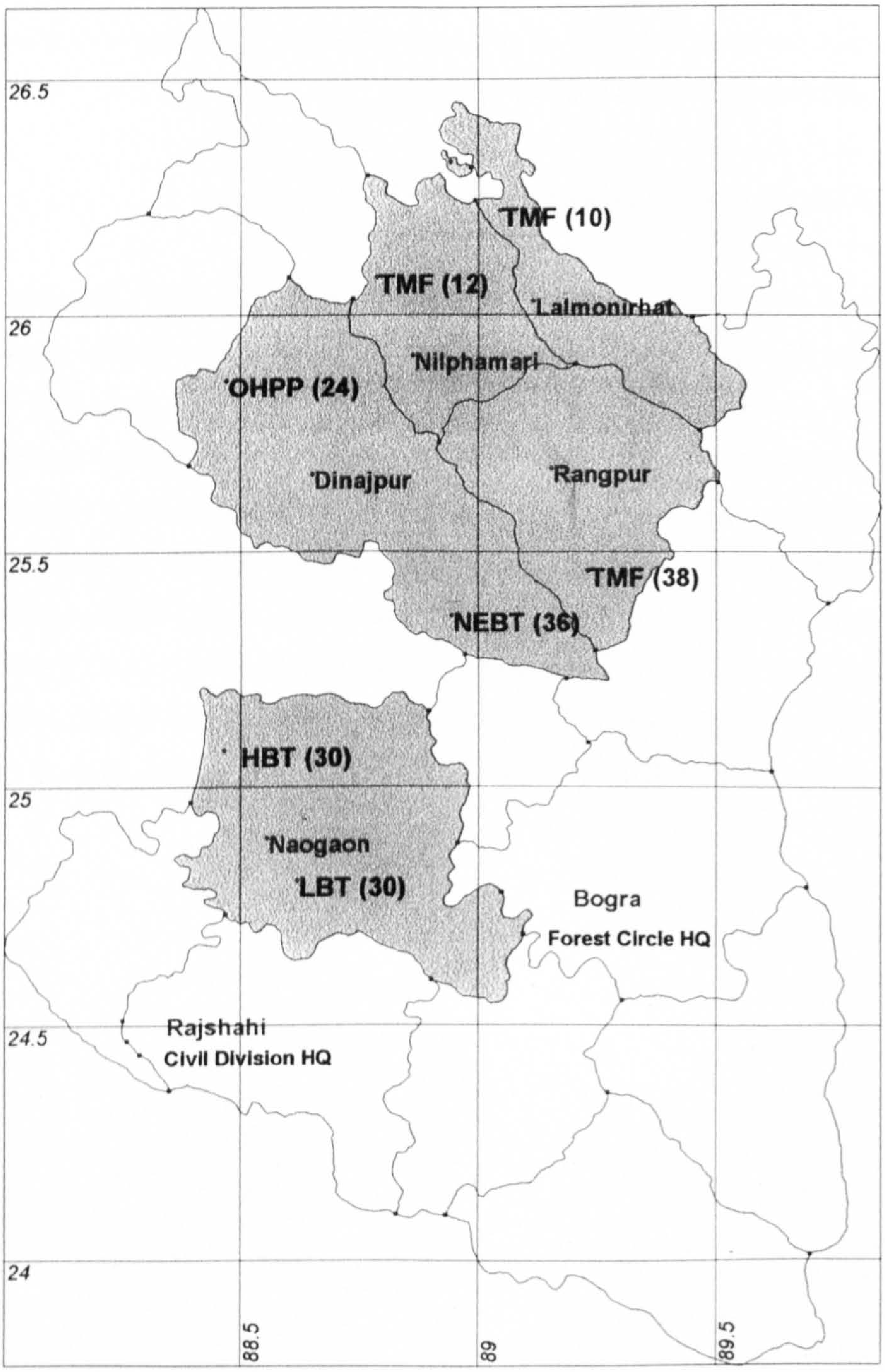

26.5
26
25.5
25
24.5
24
88.5
89
89.5
TMF (10)
TMF (12)
Lalmonirhat
Nilphamari
OHPP (24)
Dinajpur
Rangpur
TMF (38)
NEBT (36)
HBT (30)
Naogaon
LBT (30)
Bogra
Forest Circle HQ
Rajshahi
Civil Division HQ

Table 8.1 List of sampled districts, sampled villages and sampled number of participants in AF and WL schemes in respective agro-ecological zones.

AEZs	District	Village	Number of sampled participants in each scheme		Total
			AF	WL	
1. OHPP	1.Dinajpur	i. Dharmapur	15	9	24
Zonal total			15	9	24
2. NEBT	1.Dinajpur	ii. Raghunathpur	3	0	3
		iii. Bamangar	4	0	4
		iv. Prayagpur	2	0	2
		v. Joydevpur	2	0	2
		vi. Gilajhuki	4	9	13
		vii. Mohajerpur	0	5	5
		viii. Modhyopara	0	7	7
Zonal total			15	21	36
3. TMF	2.Rangpur	ix. Shampur	2	2	4
		x. Rangapukur	4	4	8
		xi. Udaipur	2	0	2
		xii. Modonkhali	6	0	6
		xiii. Tatarpur	4	0	4
		xiv. Laxmipur	0	4	4
		xv. Khoirbari	0	5	5
		xvi. Jalmahal	0	2	2
		xvii. Haranathpur	0	3	3
	3.Lalmonirhat	xviii. Hatibandha	4	6	10
	4.Nilphamari	xix. Gosaiganj	8	4	12
Zonal total			30	30	60
4. LBT	5.Naogaon	xx. Shitol	2	6	8
		xxi. Gurkhi	3	2	5
		xxii. Halakandor	2	0	2
		xxiii. Bidirpur	3	0	3
		xxiv. Tepukuria	0	2	2
		xxv. Nirmail	0	4	4
		xxvi. Umarpur	0	4	4
		xxvii. Gopalpur	0	2	2
Zonal total			10	20	30
5. HBT	5.Naogaon	xxviii. Dadanpur	8	0	8
		xxix. Mamudpur	5	0	5
		xxx. Mohisur	7	0	7
		xxxi. Chandira	0	7	7
		xxxii. Jamalpur	0	3	3
Zonal total			20	10	30
Grand total			90	90	180

Note: OHPP = Old Himalayan Piedmont Plain [1]; NEBT = North-eastern Barind Tract [27]; TMF = Tista Meander Floodplain [3]; LBT = Level Barind Tract [25]; HBT = High Barind Tract [26]. Numbers within [] correspond to those in the AEZ map.

8.2 Data requirement

As mentioned earlier, the main objective of the present study is to assess the impact of the two schemes (agroforestry and woodlot) in terms of fulfilment of basic needs of the participating farmers. In order to follow the methodology to attain this broad objective, a large amount of quantitative and qualitative field-based data of both physical and socio-economic components was needed. The following discussion covers the various types of data required.

8.2.1 Primary data

Collection of primary data had the purpose of creating a detailed quantitative and qualitative database covering relevant aspects within the study area. There is a paucity of such information from secondary sources as such a study has not been undertaken in the forestry sector of Bangladesh. The following types of primary data were required for the study:

a. A socio-economic profile of the sampled villages;
b. A socio-economic profile of the participants in the projects;
c. Quantities of the items (both food and non-food) consumed by the participants;
d. Local market prices of the items (both food and non-food) consumed by the participants;
e. Annual quantities of the various inputs incurred in the projects;
f. Annual quantities of outputs derived from the projects;
g. Market prices of inputs and outputs involved in the projects;
h. Growth (tree height and diameter) and survival percentage of trees in the agroforestry and woodlot plots;
i. Qualitative information with regard to the participants' knowledge, awareness, attitude and opinions about various aspects of the projects.

8.2.2 Secondary Data

In any project evaluation, an adequate description of the programmes with supporting data from various sources is considered important to ensure the thoroughness and precision of results (Casley and Lury 1981, King *et al.*, 1987). In Bangladesh, the office of the Chief Conservator of Forests is the main source of country level information on the social forestry programmes, where the TANDP project director also sits. However, the offices of the Divisional Forest Officers (DFO) at forest division levels are the most important sources for obtaining basic field level data. They are supported by a number of range offices at sub-divisional level. These range offices maintain year-wise standard records called 'The Plantation Register', which has served as a valuable source of secondary plantation data.

The following types of secondary data were collected for the present study:

a. Year-wise expenditure details of the social forestry plantations on different components, to estimate the indirect cost of the agroforestry and woodlot schemes.
b. Soil and climatic data on different zones, districts, and villages or localities.
c. Socio-economic backgrounds of different localities.
d. Cost estimate (prescribed by government) for agroforestry and woodlot plantations.
e. Cost estimate (prescribed by government) for harvesting of trees.
f. Estimated market sale prices of all outputs of the project.
g. Package of practices of different agricultural crops.
h. Utilisation of all outputs of the projects.

Besides the FD, the other organisations which came to use of some degree are the Bangladesh Bureau of Statistics, Bangladesh Institute of Development Studies and Bangladesh Agricultural Research Council. On the non-government side, local offices of the Asian Development Bank and the World Bank were the chief source of information of these bank funded social forestry projects.

8.3 Field survey - the methodology

8.3.1 Instruments and technique for data collection

When the sampling frame was determined for the study area, tools for data collection and a plan for the field survey were decided upon. A structured and suitably designed questionnaire and formats were used as tools for this purpose. The collection of primary data was done by personal interview of the participants using a questionnaire comprising both open and closed type questions. A copy of the questionnaire is presented in Appendix 8.1.

Household surveys have been recommended and adopted as a means of collecting data on basic needs by many practitioners. An appropriately designed household survey and tabulation plan can supply data in the form of distributional matrices obtained by cross-classifying certain variables, such as consumption levels and patterns, education, length of life, mortality etc. with another 'key' variable such as household income (Radwan and Alfthan 1978). Such data enable planners to evaluate shortfalls in the satisfaction of basic needs and to identify the poor (Howes and Lanjouw 1997). Furthermore, household surveys can provide certain exclusive data on several important relations fundamental to the basic-needs strategy.

8.3.1.1 The questionnaire

The questionnaire helps in catching the true flavour of the programme in question (Belson 1981) and serves as an important tool for the collection of primary data (Oppenheim 1966, Sudman and Bradburn 1982). The questionnaire included 50 questions, consisting of both open-ended and closed, quantitative, qualitative and attitudinal questions. An approach of combining both open and closed type questions was adopted to overcome the practical difficulties in analysing the open questions. Open-ended questions were intended to capture the instantaneous responses and thoughts of the respondent. Closed type questions were equipped with a minimum of two and maximum of seven different options. Each of the options in the individual questions was pre-coded to allow ease of computation. The questionnaire was administered by the author himself aided by two postgraduate students of the Institute of Forestry and Environmental Sciences in Chittagong University, Bangladesh, so the questionnaire was kept in English, while questions were asked in Bengali.

In designing the questionnaire, careful considerations were paid to question wordings, question sequence, funnelling of questions i.e., the order of questions within each question sequence etc. as emphasised by Oppenheim (1966). Before finalising the preliminary questionnaire, suggestions were sought from the director of studies and other related members of staff and their comments were incorporated in the questionnaire as much as possible. The questions were designed to apprehend (a) the socio-economic status of the participants and their consumption of, or expenditure on basic needs items; (b) the knowledge and awareness of participants and (c) their attitude toward and opinion about acceptance/refusal and furtherance of such activities as attempted by the project. The 50 questions of the questionnaire were grouped into following six sections for the sake of ease of their interpretation and subsequent discussion of the findings.

8.3.1.1.1 Participants' socio-economic profile (q. no. 1 to 10)

Questions in this introductory section were intended to derive the basic social and economic profile of the participants involved in the projects. Socio-economic variables included in this section were family size, age structure of the family members, literacy, occupation, nature of employment, income profile, livestock details and indication of wealth of the respondents.

8.3.1.1.2 Participants' basic consumption needs (q. no. 11 to 17)

Questions under this section were designed to collect information related to the consumption of basic needs goods viz. food, and non-food items like clothing, fuel for cooking, lighting and use of basic services like health, education and transport. The information in this section was mostly quantitative and was directly used to carry out the basic needs analysis.

8.3.1.1.3 Participants' involvement in the project (q. no. 18 to 21)

Participant involvement in any project is a significant aspect in making the programme a success (Shepherd 1998). A set of questions was designed under this section to investigate the effort and interest taken by the participants in agroforestry and woodlot schemes. Through these questions an attempt was made to gauge the survival percentage of the trees, which was later verified by field measurements. These questions also tried to derive responses with regard to possible reasons for low, medium or high survival of trees in the agroforestry and woodlot plots entrusted with respective participants.

8.3.1.1.4 Participants' view on benefits derived from the project (q. no. 22 to 35)

Although the agroforestry and woodlot plots have reached their 7th year of establishment, no effort has so far been made to assess the actual benefits derived from the projects. Another set of questions was framed to gather a practical idea of benefits generated from the various products, such as intermediate and final products; mode of use of intermediate products; contribution of the project in satisfying basic household needs; plan to utilise return from final product etc.

8.3.1.1.5 Participants' knowledge and awareness about the project (q. no. 36 to 39)

The purpose of this section is to capture the participants' knowledge about the social forestry projects in which they are participating; their opinion as to the purpose of the project; their rights and obligations; type of land used for the project and use of the land prior to the project – to get an idea of the opportunity cost of the land.

8.3.1.1.6 Participants' attitude and opinion about the project (q. no. 40 to 50)

The main purpose of incorporating this section was to find the attitudes, opinions and perceptions of the participants towards the projects. Most of the questions under this section were kept open to capture free and unbiased suggestions and opinions of the respondents, as prescribed by Schuman and Presser (1981). A few closed type questions were also included to avoid excessive complexity during analysis. Participants' opinion as to quality of land planted under the project, rightness of the species planted, reasons for getting involved in the project, change in their socio-economic status due to participation and their willingness to participate in similar ventures have been sought in this section.

8.3.1.2 The formats

Since much of the data pertaining to the inputs and outputs of agricultural and forestry crops as well as growth of forestry trees were not available either from official sources or from published documents, collection of these from primary sources was also necessitated. Thus, a set of formats was carefully designed for the purpose. Annexures 8.1, 8.2 and 8.3 present the formats for collecting input, output and growth data respectively.

The growth data were collected in order to facilitate the estimation of the yield of standing trees from the agroforestry and woodlot plots. This was needed because harvesting did not take place in any of the 1991-92 plots, not even in the older social forestry plantations (except for one plot in the NEBT zone, Dinajpur Forest Division) despite their attaining the rotation age much earlier. The reasons for non-harvesting are mainly the ban on tree-harvesting from public forest land since 1989 (ADB 1993) and delay in completing bureaucratic formalities (Ahmed 1998). In order to ascertain the output value of the trees, it was essential to estimate the yield of the trees. The detailed procedure for taking measurements of height, diameter and survival percentage of trees are explained in section 8.3.2.2.1.

8.3.2 The fieldwork

The fieldwork was one of the most important parts of the study because the data requirement for this study was mainly based on the primary data collected through the fieldwork. Exhaustive planning for the fieldwork was felt essential in view of the large spatial extent of sample area under study and the vast amount of work. The districts

Interviewing a landless participant (this homestaed is his only asset); his curious relatives onlooking

An elderly farmer in his standing woodlot plot of *Acacia auriculiformis*

Wheat farming by a bold Agroforestry farmer, compared to his neighbours' vacant plots sampled were distributed in five different AEZs and were spread throughout the length and breadth of the Division (see Map 8.1). Co-operation of the field and official staff of the concerned departments was indispensable. Therefore, permission to undertake the study and support to carry it out in the field was sought before proceeding for the actual fieldwork. A copy of the correspondence is attached in Appendix 8.2. Useful guidelines in planning and designing the fieldwork were acquired from the literature furnished by Wax (1971) in general and even more effective and practical ones specifically for developing countries from Devereux and Hoddinott (1992). A five month period (mid November 1998 to end March 1999) was devoted to the whole fieldwork including collection of primary and secondary data.

8.3.2.1 Pre-testing of questionnaire

Before proceeding to the actual interviewing of the participants, it was felt necessary to conduct a pre-testing of the questionnaire to judge its soundness, as suggested by Nicholas (1989) and Casley and Kumar (1982). The pre-testing was done in two locations namely, Dinajpur in OHPP and Rajshahi in HBT. Based on the responses received from the villagers interviewed in the pre-test, slight modifications were made in the questionnaire. After modifications, the questionnaire was finalised with a set of 50 questions, separated into six sections.

8.3.2.2 Conducting the questionnaire survey

The selected villages were arranged division (forest)-wise and district-wise and a suitable itinerary was decided to complete the survey work within the stipulated time period. The respective DFO offices were taken as the benchmarks for starting the fieldwork. The DFOs were informed well in advance of the itinerary of the fieldwork by the CF-Bogra Circle.

With written permission and instruction for co-operation from the DFO, the investigator then proceeded to the respective Range offices and where necessary, to respective Beat offices. These Range/Beat offices served the purpose of base-camps. The selected participants were visited in their respective village homes and the purpose of the interview was explained clearly. With their consent, they were exposed to each of the questions (of the questionnaire) to elicit their responses without applying any undue pressure (Kvale 1996). In all the sampled villages, the respondents proved to be highly co-operative during the interviews and their hospitality must be acknowledged with esteem. Help from local forest staff was also sought wherever it was felt necessary.

8.3.2.3 Collection of primary data

As mentioned earlier, formats (Annexures 8.1, 8.2 and 8.3), in addition to the questionnaire, were used to collect the yearly inputs, outputs and growth data from the individual plots of the agroforestry and woodlot projects.

8.3.2.3.1 Data concerning forest products

The primary aim of the collection of data related to the forest products was to investigate the resources created through agroforestry and woodlot schemes with regard to (a) the survival rate at maturity and (b) the production rate at maturity. These could then be used to calculate the revenue generated from these trees. Realistically, the forestry yield under the agroforestry and woodlot schemes should include everything from logs, poles and fuelwood to non-timber forest products like fruits, nuts, honey, medicine and environmental effects. However, this study could not cover all these aspects mainly due to time and resource constraints. So the survey was confined to investigate (a) the intermediate products like grass, dry leaves, twigs, branches etc., before harvesting of the trees, and (b) the final products in terms of the timber and firewood volume.

The interviewing of the participants revealed that they have received a number of intermediate benefits such as dry leaves, twigs, branches from the agroforestry and woodlot plots after 2 to 3 years of the plantation establishment till the time of this data collection. The silvicultural notes of the important species planted in the agroforestry and woodlot projects have been given in Appendix 8.3. It suggests that most of the species, for example, *Eucalyptus camaldulensis*, *Acacia auriculiformis*, *Dalbergia* *sissoo* and *Cassia siamea* were used as small timber for locally used furniture and household repair, fuelwood for cooking and fodder for livestock feeding. After checking of the official records of the social forestry projects, it was found that no effort has ever been made to quantify these benefits. Thus an attempt was made to quantify and evaluate the above items after obtaining the details from the respondents. It also became clear during the interviews that these benefits were of great value to these participants.

Since none of the agroforestry and woodlot plots of 1991-92 has been harvested, the quantification of the final products was difficult. Hence, it was decided to estimate the yield of the standing trees (at the age of 7 years during 1999, about at the maturity age corresponding to 'short-rotation plantations' as practised/adopted by the Bangladesh FD) in terms of the volume of timber. Since about 95% of the plots were planted with either *Eucalyptus camaldulensis* or *Acacia auriculiformis*, standing volumes of trees were estimated using the regression equations (discussed in the following paragraphs) devised by Davidson *et al.* (1985) for *Eucalyptus camaldulensis* and by Latif *et al.* (1995) for *Acacia auriculiformis*. For applying these equations, it was necessary to collect data pertaining to height, diameter and number of standing trees. As it was not possible to measure height and diameter of all the trees in a particular participant's plot, small fractions of the tree population were sampled randomly.

8.3.2.3.1.1 Measurement of tree growth parameters

After finishing the questionnaire interview at the homestead of the respondent, he was requested to lead the investigating team to his specific plantation of agroforestry or woodlot. Upon reaching his plantation, a sample plot of 0.02 ha was laid out at a place chosen randomly within each plantation. Adlard (1990) recommended a sample plot size of 0.02 ha for fast growing, short rotation species like *Eucalyptus camaldulensis* and *Acacia auriculiformis*.

For woodlot plantations, a circular plot of 8 metre radius was laid. For agroforestry plantations, rectangular plots of 200 m^2 (0.02 ha) were laid at a suitable

Laying out a circular sample plot in an Acacia woodlot patch

Remnants of natural coppices of sal (*Shorea robusta*) next to an Acacia woodlot plot [on left]

Leaf gathering from a woodlot plot, to be used as essential cooking fuel place along the 3 or more rows of trees, as suggested by Jenkins (1998), which is presented diagrammatically in Figure 8.1. The sampled plots were demarcated by blue or red fly-tapes and all the trees falling within the circular or rectangular plots were marked serially with number 1...n. Then the measurements of the height and diameter of each of the marked trees were taken following the procedure described below.

a. Measurement of tree height

The heights of the trees inside the sampled plots were measured with the aid of the Spiegel Relaskop following the elaboration provided by Temu (1990). This instrument is designed to operate from a distance of either 20 metres or 10 metres from the tree base. Tree height is obtained in metres by subtracting the bottom-reading from the top-reading in the instance of 20 metre distance and by taking half of the subtracted result in case of 10 metre distance. The measurements taken were recorded and entered in the designated format (Annexure 8.3). The mean height of all the trees of a plot was considered as the mean top height of that particular plot for the estimation of the volume of trees of that particular plot.

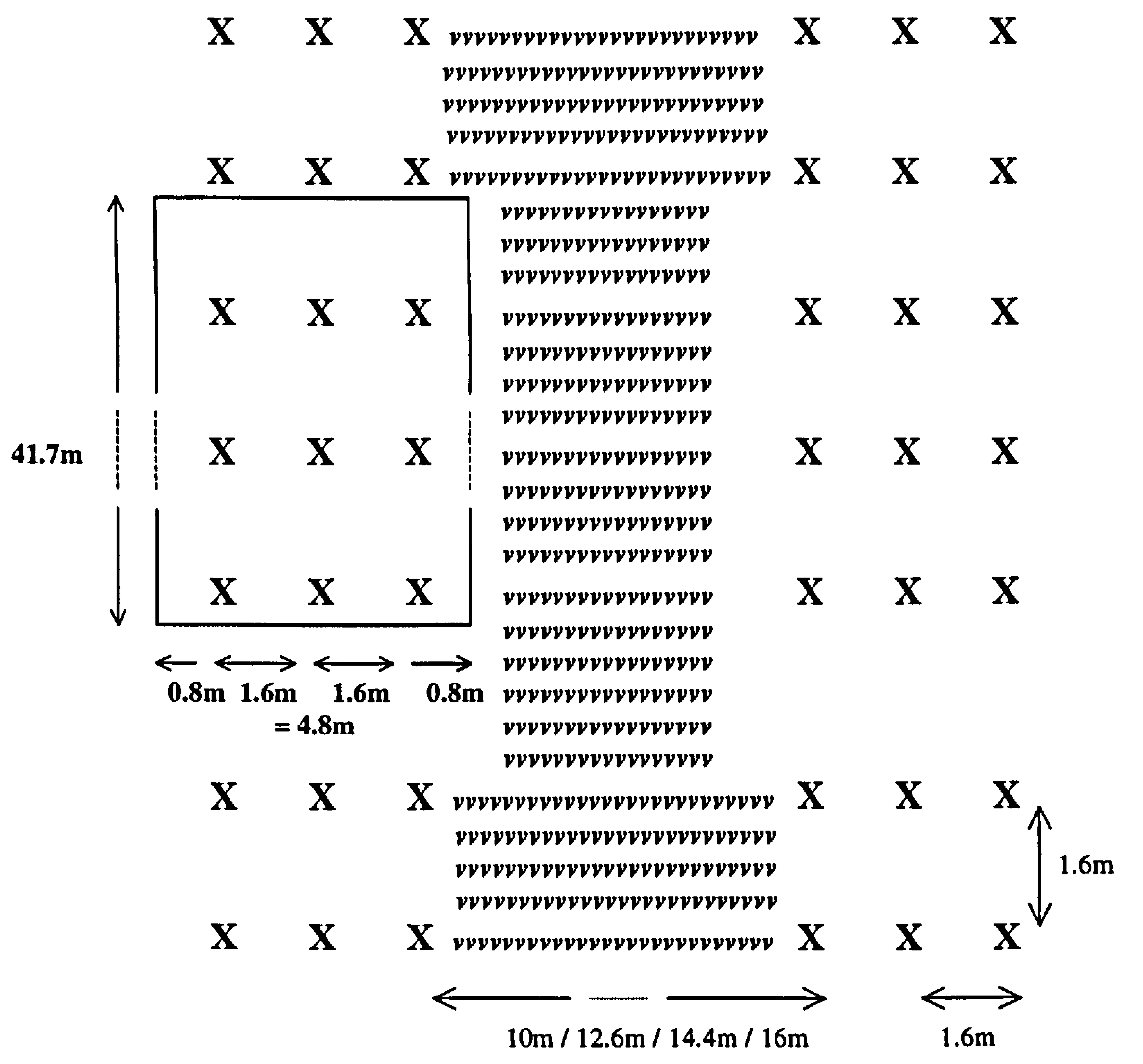
b. Measurement of tree diameter

The diameter at breast height (dbh) of all the trees falling inside the sampled plots was measured with the help of a diameter-tape. Diameters were measured at breast height, i.e., at a height of 1.37 metres above the ground and were recorded in the designated format (Annexure 8.3). This was accomplished on the traditional presumption that a tree having height of less than 1.37 metres is supposed to have zero diameter and consequently zero volume. Other details for measuring trees with abnormalities, such as those having bifurcation or swellings, were followed according to Temu (1990).

c. Survival percentage of trees

Actual number of trees standing in the sampled plots was required in order to know the total volume of the standing trees. This was achieved simply by counting the trees,

Figure 8.1 Diagrammatic representation of an AF plantation and the sample plot within it.



Legends:

X Eucalyptus or Acacia trees
v Agricultural crops
The rectangle is the sample plot of 200 m^2 for taking tree-growth measurements.

whose height and diameter were measured, since all the trees within a sample plot were measured for these two variables[4].

[4] Original number of trees planted in different modules of AF and WL plantations can be found in the TANDP Project Proposal (GPRB 1994).

d. Estimation of stem volume

Eucalypts and acacias have been studied in great detail with regard to their growth and yield. However, to ensure the accuracy and precision in respect of volume from the agroforestry and woodlot plantations in the particular situation of Rajshahi Division, the actual growth data were applied in the following regression equations for estimation of timber volume per tree:

Eucalyptus camaldulensis:

ln (Vob) = -9.3520 + 1.8055*ln(D) + 0.8590*ln(H)

Acacia auriculiformis:

ln (Vob) = -9.1250 + 1.9180*ln(D) + 0.67988*ln(H)

where,
Vob is volume over bark
D is diameter at breast height in cm and
H is top height of tree in m.

Using these equations, the total volume of surviving trees from each agroforestry and woodlot plot was estimated by multiplying the total number of trees by the estimated volume per tree.

8.3.2.3.2 Data concerning agricultural products

Quantities of the annual agricultural outputs (from 1992 to 1999) from agroforestry plots were collected from the respective participants through the questionnaire survey. Wherever possible, this information was verified by checking the FD records. Input data for agroforestry and woodlot plots were collected from the local forest offices, because the same inputs were applied in all agroforestry and woodlot plots, according to the government prescribed norms.

8.3.3 Experience gathered and problems encountered in the fieldwork

Fieldwork was one of the most important aspects of the study, as most of the data required in the study were generated from the household questionnaire survey. Following the hierarchy of the FD administration, I first approached the CCF to seek his consent and support in undertaking the fieldwork for data collection towards my doctoral study in the UK. The then CCF, Mr. Gulam Habib expressed his keen interest in my research and gladly agreed to extend all possible assistance in my fieldwork. He then issued a letter to the CF of Bogra Circle to provide me with all out support in the fieldwork (Copy of correspondence enclosed in Appendix 8.4). The CF discussed the nature of the fieldwork with me and then issued a letter to all the five DFOs under his jurisdiction. However, I had to visit only three DFOs, since there was no AF or WL plantation in the other two Forest Divisions.

The DFOs, in their turn, circulated the nature of my work to the Range Offices under their respective divisions. The ROs also sent out the subject to Beat Offices, wherever that was necessary. The questionnaire survey and subsequent field measurements were carried out by making base at the respective Range or Beat offices. One experienced FG (Forest Guard) was assigned by the RO or BO to lead the investigating team to the selected participants, where the members of the team were introduced. I explained the purpose of my visit to the farmer and requested him to take us to his homestead, where the interview took place. The fact that I am an academician, not a FD official, put the farmers in a relatively comfortable position. Our travel by bicycle or simply on foot, rather than by any motorised vehicle, often to a distance of up to 20 Km, to meet the farmers, built a sort of confidence in them.

Most of the farmers answered the questions willingly and seemingly honestly and tried their best to recall certain issues like inputs into the agricultural practices and outputs from them in different years. Conducting the interview in the homestead rather than in the crop-field or in the village market had a twofold advantage. On the one hand, it provided the necessary privacy in the interview process to let the respondent express his personal, unbiased views. On the other, it helped me to get an overall idea about the socio-economic condition of the respondent.

After the questionnaire survey and some informal discussion with the farmer, he was requested to take us to his plot of AF or WL. Sample plots were laid out in the respective plantations and growth parameters were measured and recorded according to the procedure described. This activity encouraged the farmers highly in the assumption that their plots would be harvested shortly. I had to clarify to them that these data might be used by the FD to establish a felling plan, but it all depends on complicated Government procedures. Once again, the hospitality and co-operation of the participants must be acknowledged with highest esteem.

It better be mentioned here that non-participants were not included in the survey, largely on two grounds viz.

i. Principal objective of this research was to explore the effect of the social forestry project on the participants' basic needs satisfaction. 'Primary data' gathered through the household survey were tried against national level 'secondary data' to get a broader comparison, which can possibly utilised in other similar national undertakings; and

ii. Non-participants were difficult to approach under the cover of this project's study.

Chapter Nine

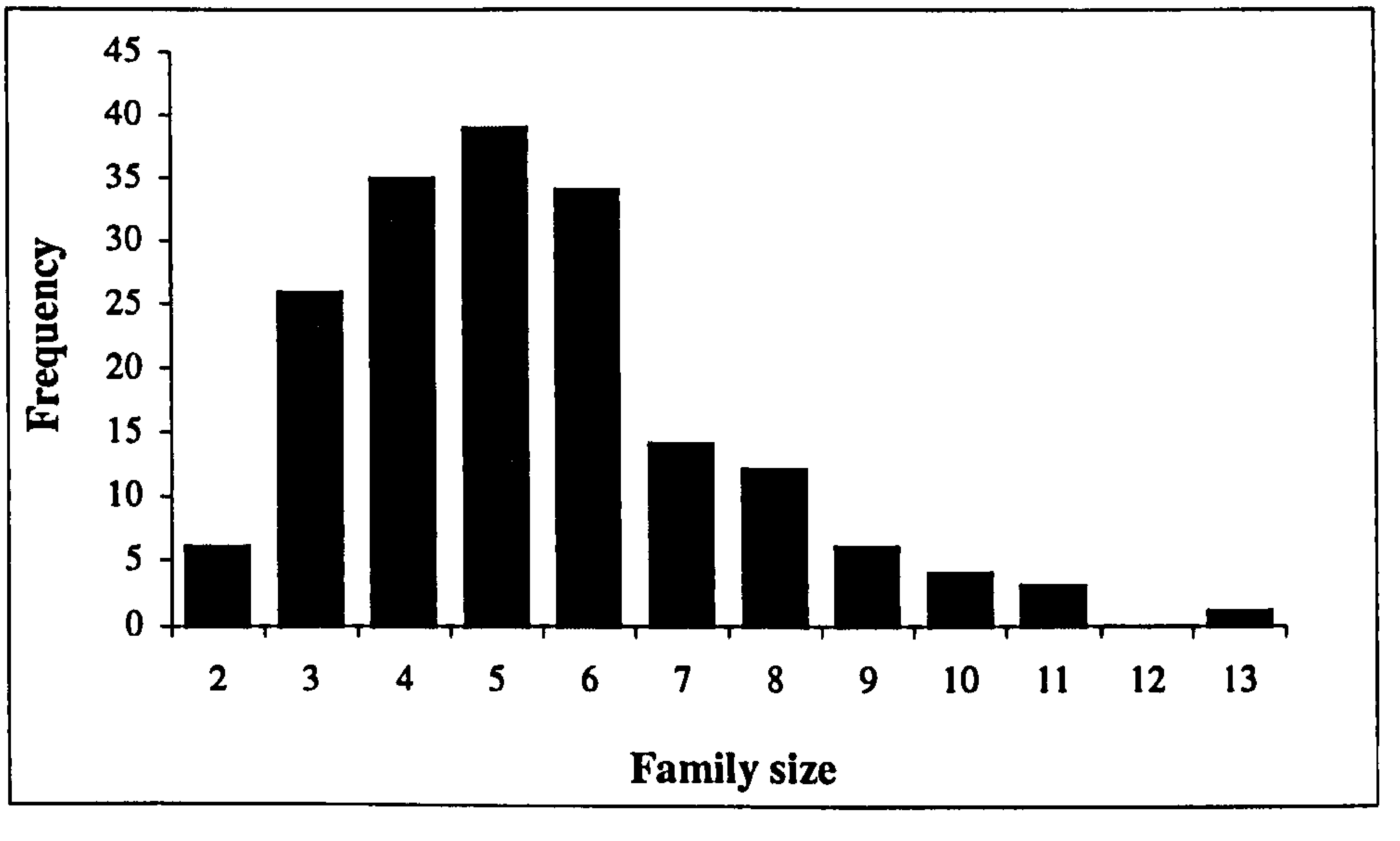
Socio-economic Profile of the Participants in the Social Forestry Project

Information on socio-economic profiles of the participants in the social forestry project in north-western Bangladesh has been gathered through the first part of the questionnaire, which consisted of ten questions. Socio-economic variables included in this group were family size, age structure of family members, literacy and level of literacy, occupation, nature of employment, household income and sources of income, land holding, livestock details and indication of wealth of the participants.

9.1 Family structure

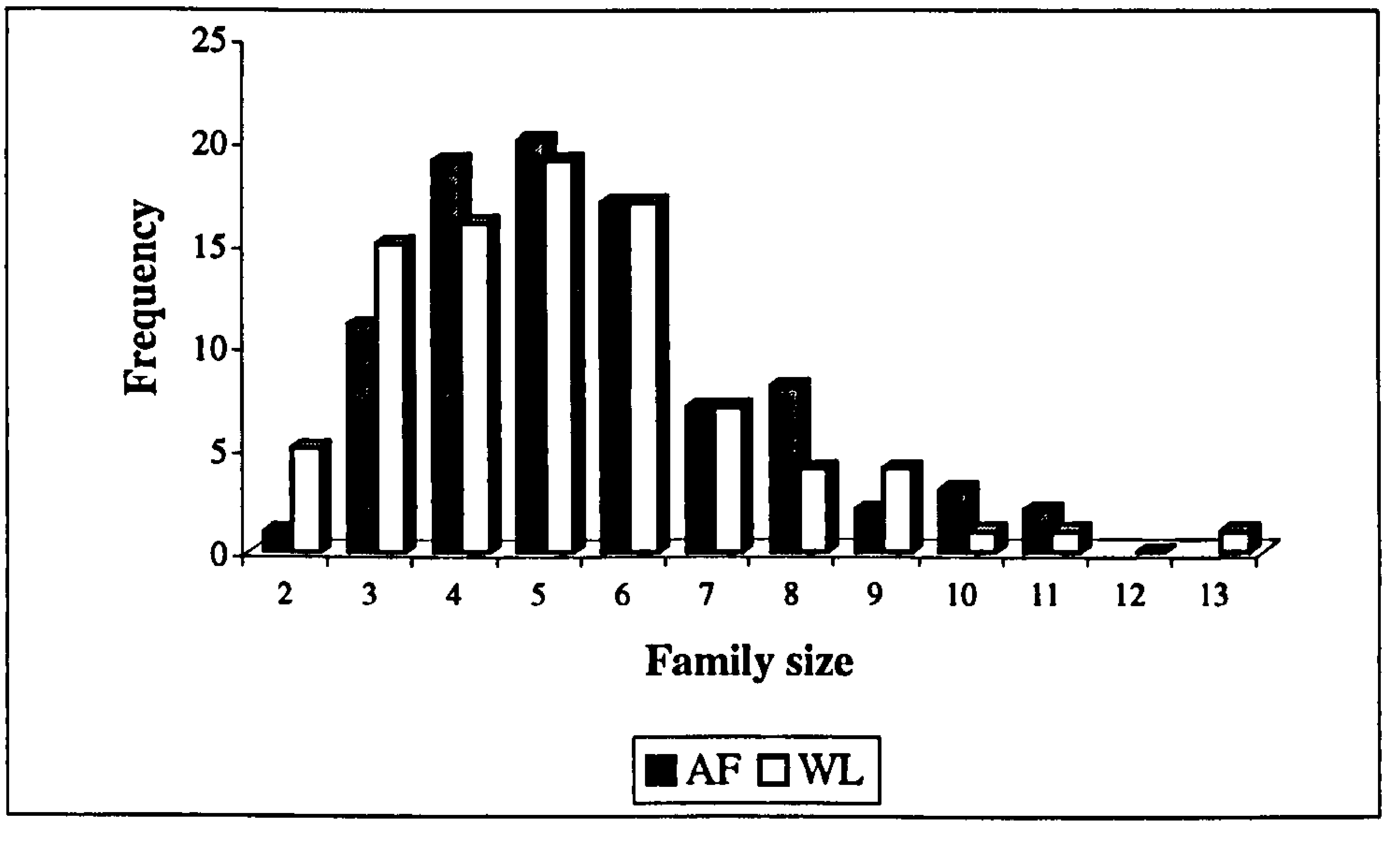
The information with regard to size of a family i.e., number of adult males, adult females and children, and age structure of the family members was gathered through the first two questions of this section. Age structures were broken down firstly between the two genders and then further down to four relevant age classes. Figure 9.1 below shows the frequency distribution of households according to the total number of members in a family.

Figure 9.1 Frequency distribution of households by family size



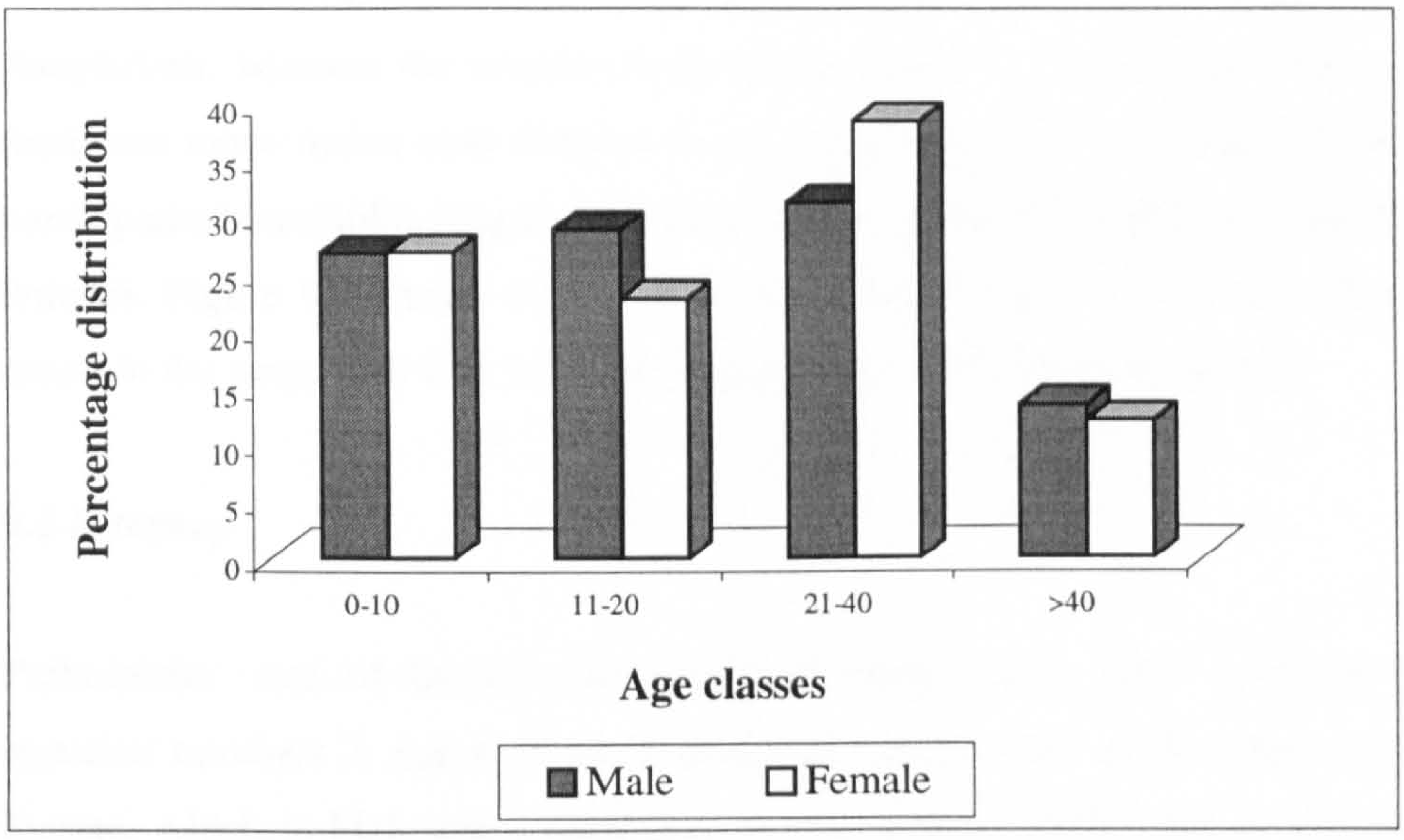
Families with five members were found with highest frequency (22%) in the study area, with an average family size of 5.35. BBS (1997a) reported size of households as 5.4 for Rajshahi division and 5.6 for the nation as a whole. Family sizes ranged between 2 and 13, with very few in the smallest family size (3%) and just one household (1%) was found in the highest size. Sizes of second and third most frequent categories, 4 and 6 members respectively, were clustered around the one with highest frequency. Figure 9.2 shows a comparative representation of frequency distribution of family size of AF and WL participants.

Figure 9.2 Comparative frequency distribution of AF and WL farmers by family size



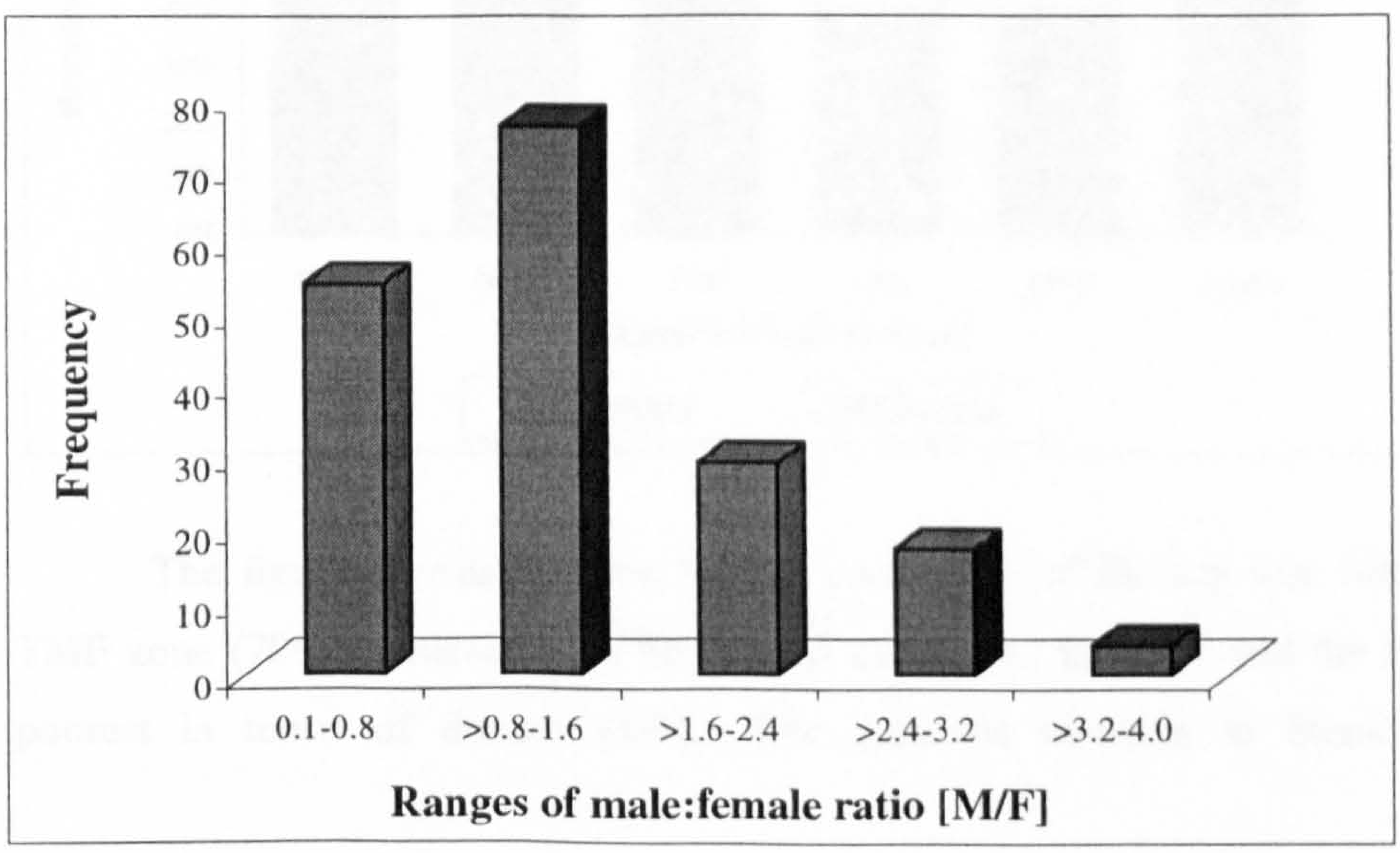
It can be visualised from the figure that both WL and AF farmers had greatest number of families with a size of 5, with the next two frequencies in the two adjacent family sizes. However, the mean family size for AF and WL farmers were calculated as 5.5 and 5.2 respectively, which were found not significantly different, using the Student's t test (p = 0.29, at 177 df).

Figure 9.3 Percentage distribution of age classes between males and females.



Although BBS (1997a, 1998a, 1999a) uses a much segregated grouping of age, the present study has been kept limited to four major age classes or groups as 0 to 10, 11 to 20, 21 to 40 and above 40 years. This classification was decided upon through a PRA exercise conducted with a smaller sample of farmers, who opined that children do start working from the age of 10/11 but 20-40 is the prime working age for the local rural people. The figure shows that almost equal, smaller proportions of males and females occur within the two less active age classes but maximum proportions of males (31%) and females (38%) occur in the most active age class.

Figure 9.4 frequency distribution of ranges of male:female ratio

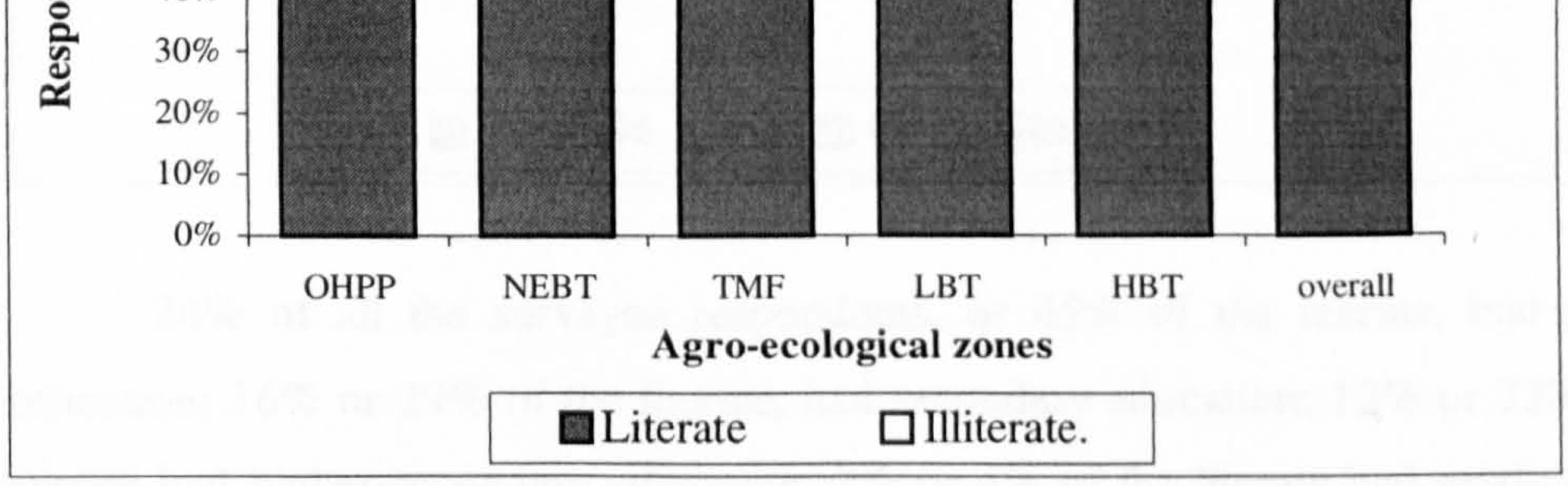


BBS (1997a) reports sex ratio (M/F) as 1.05 for Rajshahi division and 1.06 for Bangladesh, whereas the present study found it as 1.11 on average, indicating that there are more males than females in the study area. The sex ratio of the project participants households ranges in between 0.17 (1 male, 6 female) and 4.00 (4 male, 1 female). Figure 9.4 shows that most of the sampled households (42%) have a sex ration in the range of 0.8 to 1.6, which approximates the national figures.

9.2 Literacy

Participants' rate of literacy and levels of literacy have been explored through question numbers 3 and 4. It was found that overall, 54% of the respondents were literate, which is high when compared to the national (32%) and divisional (28%) figures (BBS 1999a). Figure 9.5 shows the rate of literacy across the five agro-ecological zones of the study area.

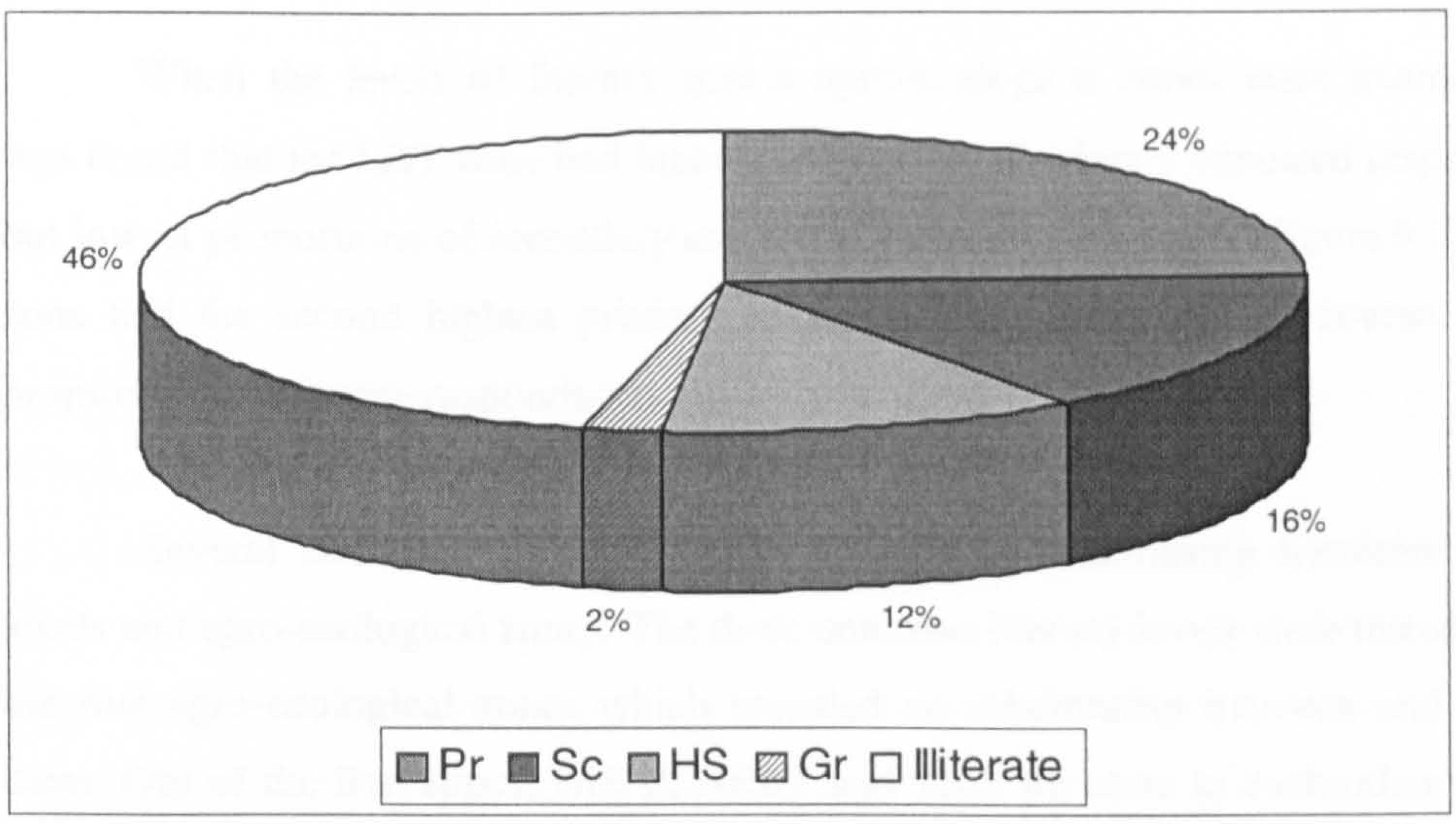
Figure 9.5 Percentage distribution of literacy rate across agro-ecological zones



The figure reveals that the highest percentage of literacy was found in the TMF zone (70%), whereas both the Barind tracts, i.e., the LBT and the HBT were poorest in terms of literacy (40%). The apparent variation in literacy rate of participants in different agro-ecological zones was found significantly different (χ^2 value 11.76 at df = 4) at the 0.025 level. This implies that the agro-ecological zones and the literacy rates are closely related. This apparent variation in literacy rate can be attributed to the level of poverty across the agro-ecological zones. The incidence of poverty (HCR) in the TMF zone was found lowest among the agro-ecological zones (see Chapter 11), where literacy has been found highest.

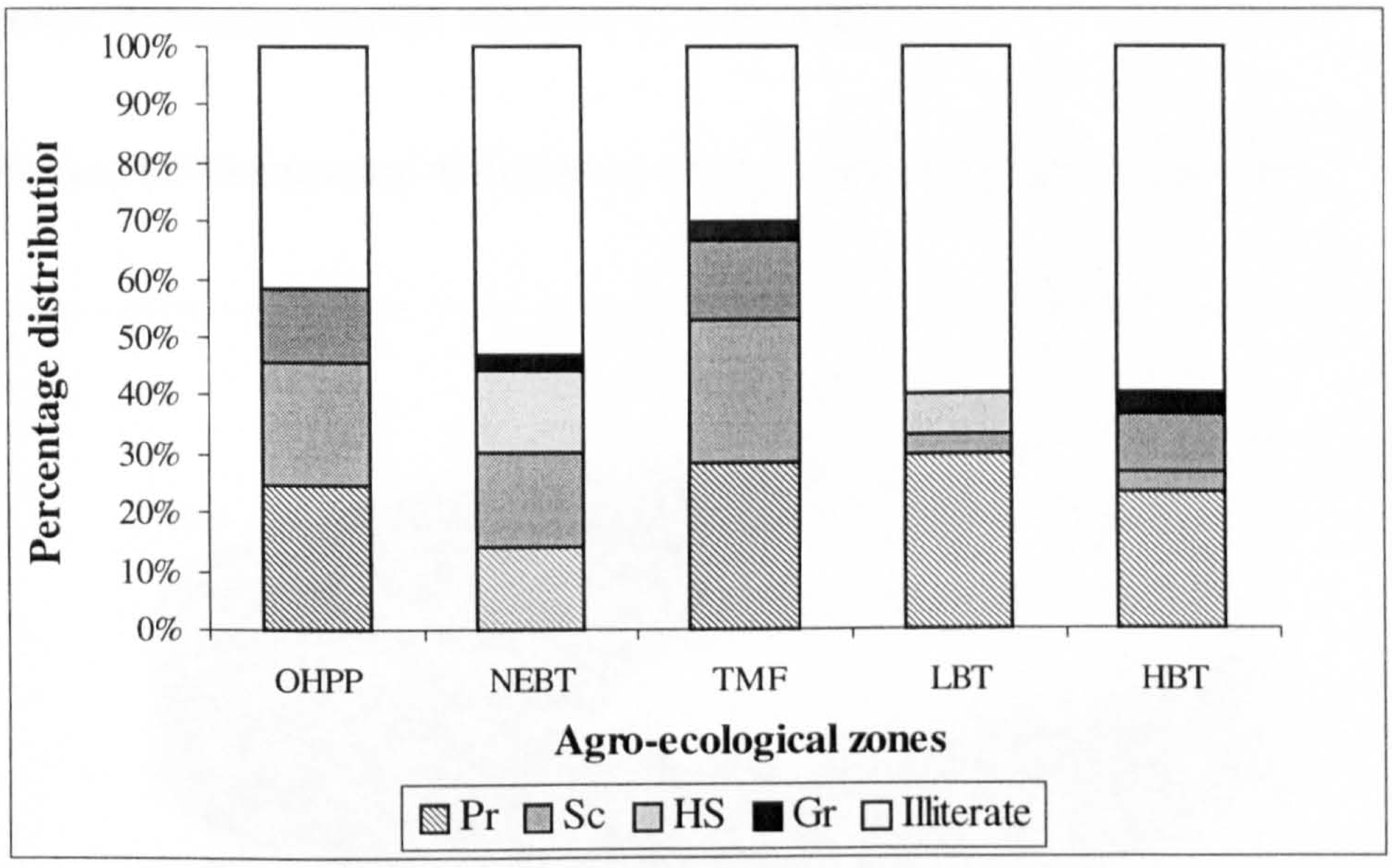
The common three levels of literacy in Bangladesh are primary, secondary and higher-secondary and to some lesser extent, graduation. Primary education has been defined as five years of schooling, secondary as ten years, higher-secondary as 12 years and graduation as 15-16 years of education respectively. These four levels of literacy combined with the proportion of illiteracy have been presented in Figure 9.6.

Figure 9.6 Overall percentage distribution of levels of literacy



24% of all the surveyed respondents, or 45% of the literate, had primary education; 16% or 29% of the literate, had secondary education; 12% or 22% of the literate had higher-secondary education; 2% or 4% of the literate had graduate level education and the remaining 46% were deprived of the light of education. Although the national figures from Statistical Yearbook 1998 (BBS 1999a) for levels of education were not significantly different from the observed figures, it was found that the respondents have a higher proportion of secondary and tertiary levels of education.

Figure 9.7 Percentage distribution of literacy levels across agro-ecological zones



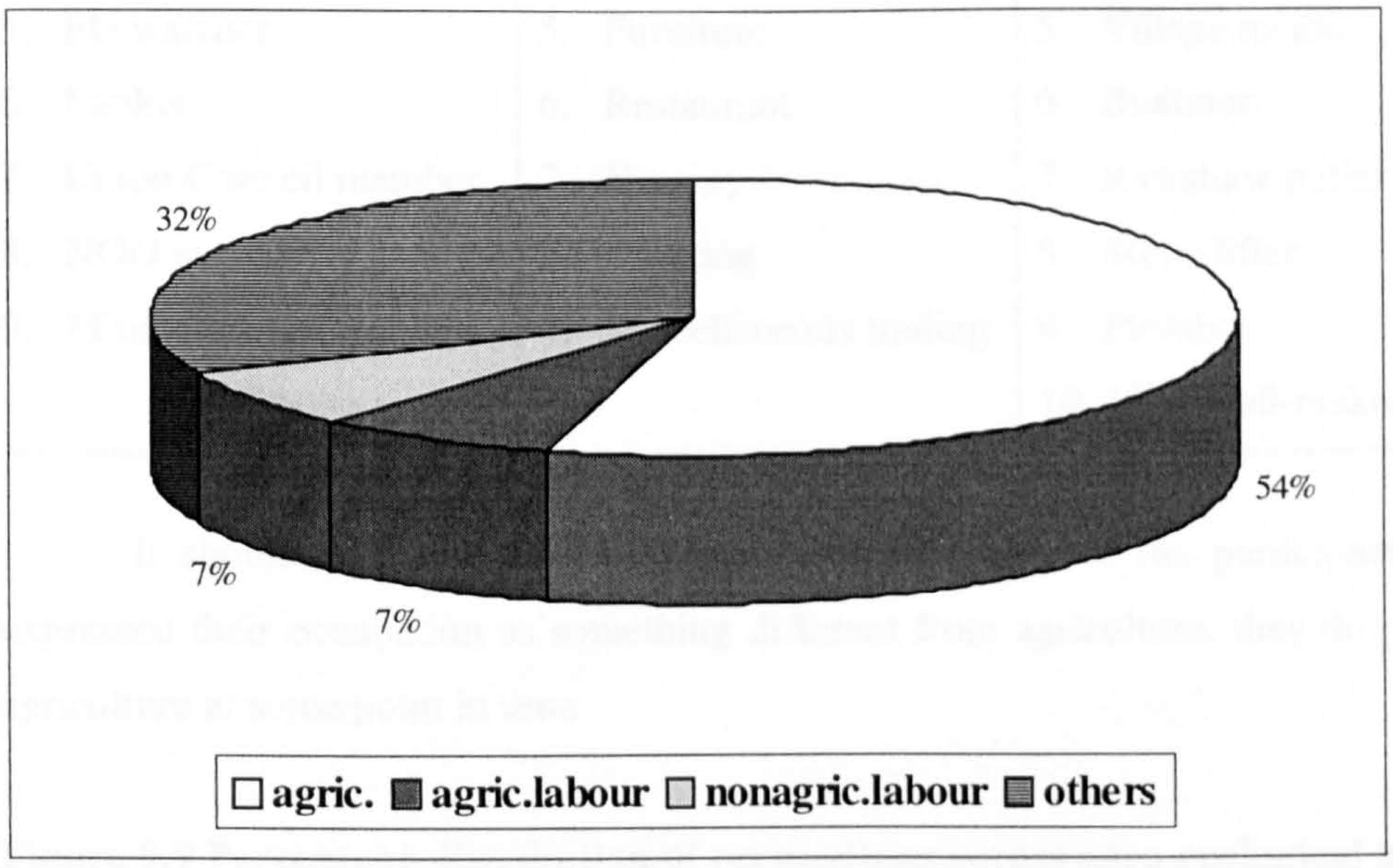
When the levels of literacy across agro-ecological zones were examined, it was found that the LBT zone had highest proportion of primary educated respondents but lowest proportions of secondary and tertiary levels of educated (Figure 9.7). TMF zone had the second highest primary educated respondents and of course, lowest proportion of illiterate respondents.

Several statistical tests were done to explore relationship between literacy levels and agro-ecological zones. The three common literacy levels were tested across the five agro-ecological zones which revealed no relationship between and among them. Out of the five zones, OHPP, NEBT and TMF lie close to each other and the other two, i.e., LBT and HBT are adjacent to each other. So, the five zones were aggregated into two major regions as Dinajpur and Rajshahi and were tested for relationship of the three general levels of literacy. The evident disparity of the participants in these two major regions for different levels of literacy was found statistically significant (χ^2 value 7.86 at df = 2) at the 0.02 level, which entails that literacy levels of the participants and broad regions are related.

9.3 Occupation

Investigation into the respondents' occupation and nature of employment has revealed some interesting findings which are presented below.

Figure 9.8 Percentage distribution of respondents by their occupation



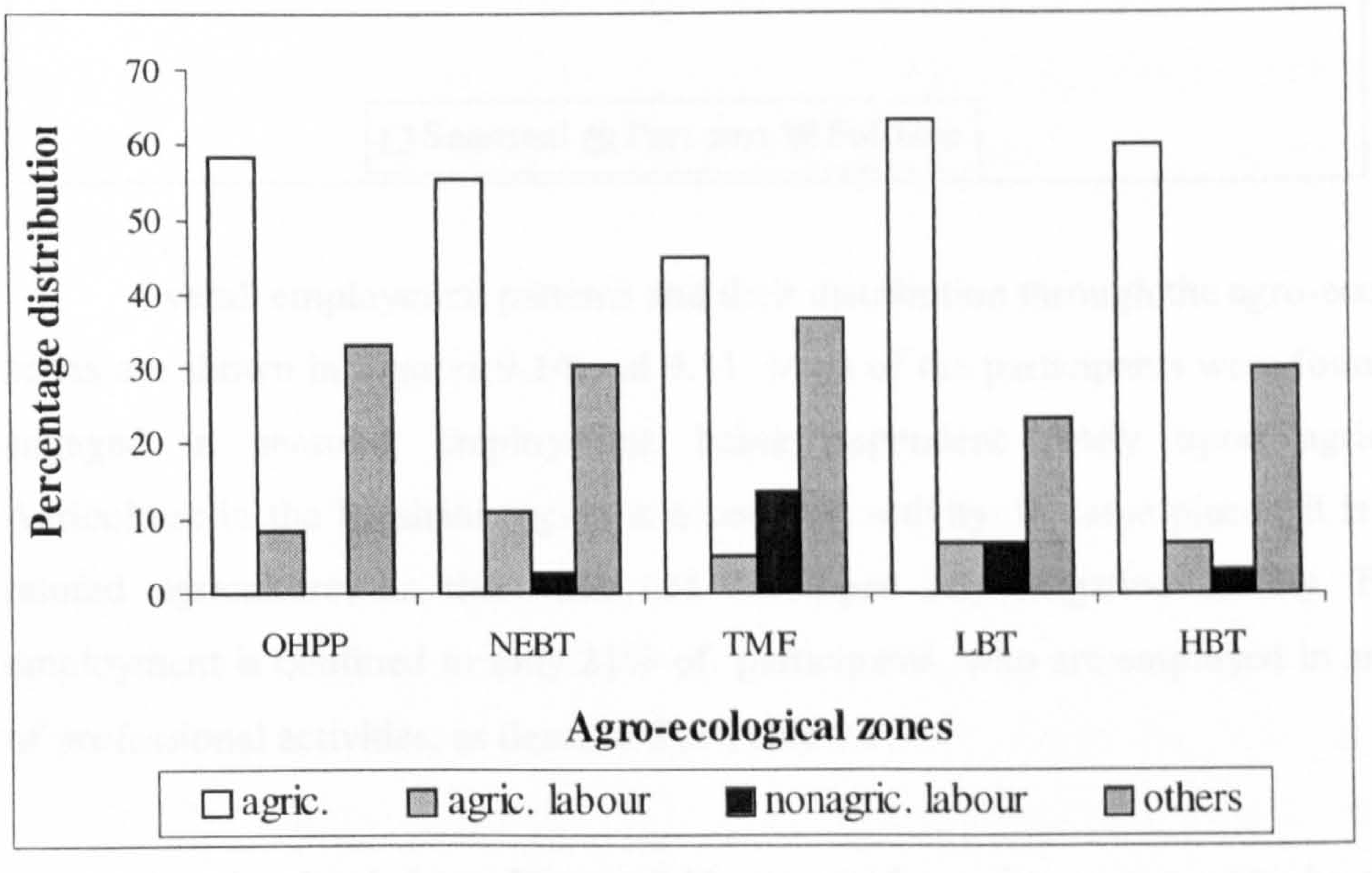
The majority of the respondents were engaged in agricultural work, either directly practising agriculture themselves or as agricultural labourers. Those practising agriculture either cultivated their own land or share-cropped on other's land, sometimes even doing both. Non-agricultural labourers worked mostly as migrant workers in nearby towns or cities. A considerable proportion (32%) of respondents expressed their occupation as 'others', which have been explicitly enquired of them. It was observed that the range of other occupations fell into three broad categories, which are presented below in Table 9.1

Table 9.1 Categories and types of 'other' occupation of respondents

Services	Businesses	Professional jobs
1. School teacher	1. Paddy trader	1. Paddy processing
2. School orderly	2. Rice mill	2. Oil grinder
3. Postal runner	3. Cattle trader	3. Mechanic
4. FD nursery man	4. Grocer	4. Carpenter
5. FD watcher	5. Furniture	5. Village medic
6. Banker	6. Restaurant	6. Boatman
7. Union Council member	7. Nursery	7. Rickshaw puller
8. NGO worker	8. Clothing	8. Stone lifter
9. Mining project worker	9. Miscellaneous trading	9. Plumber
		10. Mud-wall-maker

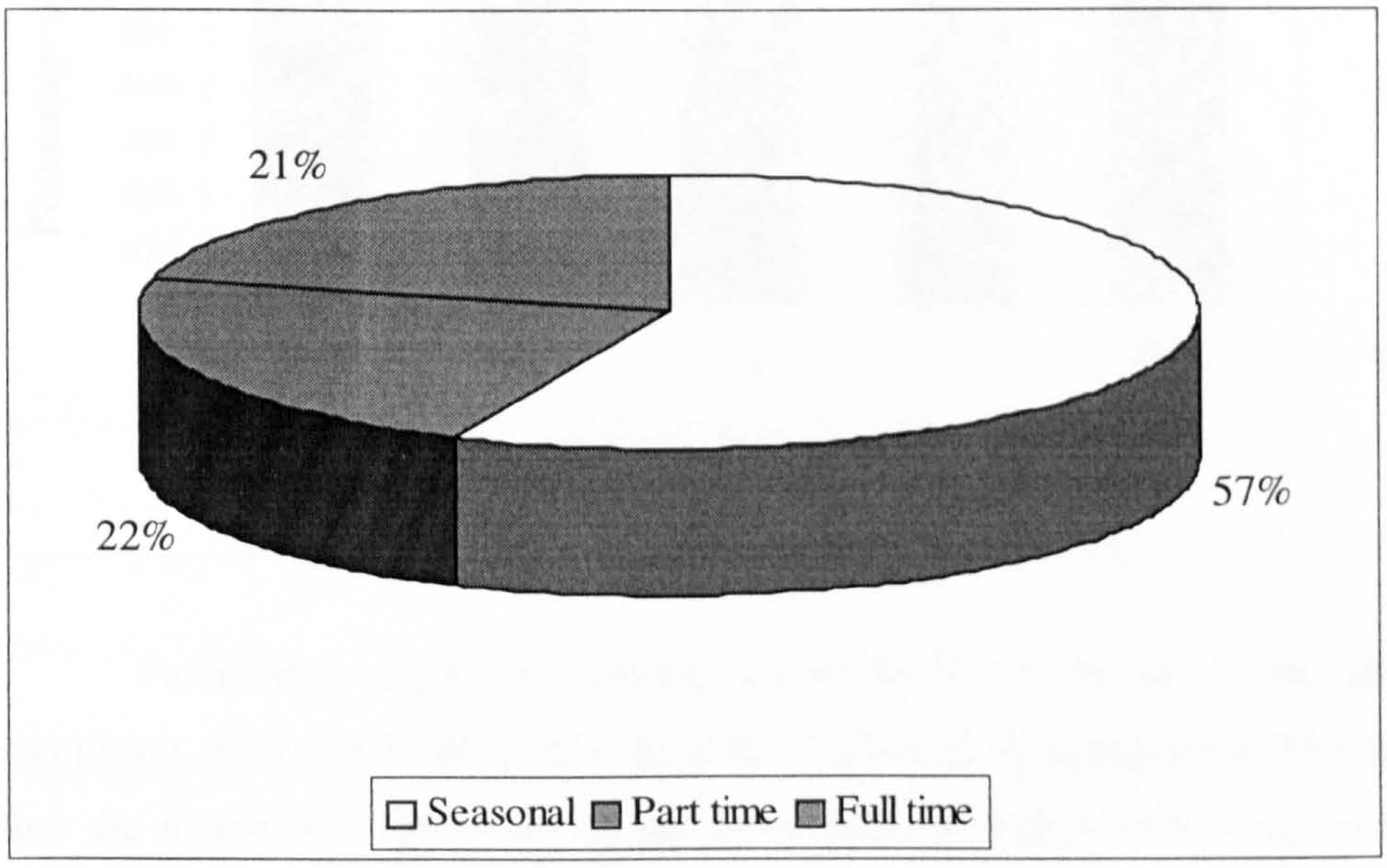
It should be mentioned here that, although many of the participants have expressed their occupation as something different from agriculture, they do practice agriculture at some point in time.

Figure 9.9 Percentage distribution of occupations across agro-ecological zones



Agriculture is the main occupation of most of the participants across all agro-ecological zones. The proportion of agricultural labour is dependent upon the major cropping season, and varies slightly across the zones. Non-agricultural labourers are primarily urban or peri-urban oriented and this varies greatly across the zones depending upon vicinity to towns. 'Other occupations' vary in the substantial range of 25–30 percent across all agro-ecological zones. However, there were no significant relationships between occupational patterns and agro-ecological zones (χ^2 value 11.00 at df = 12).

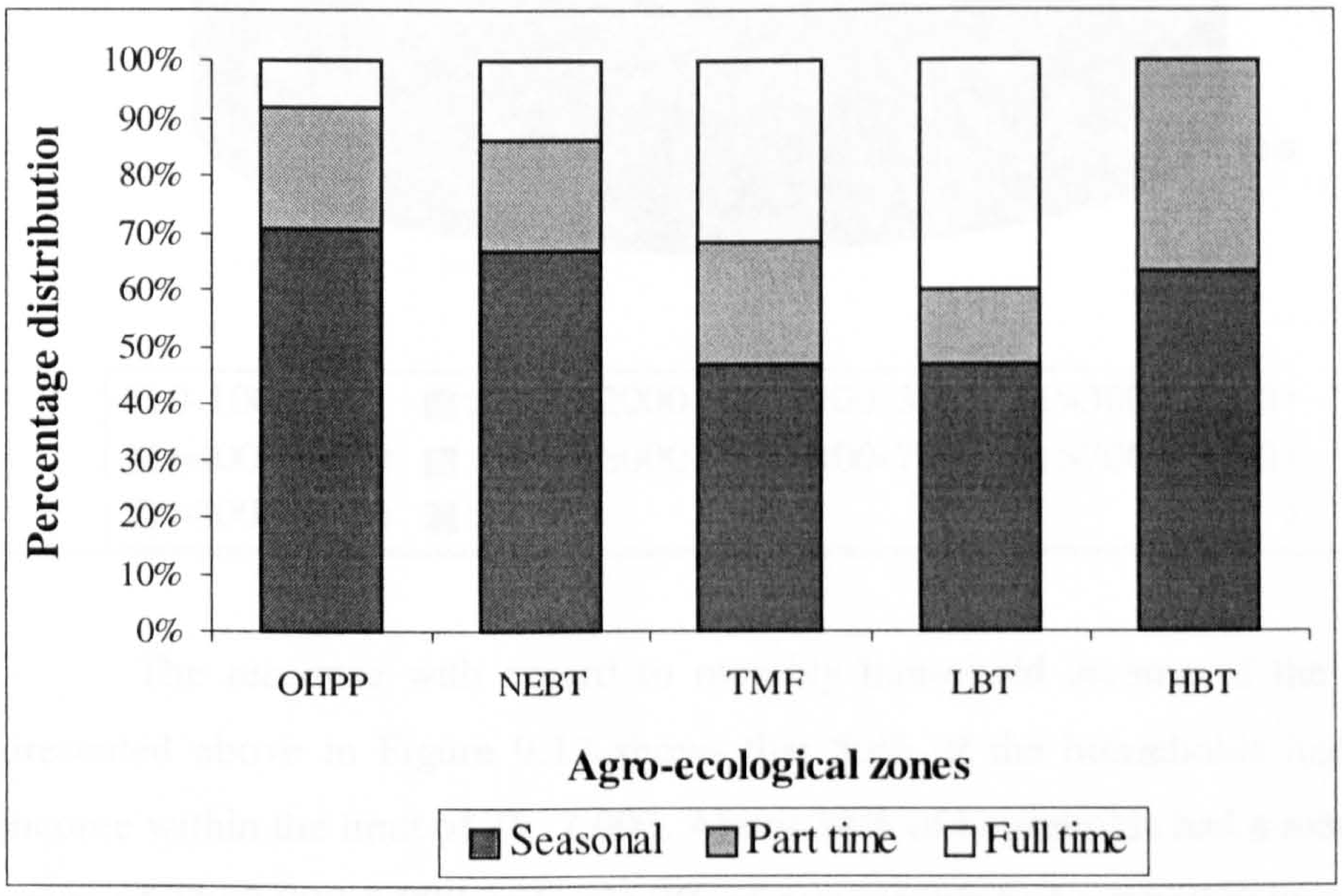
Figure 9.10 Distribution of participants by nature of employment



Overall employment patterns and their distribution through the agro-ecological zones are shown in Figures 9.10 and 9.11. Most of the participants were found to be engaged in seasonal employment, being dependent solely upon agriculture. Agriculture in the Rajshahi region is a seasonal activity. In some places, it is wholly rainfed agriculture, as there has not developed any irrigation facility. Fulltime employment is confined to only 21% of participants, who are employed in any form of professional activities, as described in Table 9.1.

As visualised from Figure 9.11, seasonal employment was highest in the OHPP zone, where most of the participants (91%) are dependent on agriculture. LBT zone had 40% respondents employed in full time occupation. On the other hand, there was no response of full time employment from the HBT zone, the participants being fully or partially agricultural workers.

Figure 9.11 Percentage distribution of participants by employment pattern across each agro-ecological zone.

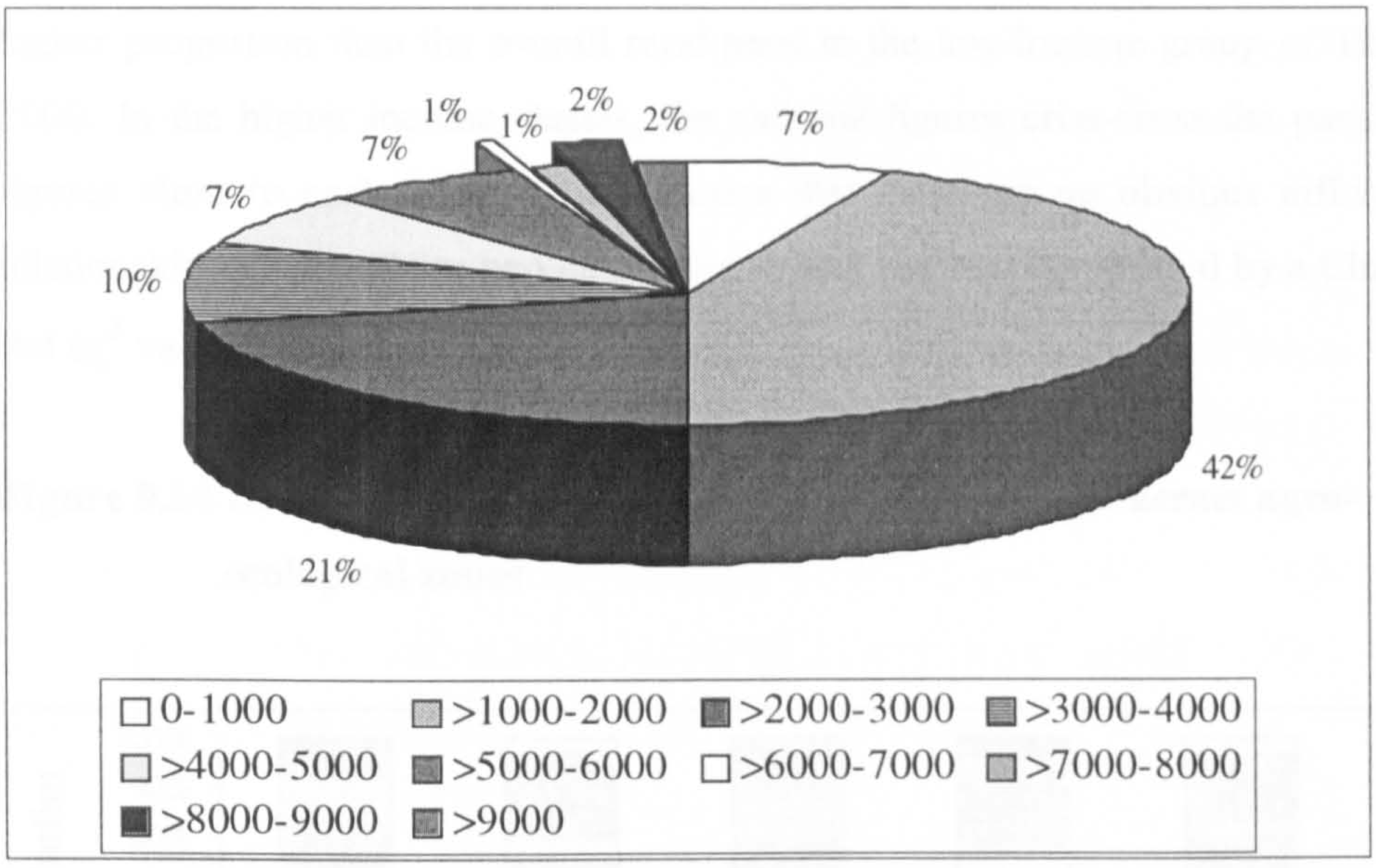


Variation in employment patterns across the five zones was found statistically significant (χ^2 value 24.66 at df = 8) at the 0.05 level of significance. This suggests that the nature of employment of the participants is related to the agro-ecological zones.

9.4 Household income

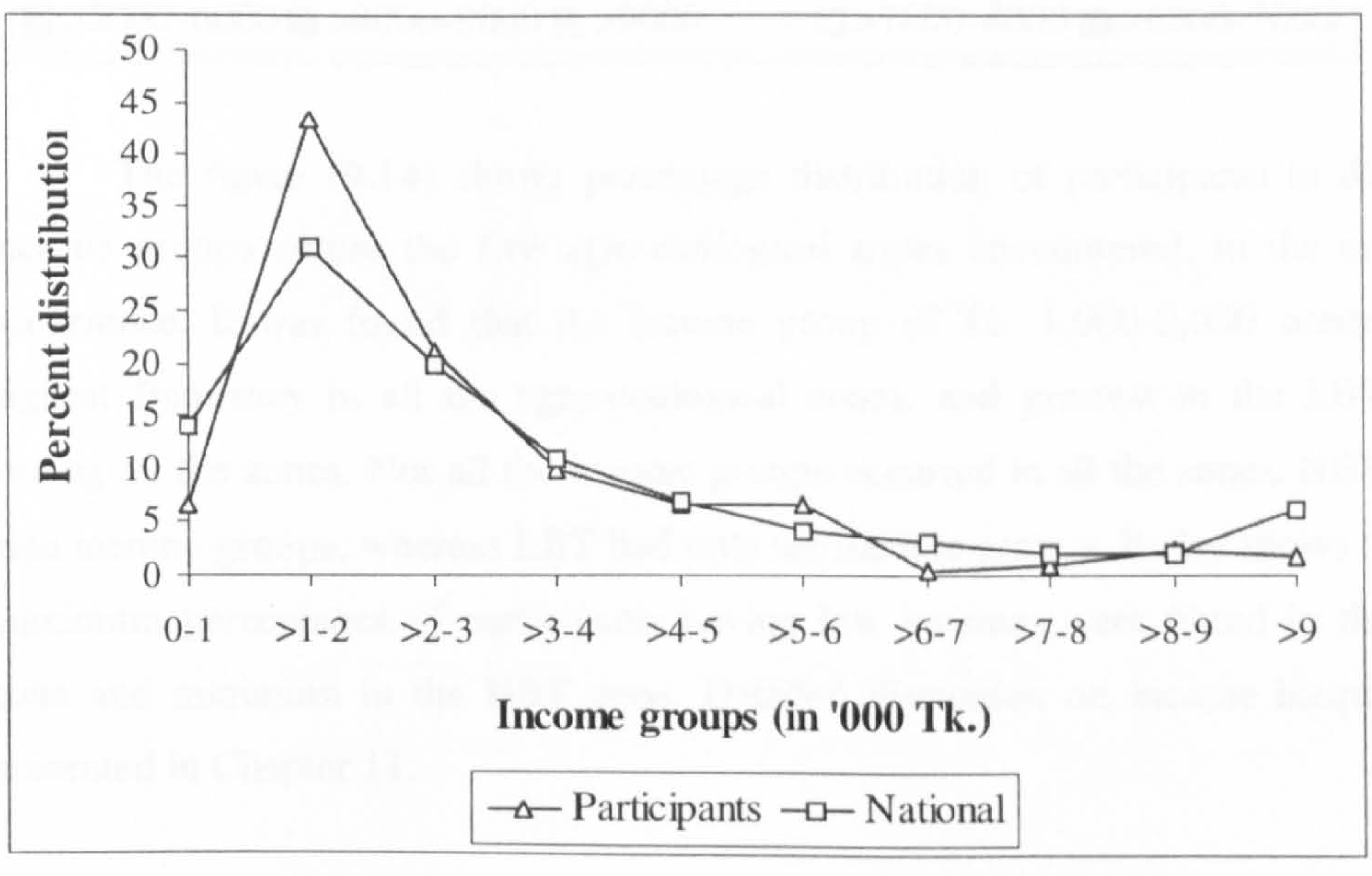
Household monthly income of the participants revealed a very dismal picture as it ranged from a minimum of as low as Tk. 750 to a very high maximum of Tk. 18,000. This high variation occurred because some of the participants were genuinely landless, whereas a few were large land holders. Accordingly, the participants were classified into ten income groups, as followed in the rural poverty monitoring survey of BBS (BBS 1998c), which is depicted below in Figure 9.12.

Figure 9.12 Distribution of participants by monthly household income



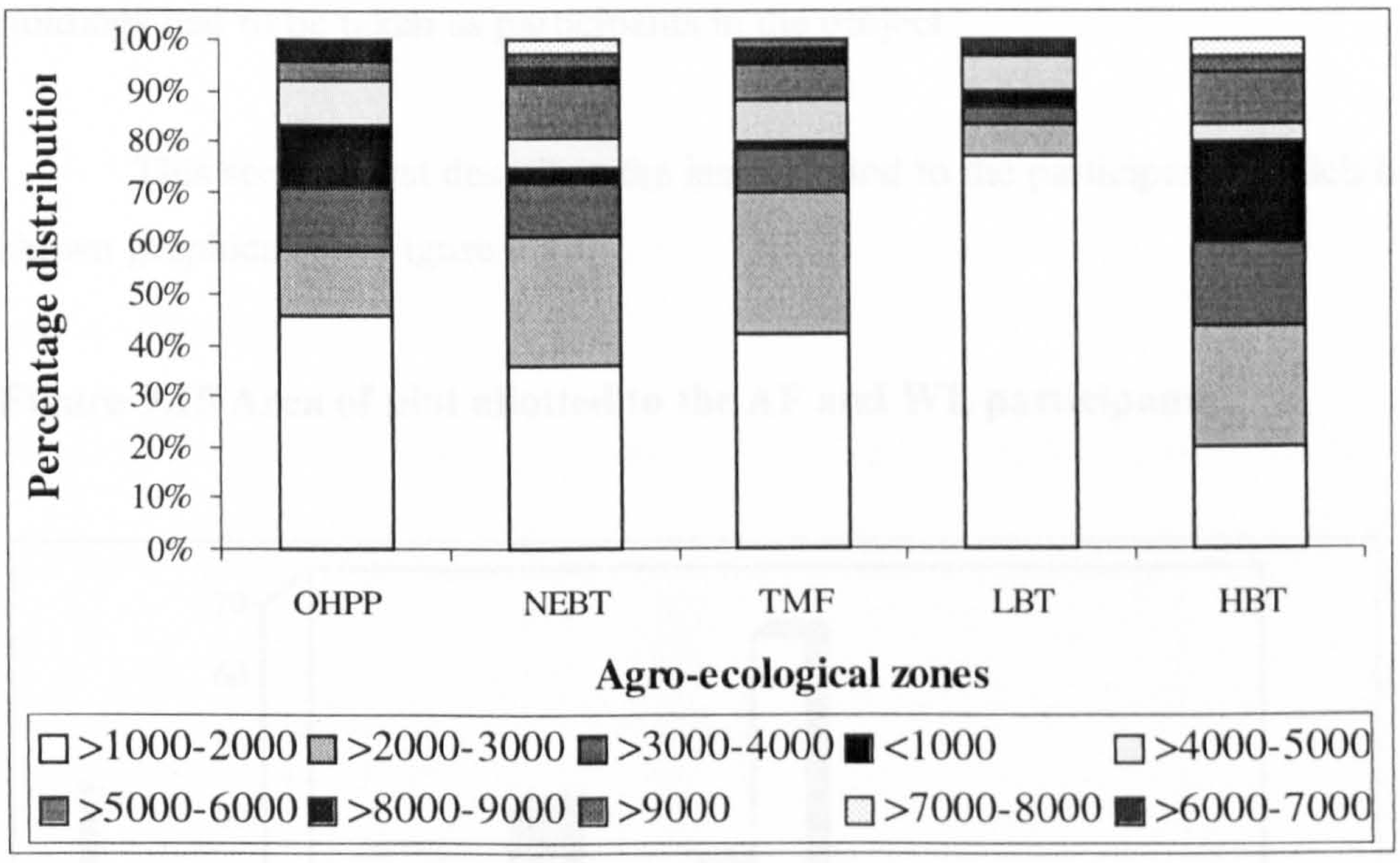
The response with regard to monthly household income of the participants presented above in Figure 9.12 shows that 50% of the households had a monthly income within the limit of Tk. 2,000. About 38% of households had a median income range of Tk. 2,000-5,000 and only 2% of participants had a monthly income of more than Tk. 9,000.

Figure 9.13 Income distribution of participants and 'national-rural' population



The comparative picture of income groups of the rural population against those of the participants shows that the social forestry participants occupy a much higher proportion than the overall rural poor in the low income group of Tk. 1000-2000. In the higher income classes, the national figures criss-cross the participants' figures close to each other. This indicates that there are no obvious difference or relationship between these two categories, which has been supported by a Chi-square test (χ^2 value 8.5 at df = 9).

Figure 9.14 Distribution of participants by monthly income across agro-ecological zones



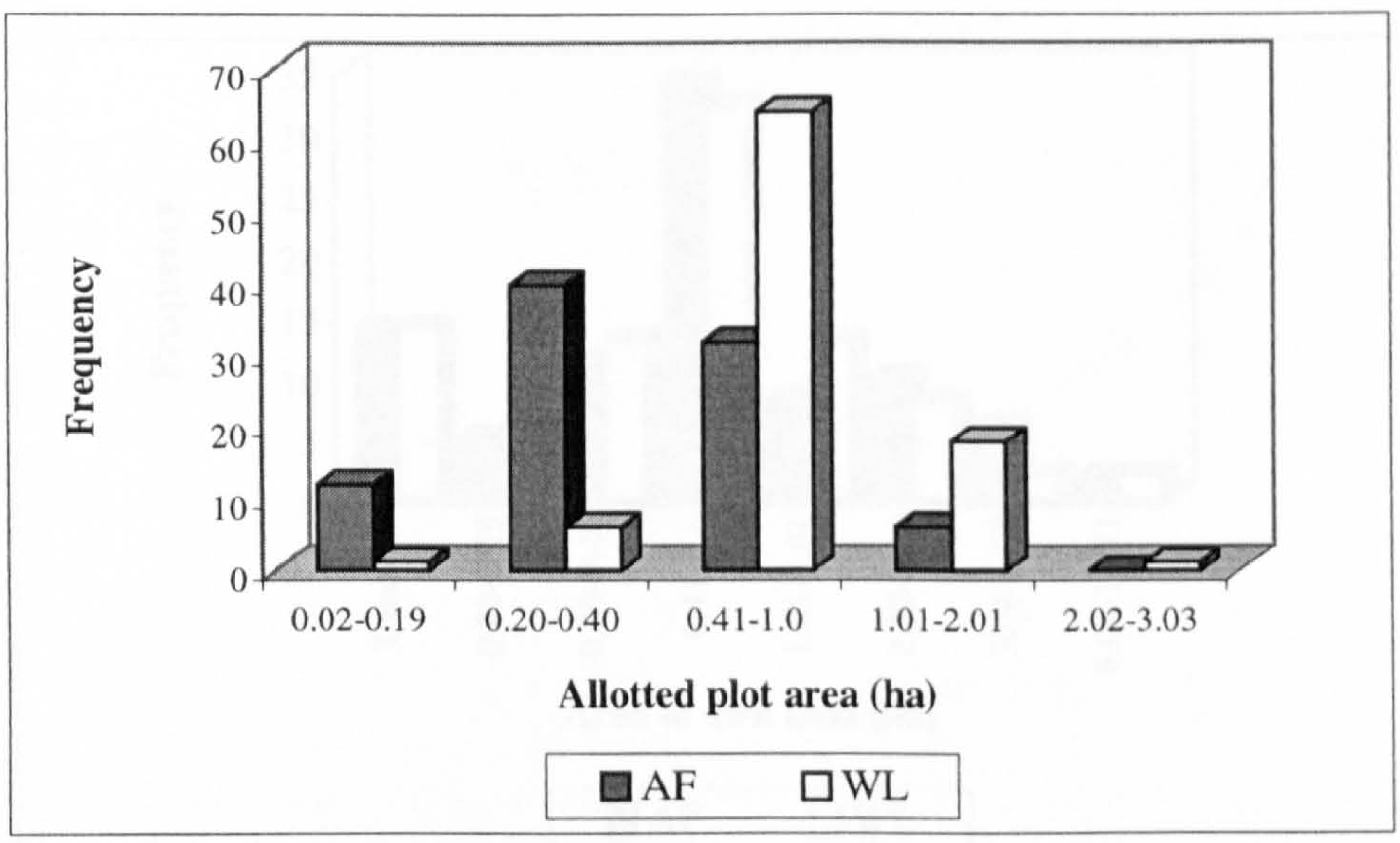
The figure (9.14) shows percentage distribution of participants in different income groups across the five agro-ecological zones encountered, in the order of occurrence. It was found that the income group of Tk. 1,000-2,000 occurs with highest frequency in all the agro-ecological zones, and greatest in the LBT zone among all the zones. Not all the income groups occurred in all the zones. NEBT had nine income groups, whereas LBT had only six income groups. It also shows that the maximum percentages of participants having low incomes were found in the LBT zone and minimum in the HBT zone. Detailed discussion on income inequality is presented in Chapter 11.

9.5 Land holding

The participants in the social forestry project have been accepted on the understanding that they have no land, other than their homesteads. An announcement was made and written application was asked from the local people for being considered as participants. The lands on which this TANDP has been implemented are government forest lands, belonging to the Bangladesh Forest Department. But most of the land was encroached upon by local people, some of whom were influential in the local context. The encroachers were practising agriculture in the government forest land. It was practically very difficult to evacuate the encroachers from the land and start planting. So, what had actually happened is that many farmers with large land holdings had to be taken as participants in the project.

This section first describes the land allotted to the participants, which has been shown graphically in Figure 9.15.

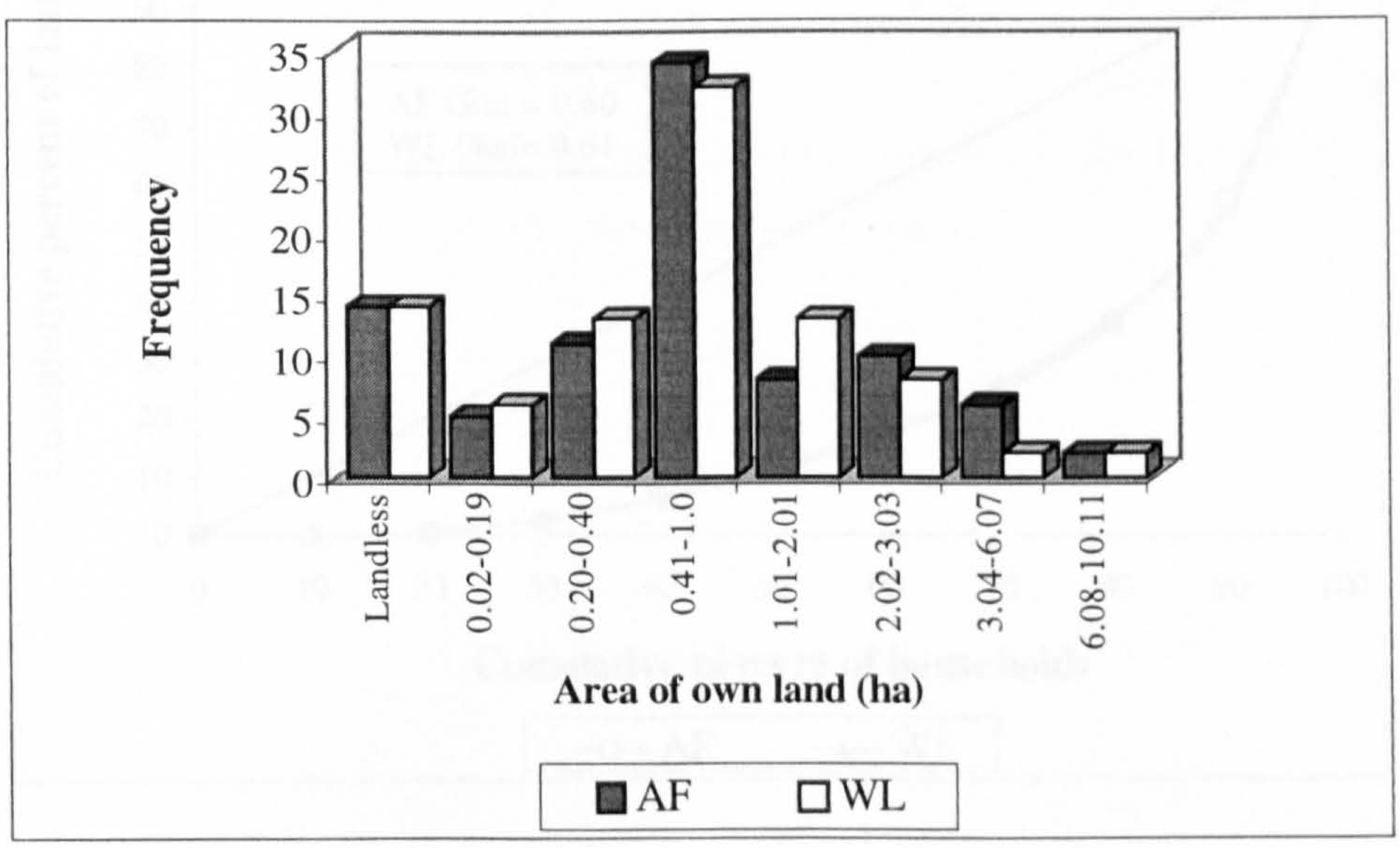
Figure 9.15 Area of plot allotted to the AF and WL participants



Plots of land were allocated to the participants in the order they were available in different locations, and sometimes also depending on who was encroaching what area of land. People were reluctant to give up land from their temporary possession. So, there was not any fixed area of plot allocated for each participant. As visualised from the figure (9.15), WL participants were given larger plots, compared to AF participants. The land classes used here are being widely used by the BBS (BBS 1998b, BBS 1999b). AF plots ranged in area from 0.06 ha to 1.40 ha; the average plot size was found to be 0.4 ha. WL plots were found in the range of 0.17 to 2.02 ha and with an average size of 0.7 ha. Maximum AF participants (44%) had plots in the range of 0.2-0.4 ha, whereas WL participants mostly (71%) had plots ranging from 0.41 to 1.0 ha. Only one WL participant had his plot of an area of over 2 ha. There was highly significant difference between the plot area of AF and WL participants (χ^2 value 51.86 at df = 3) at the 0.01 level of significance. This apparent difference in area of plots can be attributed to the fact that different individuals were encroaching different area of land before being accepted as participants in to the social forestry project.

As discussed earlier, few of the participants were genuinely landless, for whom the project was designed. Figure 9.16 depicts the ranges of own land possessed by the participants.

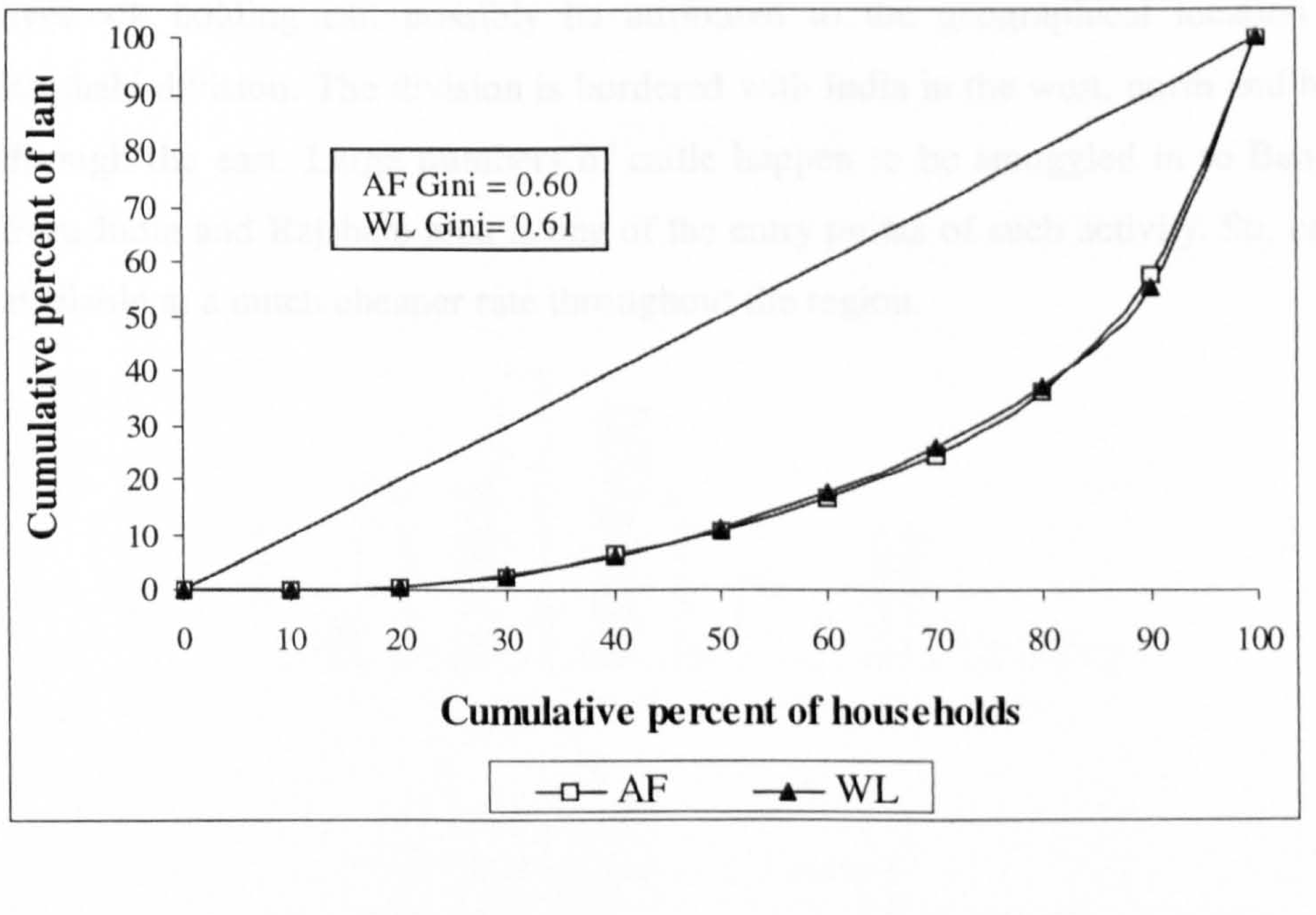
Figure 9.16 Area of own land possessed by the AF and WL participants.



Only about 16% of participants from both the schemes were landless (Figure 9.16). The rest were holding land of varied area, which was up to 6.48 ha for AF farmers and 8.10 ha for WL farmers. On an average, AF farmers had their own land of 0.95 ha and those from WL, 0.86 ha. However, there was no significant difference between own land holding of the AF and WL participants (χ^2 value 3.06 at df = 6).

As own land holding is an individual matter, where the project or project personnel had no influence, an attempt was made to explore the distribution of own land of the participants (Figure 9.17). It was found that land was highly unequally distributed among both the AF and WL farmers (Gini co-efficient 0.60 for AF farmers and 0.61 for WL farmers respectively). This implies an expected, similar socio-economic background of participants in both the schemes throughout the study area. The figure shows that the bottom 20% of the farmers possessed no land at all of their own, while the top 10% of the farmers possessed 57% and 55% of all available own land among the AF and WL farmers.

Figure 9.17 Lorenz curves for own land holding of AF and WL participants



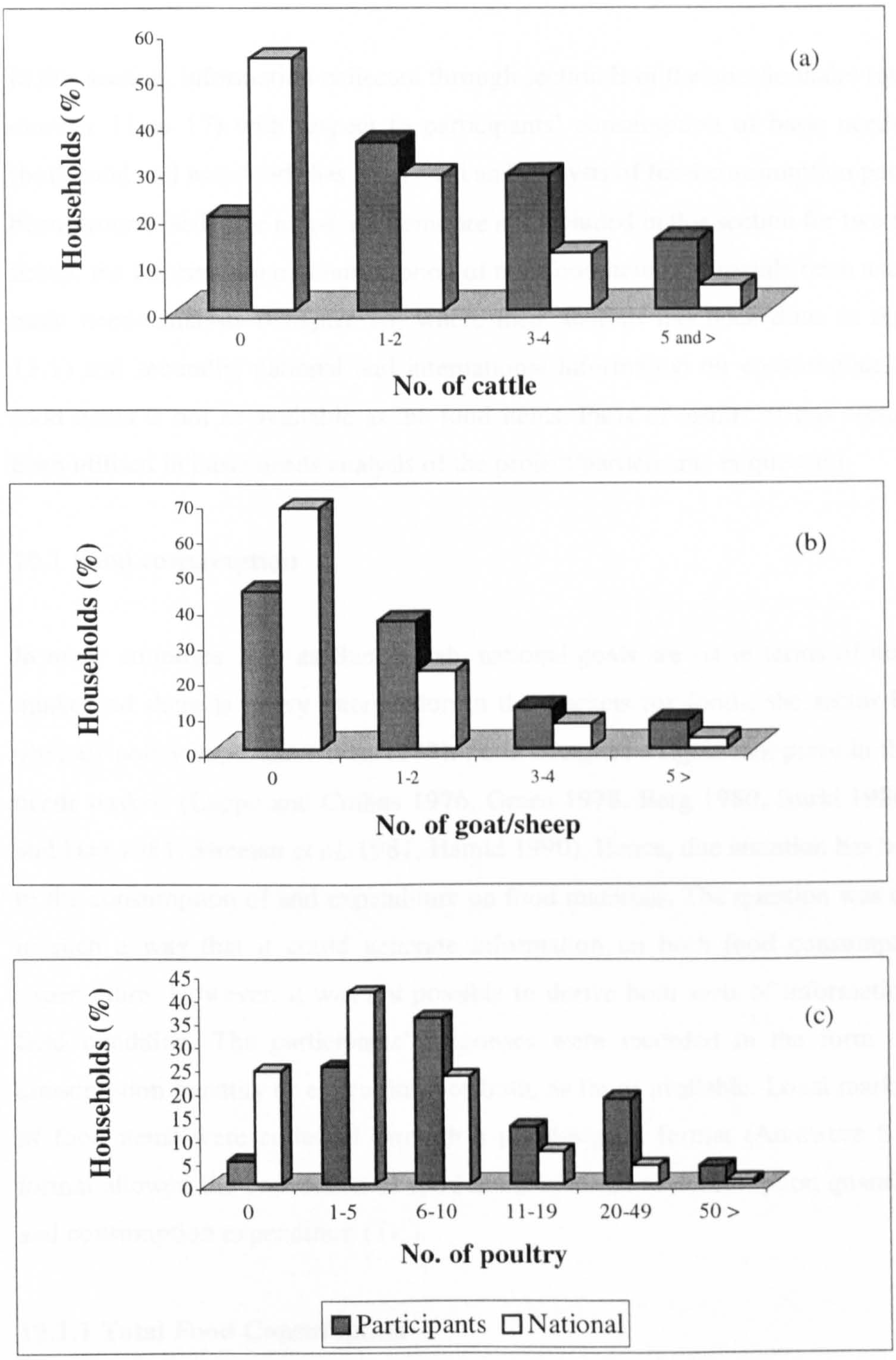
9.6 Livestock details

Data on the possession of cattle, goat/sheep and poultry of the participants have been collected through the questionnaire as well. The collected data have been compared with national rural figures as published in the 'Census of Agriculture and Livestock 1996' (BBS 1999b) and are presented in Figure 9.18.

In terms of households possessing no cattle, no goat/sheep and no poultry, the participants were found to be in a better condition as compared with the national rural situation, having smaller proportions of no animals in each of the three categories (Figure 9.18 [a], [b] and [c]). In fact, the participants were possessing greater proportions of cattle and goat/sheep in all the higher possession classes (1-2, 3-4 and 5 and above). The only exception in this state was found in the case of poultry. Participants were observed to be holding 30% fewer poultry in the range of 1-5 (Figure 9.18 [c]). But in the higher four ranges, participants had greater proportions of poultry in contrast with national rural figures.

This apparent better situation of the social forestry participants in terms of livestock holding can possibly be attributed to the geographical location of the Rajshahi division. The division is bordered with India in the west, north and half way through the east. Large numbers of cattle happen to be smuggled in to Bangladesh from India and Rajshahi area is one of the entry points of such activity. So, cattle are available at a much cheaper rate throughout the region.

Figure 9.18 Livestock and poultry details of participants compared with national data



Source: Questionnaire survey and BBS 1999b.

Chapter Ten

Participants' Basic Consumption Needs

In this section, information collected through section B of the questionnaire (questions number 11 to 17) with respect to participants' consumption of basic needs goods (both food and non-food) has been used and analysis of food consumption pattern has been summarised. The non-food items are not included in this section for two reasons: firstly, the information on consumption of non-food items has mainly been used in the basic needs analysis (Chapter 13, where their analysis has been done in Appendix 13.1) and secondly, national and international information on consumption of non-food items is not as available as the food items. Parts of results of this section have been utilised in basic needs analysis of the project/participants in question.

10.1 Food consumption

In many countries such as Bangladesh, national goals are set in terms of nutritional intake and there is heavy intervention in the markets for foods, the sector being of obvious policy importance (Pitt 1983). Food occupies a significant place in the 'basic needs basket' (Lappe and Collins 1976, Green 1978, Berg 1980, Burki 1980, Burki and Haq 1981, Streeten *et al.* 1981, Hamid 1990). Hence, due attention has been paid to the consumption of and expenditure on food materials. The question was designed in such a way that it could generate information on both food consumption and expenditure. However, it was not possible to derive both sorts of information in the field condition. The participants' responses were recorded in the form of either consumption quantity or expenditure or both, as far as available. Local market prices of food items were collected through a pre-designed format (Annexure 8.1). This format allowed the conversion of food items in terms of consumption quantity (gms) and consumption expenditure (Tk.).

10.1.1 Total Food Consumption

Table 10.1 below illustrates the details of per capita, per day consumption of major food items across each agro-ecological zone as well as overall for all zones. The earliest account of a similar type of information for the region now constituting Bangladesh can be found in the work of Chen (1975), where he mentioned cereals (63%) and vegetables (16%) constituting the bulk of a daily food basket.

Table 10.1 Per capita per day consumption of basic food items across agro-ecological zones

Food items	Per capita per day food consumption in agro-ecological zones (gm/head/day)					Average of five AEZs	Percentage of Total food consumed
	OHPP	NEBT	TMF	LBT	HBT		
i. Rice	545	564	543	606	540	560	55
ii. Pulse	20	21	19	21	18	20	2
iii. Oil	11	10	15	17	13	13	1
iv. Vegetable	284	242	199	193	185	221	22
v. Fruit	14	12	16	8	10	12	1
vi. Milk	80	79	98	81	104	88	9
vii. Fish	70	43	56	41	37	49	5
viii. Meat	19	22	26	22	23	22	2
ix. Egg	5	6	7	8	9	7	1
x. Sugar	13	19	18	17	19	17	2
Total (gm)	**1061**	**1018**	**997**	**1014**	**958**	**1010**	**100**

Note: percentage figures rounded to zero decimal place for ease of perception.

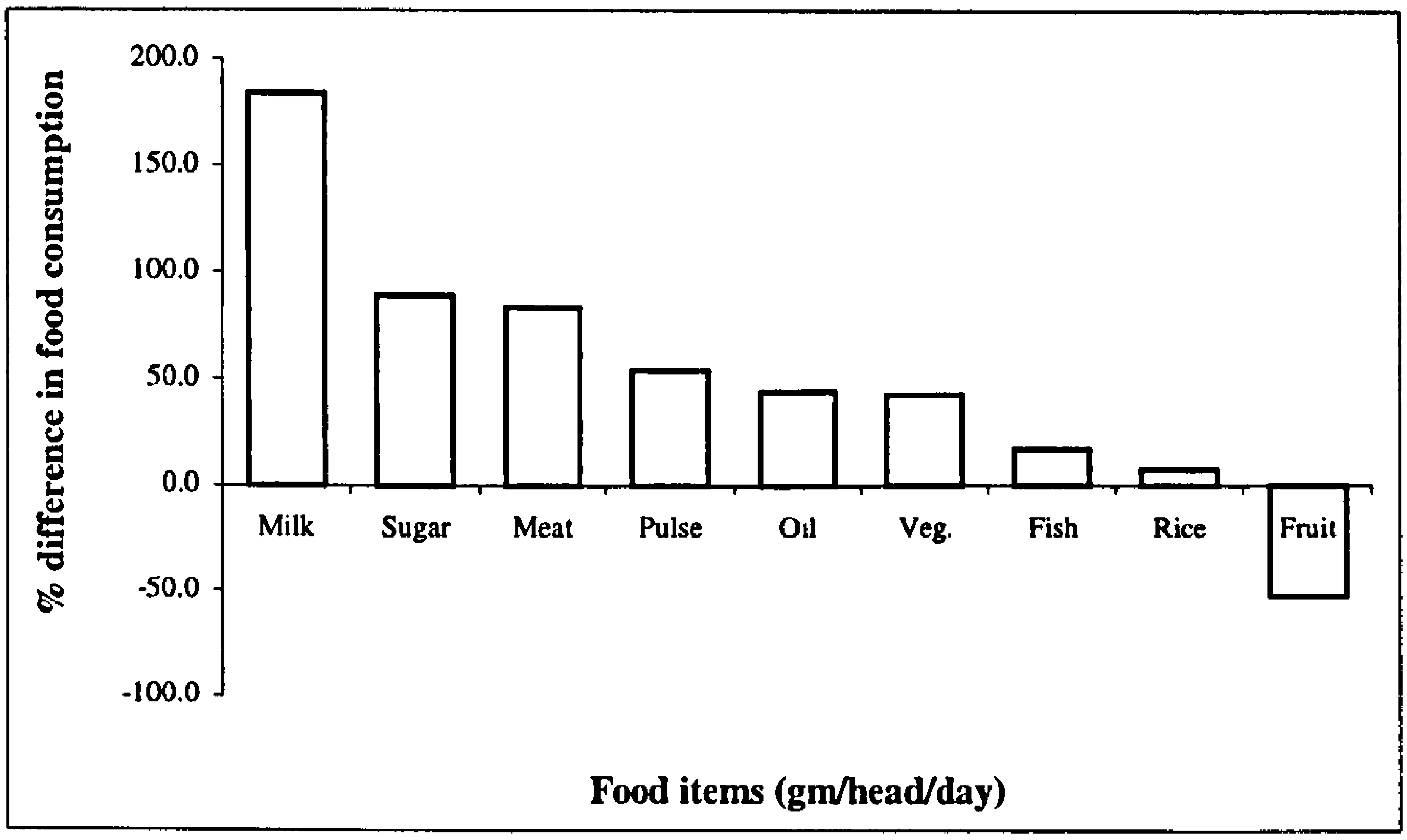
It can be seen from the table that rice constitutes the bulk of daily food consumption (55%) followed by vegetables (22%), milk (9%) and fish (5%). Consumption of pulse and meat are very small, a mere 2%. A very similar pattern of food consumption has been reported by Ahmed (1993) for rural Bangladesh, wherein percentages of total food consumed for all major food items match closely with the present study, except that milk occupied only 1% of that daily food basket. Reasons for this disparity are discussed later in this section. In terms of total food consumed per day, OHPP zone stands atop the others while consumption in HBT zone was found as the lowest.

Table 10.2 Per capita per day consumption of basic food items for agroforestry (AF) and woodlot (WL) participants

Food items	Per capita per day food consumption (gm/head/day)		Average of all participants	Percentage of total food consumed
	AF	WL		
i. Rice	552	563	557.5	55
ii. Pulse	20	20	20.0	2
iii. Oil	14	13	13.5	1
iv. Vegetable	219	215	217.0	22
v. Fruit	15	10	12.5	1
vi. Milk	87	93	90.0	9
vii. Fish	53	47	50.0	5
viii. Meat	24	22	23.0	2
ix. Egg	7	7	7.0	1
x. Sugar	18	17	17.5	2
Total (gm)	**1009**	**1007**	**1008.0**	**100**

Agroforestry farmers were found to be consuming slightly higher food quantities in terms of total food consumed, compared to the woodlot farmers, which can be accounted to their greater intake of vegetables, fruits and fish. However, total quantity of food consumed for the two categories of participants were similar to that of across the five agro-ecological zones. Also the percentage share of food consumed were the same for the two forms of presentation (Table 10.1 and 10.2).

Figure 10.1 Difference between observed and national food consumption as percents of national consumption

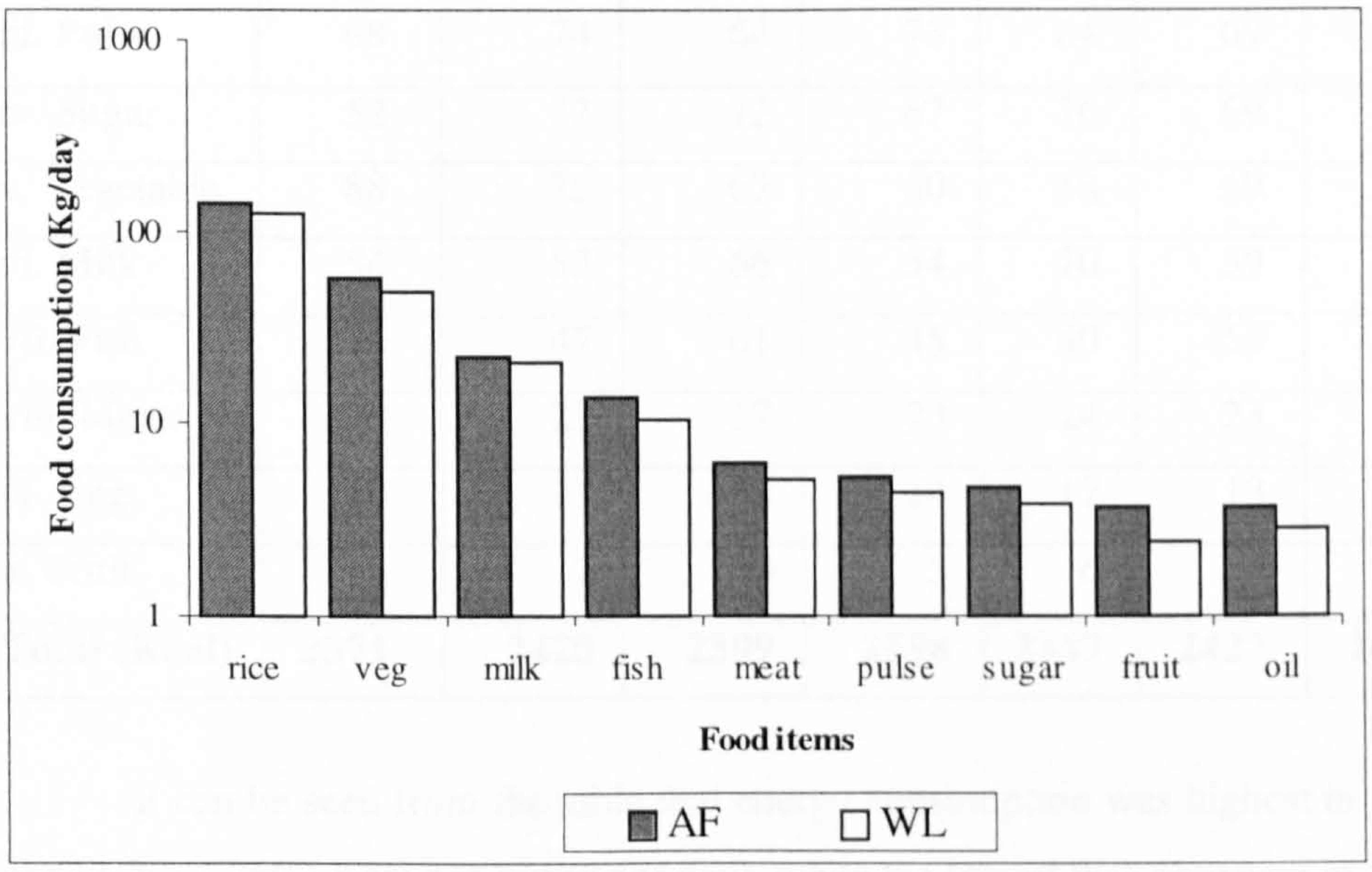


Food intakes of participants were compared with those of average rural households, which revealed that the participants were consuming significantly higher quantities of each food item except for fruits. Total food consumption was also found to be higher for the participants, 1010 gms per capita per day as compared to 911 gms (BBS 1998a) for a rural individual. This implies better food consumption of the participants in terms of quantity of food, compared to national rural consumption. Figure 10.1 presents differences between per capita, per day food consumption of the participants and those of an average rural individual in Bangladesh, as a percent of the rural one's consumption. Highest percentage difference was observed for milk consumption, followed by sugar and meat (184%, 89% and 83% respectively) consumption. These higher consumptions can be attributed to two interrelated factors:

- proximity of Indian border to the study area;
- rampant smuggling of cattle and sugar (among other goods) from India to Bangladesh through borders in that region.

The incidence of cattle and sugar smuggling in Rajshahi region from the Indian state of West Bengal has been witnessed by the author during data collection and reported by Chowdhury (1992) as well. As a consequence, average cattle-holding in the study region is quite high (3 heads per household), resulting in higher milk consumption and availability of meat (mainly beef) at a relatively cheap rate. On the other hand, lesser fruit consumption can perhaps be ascribed to the fact that fruits produced in the region are mostly sent to the capital city and other more affluent areas, where they can fetch higher prices.

Figure 10.2 Comparison of total food consumption of agroforestry and woodlot participants



Weighted (by sample size; 496 heads for AF and 467 heads for WL) values of total food consumption per day of agroforestry (AF) and woodlot (WL) farmers have been depicted in figure 10.2, which shows that the agroforestry farmers were consuming higher quantities of each food item than the farmers participating in the woodlot scheme. However, there was no significant difference in per capita, per day food consumption between agroforestry and woodlot farmers.

10.1.2 Energy intake

Energy consumption of the participants from major food items across all sampled agro-ecological zones has been presented in Table 10.3.

Table 10.3 Per capita per day energy consumption from basic food items across agro-ecological zones

Food items	Energy consumption in AEZs (Kcal/head/day)					Average of five AEZs	Percentage of total energy consumed
	OHPP	NEBT	TMF	LBT	HBT		
i. Rice	1896	1961	1888	2105	1876	1945	80.1
ii. Oil	98	93	134	152	118	119	4.9
iii. Pulse	68	74	66	73	64	69	2.8
iv. Sugar	52	77	72	67	76	69	2.8
v. Vegetable	88	75	62	60	58	69	2.8
vi. Milk	54	53	66	54	70	59	2.4
vii. Fish	76	47	61	45	40	54	2.2
viii. Meat	20	22	27	23	24	23	1.0
ix. Egg	10	11	13	14	17	13	0.5
x. Fruit	9	7	10	5	6	7	0.3
Total (Kcal)	**2371**	**2420**	**2399**	**2598**	**2349**	**2427**	**100.0**

It can be seen from the table that energy consumption was highest in the LBT zone (about 2600 Kcal per capita per day), while the lowest was observed in the HBT zone (about 2350 Kcal per capita per day), wherein total food consumption was also lowest (Table 10.1). Even this lowest energy consumption is about 11% higher than the threshold level energy requirement of 2122 Kcal for Bangladesh (BBS 1998a, 1999a). Energy intakes of the participants in different agro-ecological zones were significantly different at the 5% level of significance (t value 5.00 at 179 df).

Average energy intake for all participants stood at 2427 Kcal/head/day, which is also 14% greater than the average minimum energy requirement for Bangladesh. However, this average energy intake is approximately 13% deficient compared with the 2780 Kcal suggested by the WHO (1985) for a subsistence farmer with moderate activity work. The bulk of the energy consumed is contributed by rice (80%), followed by a much lesser share of 5% by edible oil (mostly mustard oil), and then by almost equal parts (2-3%) contributed by pulses, sugar, vegetables, milk and fish. Meat, constituting 2% of the typical daily food consumed, provides mere 1% of daily energy. Contributions of egg and fruits were found to be negligible.

Table 10.4 Per capita per day energy consumption from basic food items for agroforestry (AF) and woodlot (WL) participants

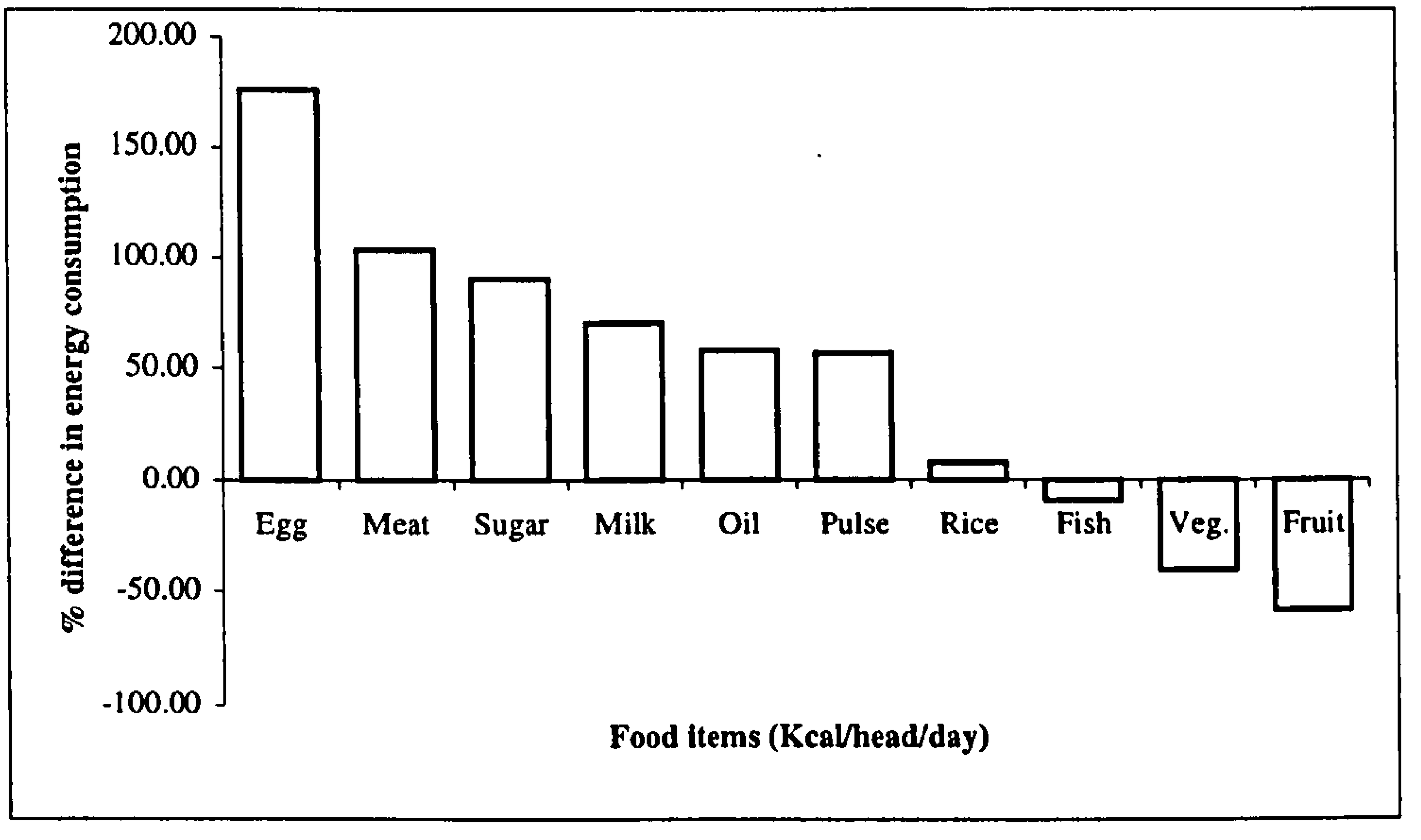
Food items	Energy consumption (Kcal/head/day)		Average for all participants	Percentage of total energy consumed
	AF	WL		
i. Rice	1919	1958	1939	79.9
ii. Oil	127	113	120	4.9
iii. Sugar	72	68	70	2.9
iv. Pulse	70	68	69	2.8
v. Vegetable	68	67	68	2.8
vi. Milk	58	62	60	2.5
vii. Fish	58	51	55	2.2
viii. Meat	25	23	24	1.0
ix. Egg	13	13	13	0.5
x. Fruit	10	7	9	0.4
Total (Kcal)	**2420**	**2430**	**2425**	**100.0**

Woodlot participants have been shown to be consuming slightly higher energy per day compared with the agroforestry participants. But woodlot farmers were consuming lesser total food per day (Table 10.2). This is because the woodlot farmers were deriving greater energy from rice and milk respectively. Nonetheless, agroforestry and woodlot participants did not differ significantly in daily energy intake. Percentage shares of food items in terms of daily energy intake were analogous to those found across different agro-ecological zones.

Energy intakes of participants were compared with those of average rural households, which revealed that the participants were consuming significantly higher quantities of energy from each food item except for from fish, vegetables and fruits.

Also there were highly significant differences between the energy consumption pattern Oof the participants and an average rural household. Total energy consumption was also found to be higher for the participants, 2427 Kcal per capita per day as compared to 2204 Kcal (BBS 1998a) for a rural individual. Figure 10.3 presents differences between per capita, per day energy consumption of the participants and those of an average rural individual in Bangladesh, as a percent of the rural one's consumption.

Figure 10.3 Difference between observed and national energy consumption as percents of national consumption



The highest percentage difference in energy intake was observed for egg, followed by meat and sugar (176%, 103% and 91% respectively) consumption. The participants were deriving lesser amounts of energy from fruits, vegetables and fish respectively compared with the national rural figures. This is perhaps because fruits and fish are dearer food items which do not come into daily food basket of these farmers. Availability of fish is another limiting factor for this lesser consumption. Rajshahi region supplies with only 18% of all inland fish catches and 9% of river catches of the whole fish production of the country (BBS 1999a). This is the background reason for scarcity and costliness of fish around the survey area.

10.1.3 Protein intake

Protein consumption of the participants from major food items across all sampled agro-ecological zones has been presented in Table 10.5.

Table 10.5 Per capita per day protein consumption from basic food items across agro-ecological zones.

Food items	Protein consumption in AEZs (gm/head/day)					Average of five AEZs	Percentage of total protein
	OHPP	NEBT	TMF	LBT	HBT		
i. Rice	43.64	45.15	43.46	48.46	43.18	44.78	61.80
ii. Fish	12.42	7.65	9.95	7.31	6.49	8.76	12.10
iii. Meat	4.39	4.91	5.97	4.97	5.30	5.11	7.10
iv. Pulse	4.90	5.33	4.76	5.28	4.60	4.97	6.80
v. Veg.	6.19	5.27	4.34	4.20	4.04	4.81	6.60
vi. Milk	2.56	2.53	3.15	2.59	3.33	2.83	3.90
vii. Egg	0.74	0.81	0.99	1.10	1.27	0.98	1.30
viii. Fruit	0.16	0.13	0.18	0.09	0.11	0.13	0.20
Total (gm)	**75.00**	**71.78**	**72.80**	**74.00**	**68.32**	**72.38**	**100.00**

Note: Oil and sugar have been excluded from this presentation since their protein content is zero.

Table 10.5 illustrates that protein consumption was highest in the OHPP zone (75 gm per capita per day), while the lowest was observed in the HBT zone (68 gm per capita per day), wherein total food consumption and energy consumption were also lowest (Table 10.1 and Table 10.3). Even this lowest protein consumption is about 5% higher than the average rural protein consumption of 65 gm/head/day, as enumerated in the last household expenditure survey (BBS 1998a). However, there were no apparent difference in protein intake of the participants in different agro-ecological zones.

Average protein intake for all participants remained at 72 gm/head/day, which is also 11% higher than the average per capita protein consumption for rural Bangladesh. More encouraging is the fact that this average protein intake is about 90% higher than the WHO (1985) recommended safe protein intake level of 38 gm. The bulk of the protein consumed is contributed by rice (62%), followed by fish (12%), and then by almost equal parts (7%) contributed by meat, pulses and vegetables. The contribution of egg and fruits were found to be negligible, as in the case of energy intake.

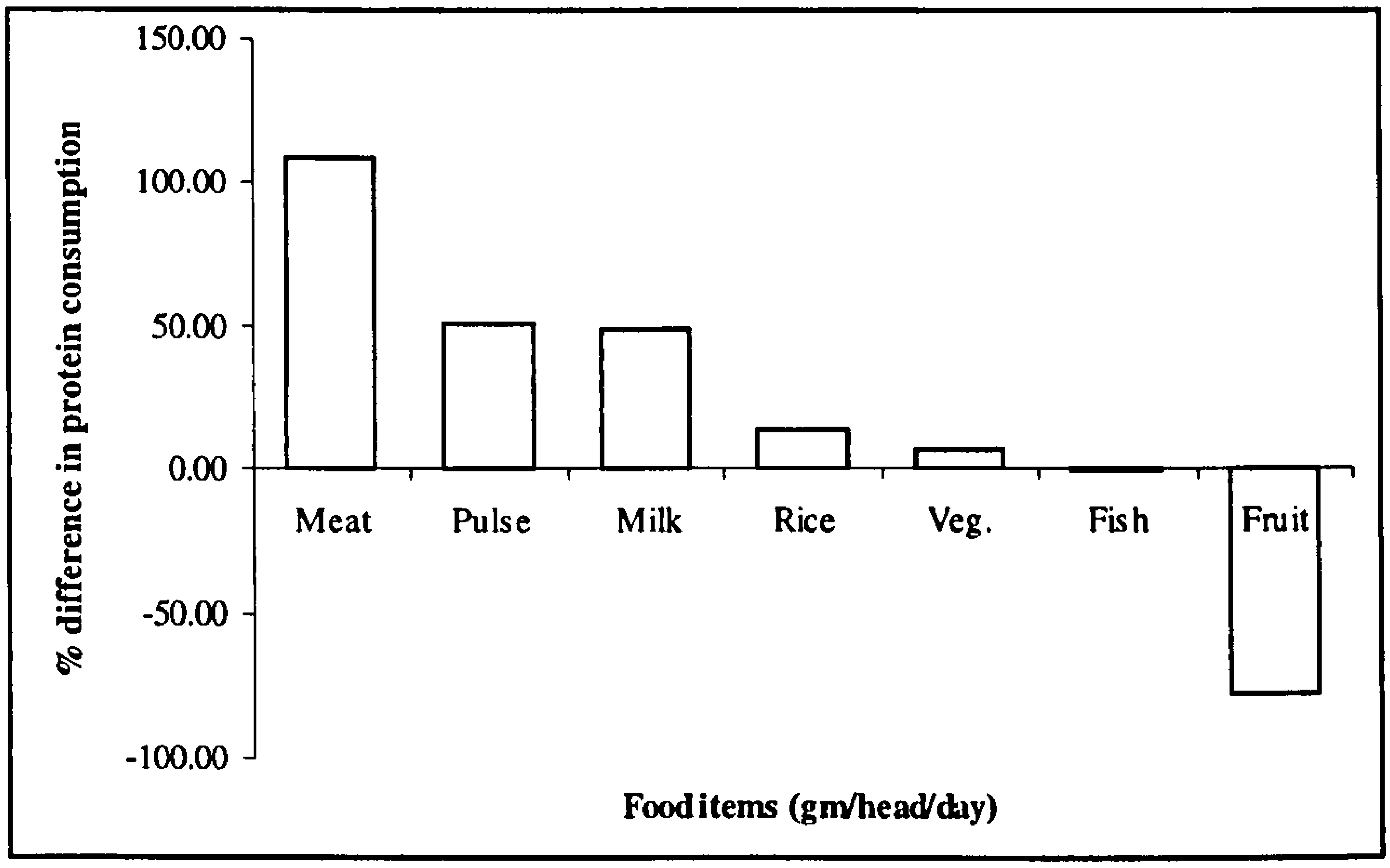
Table 10.6 Per capita per day protein consumption from basic food items for agroforestry (AF) and woodlot (WL) participants.

Food items	Protein consumption (gm/head/day)		Average for all participants	Percentage of total protein consumed
	AF	WL		
i. Rice	44.18	45.09	44.64	61.70
ii. Fish	9.38	8.23	8.81	12.20
iii. Meat	5.43	5.07	5.25	7.30
iv. Pulse	5.02	4.9	4.96	6.90
v. Vegetable	4.78	4.68	4.73	6.50
vi. Milk	2.78	2.97	2.88	4.00
vii. Egg	0.95	1	0.98	1.30
viii. Fruit	0.17	0.12	0.15	0.20
Total (gm)	**72.69**	**72.06**	**72.38**	**100.00**

Protein consumption patterns of agroforestry and woodlot participants have shown a very similar pattern, consuming about 72 gms of protein per capita per day from major food items (Table 10.6). Agroforestry and woodlot participants did not differ significantly in daily protein intake. Percentage contributions of food items in respect of daily protein intake were similar to those found across different agro-ecological zones. Rice alone provided some 62% of daily protein consumption, while fruits provided the lowest part (0.2%).

Protein intakes of participants were compared with those of average rural households, which revealed that the participants were deriving higher quantities of protein from each food item except for from fruits. Total protein consumption was also found to be nearly 11% higher for the participants, 72.37 gms per capita per day as compared to 65.38 gms (BBS 1998a) for a rural individual. Figure 10.4 presents differences between per capita, per day protein consumption of the participants and those of an average rural individual in Bangladesh, as a percent of the rural one's consumption.

Figure 10.4 Difference between observed and national protein consumption as percents of national consumption



The highest percentage difference in protein intake was observed for meat, followed by pulse and milk (109% and 50% respectively) consumption. The participants were deriving lesser amounts of protein from fruits and fish respectively compared to the national rural figures. This is perhaps because fish is the most costly and less available food item in the region which the farmers cannot afford to eat as required by the minimum standard. Besides, the Rajshahi region could produce only about 19% of the total fruit production of the country with 24.7% of the total population in Bangladesh during 1997-98 (BBS 1999a). Majority of this production is contributed by the abundant supply of mango (49% of the country's production) and litchi (25%), with minor shares of coconut and pineapple. That is more why fruits are rare commodities in the region.

10.1.4 Income elasticity of demand of food items

Per capita, per day consumption of each of the common food items (logarithms of) were regressed against per capita monthly income (logarithms of) for each of the households in agroforestry and woodlot schemes to derive cross-sectional income elasticities of the food items, and the results have been presented in Table 10.7.

It can be seen from the table that income elasticity for the different food items for the agroforestry farmers ranges from –0.03 to 0.68, for the woodlot farmers from 0.11 to 0.66, and from 0.03 to 0.65 for all sampled households considered together. While defining the concept of 'income elasticity of demand (η_y)', Bannock *et al.* (1984) have noted that one expects the income elasticity of a good to be positive (increase in income causes increase in demand), i.e., a normal good, or, zero (increase in income causes no change in demand), i.e., a basic good. In some cases the elasticity may be negative, at least for some levels of income, where the goods are termed as 'inferior goods'.

Table 10.7 Income elasticities of food items for AF and WL participants

Food items	Income elasticity (η_y)			Level of significance			R^2		
	AF hhs	WL hhs	All hhs	AF hhs	WL hhs	All hhs	AF hhs	WL hhs	All hhs
Rice	-0.03	0.11	0.03	ns	**	ns	0.00	0.05	0.00
Pulse	0.23	0.34	0.28	**	***	***	0.06	0.12	0.09
Ed.oil	0.26	0.23	0.26	***	***	***	0.14	0.09	0.14
Veg.	0.05	0.14	0.09	ns	*	*	0.00	0.04	0.02
Fruits	0.57	0.63	0.58	***	***	***	0.29	0.17	0.23
Milk	0.43	0.29	0.36	***	*	***	0.19	0.05	0.12
Fish	0.37	0.66	0.49	***	***	***	0.14	0.31	0.22
Meat	0.68	0.61	0.65	***	***	***	0.36	0.29	0.33
Sugar	0.33	0.37	0.35	***	***	***	0.13	0.18	0.15
Kcal/hd	**0.06**	**0.17**	**0.11**	ns	***	***	**0.03**	**0.14**	**0.08**

ns = not significant
* = significant at 10% level
** = significant at 5% level
*** = significant at 1% level

Based on the above concept, rice for the agroforestry farmers was found as the only inferior good in the whole analysis. Such a negative income elasticity of demand is natural at occasions for a very basic food item like rice. All the other food items in all three phases of the analysis have been found as normal goods, with positive income elasticities. Cheaper and most frequently consumed food items like rice and vegetables have shown corresponding lowest values of income elasticity ($\eta_y = 0.03 - 0.14$). Goods in the medium price range (pulse, edible oil, milk and sugar) have shown η_y in the range of 0.23 to 0.43, commensurate with their demand and income level of the farmers. Goods in the high price range (fruits and meat) have resulted in η_y in the expanse of 0.57 to 0.68. According to Talukder (1993), all these food items fall under the category of 'preferred necessity' or 'non-preferred necessity' on the virtue of the elasticity condition of '$0 \leq \eta_y \leq 1$'.

The results of this analysis match closely with those of Knudsen and Scandizo (1982) and Bouis (1994), where they have reported that cross-section estimates of income elasticites for food staples are often in the range of 0.3-0.6 in the developing countries. Pitt *et al.* (1990) have found a mean calorie-income elasticity of 0.12 in their study of inequality in intrahousehold food distribution in Bangladesh. The present study has come up with a figure of 0.11 for the same analysis, which is analogous to the research finding just mentioned.

The R^2 values presented in Table 10.7 explain the variability in quantity consumed of the food items that is correlated with the variability in income. The R^2 value of 0.00 for rice for all households from both the schemes is quite commensurate with the fact that whatever the level of income of the households or whatever the change may be in household income situation, rice will remain as the most basic food item in these rural farmers' daily menu. Low R^2 values of vegetables (0.02) and pulse (0.09) carry the same message. On the other hand, high R^2 values of fish (0.22), fruit (0.23) and meat (0.33) establish the fact that the variability in their consumption can be explained more by a change in income, the goods being dearer food items in a rural setting.

However, it should be borne in mind that nutrient intake of poor populations will not necessarily improve rapidly with increasing income (Behrman and Deolalikar 1987, 1989) as has been maintained by the World Bank and others on account of overstated nutrient elasticities arising from aggregate estimates of food expenditure.

Chapter Eleven

Assessing the Poverty Situation and Income Distribution of the Social Forestry Participants

11.1 Introduction

As a multidimensional phenomenon, poverty is defined and measured in a multitude of ways. Given the complexity of the issues, the best introduction to poverty measurement is through the multifaceted nature of the phenomenon and the different concepts of it (Lok-Dessallien 1999).

Economists commonly define poverty in terms of income or consumption deprivation relative to a monetary threshold, the so-called poverty line (Anand and Morduch 1996). This criterion specifies the (private) resources required to purchase a bundle of essential goods (food, clothing, shelter etc.) – often referred to as 'basic needs'. Obviously, some adjustments to money income or consumption would be necessary to reflect command over commodities in particular circumstances. For example, prices for the same good vary across regions. Thus, personal incomes must be adjusted by price indices to get a measure of 'real'[1] income.

Adjustments are also needed to account for household composition. Data on incomes and expenditures are usually collected at the household level through household income and expenditure surveys. There are, thus, no direct estimates of the command over resources or consumption of *individuals*. Economists approach this informational gap by making assumptions about intra-household allocation of resources. Two assumptions are typically made in the literature about the sharing of household income and household consumption: either, (i) that it is distributed *equally* among all members (Hassan *et al.* 1985, Lanjouw 1999); or (ii) that it is distributed *in proportion* to the 'needs' of individual members. In (ii), the variation in personal needs – for example, between children and adults – is recognised and an "equivalence scale" is constructed to reflect differential needs according to the age and sex of individuals (Deaton and Muellbauer 1980, Fisher 1987, Lewbel 1989).

[1] Income measured in terms of the real goods and services it can buy.

11.2 Poverty concepts

11.2.1 Absolute and relative poverty

Poverty can be viewed in absolute and relative terms. Absolute poverty refers to subsistence below minimum socially acceptable living conditions, usually established based on nutritional requirements and other essential goods. The Copenhagen Declaration of the World Summit for Social Development (UN 1995), which was signed by the governments of 117 countries, has attempted to define 'absolute poverty' as 'a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to social services'. By contrast relative poverty compares the lowest segments of a population with upper segments, usually measured in income deciles or quintiles.

Sen (1994) points out that poverty can be an absolute notion in the space of capabilities, though relative in that of commodities or characteristics. For example, households incapable of obtaining sufficient food for survival are considered absolutely poor. However, the cost and composition of that food basket may vary considerably between households across different groups, regions and countries.

Another facet of relative and absolute poverty pertains to changes in circumstances. For instance, if prices rise faster than incomes, the well-being of some households classified as relatively poor may decline to levels formerly associated with absolute poverty, without a corresponding change in status since the living standards of the absolute poor have also declined proportionally. A similar situation arises when cultural or status values change over time. To quote Streeten (1994), 'Absolute deprivation is a function of relative advantage.'

11.2.2 Primary and secondary poverty

Primary poverty is defined as the inability to command enough income (or expenditure) to buy the bare necessities of life. This poverty line is usually constructed by estimating the cost of a minimum diet of essential food items and the fuel needed to prepare it (Streeten 1990). This can be done either in a rather mechanical way, by calculating the cost of a strictly minimum needs diet; or, it can be done better by allowing for the behaviour of actual consumers and observing how they spend their money on food.

Secondary poverty can be perceived as a situation in which real incomes are adequate to buy the minimum needs basket but for one reason or another, the poor do not spend the money on satisfying these needs. Primary poverty is *insufficient* resources, secondary is *inefficient* use of adequate resources. The distinction gained in sharpness when Sen (1987) analysed the standard of living as 'capabilities' and 'functionings', which refer to the capacity to convert resources into well-being. Primary poverty refers to lack of resources, while secondary refers to a flaw in the conversion mechanism.

11.2.3 Some related concepts

Poverty and inequity. Whereas poverty refers to different forms of deprivation that can be expressed in a variety of terms (e.g. income, basic needs etc.), equity is concerned with distribution within a population group. Despite the clear distinction between the two concepts, analysis of poverty often employs indicators of equity because of the inherent linkages between the two.

Poverty and vulnerability. Although these two terms are often related, they are not synonymous. Some groups may be at risk of becoming poor because of inherent vulnerabilities (i.e., different types of discrimination based on class, gender, ethnicity etc.). Furthermore, certain combinations of vulnerability may be strongly correlated with poverty, such as female-headed households. But not all members of a particular vulnerable group are invariably poor. In short, poverty relates to deprivation, while vulnerability is a function of external risks, shocks, stresses and internal defencelessness.

Poverty and exclusion. Social exclusion can be defined within the concept of poverty focusing on those aspects of social deprivation that impede people from participating fully in their society and its development. On another end, social exclusion encompasses a much broader range of issues, including poverty itself. Social exclusion also refers to issues of participation, empowerment and social rights.

Poverty and underdevelopment. The distinction between poverty and underdevelopment depends on how each is defined. When defined in broad human deprivation terms, poverty is often viewed as a form of underdevelopment. The *Human Development Report 1997* (UNDP 1997) distinguishes between the two concepts by associating the former with individuals and the latter with an aggregate perspective. Given the close relationship between these two concepts, many poverty indicators are the same as those used to measure underdevelopment.

11.3 Approaches to measuring poverty

Mathematical measures of poverty and inequality embody values that reflect the historical, political, social, intellectual and ethical forces prevalent at the time of their formulation , so that policy makers may select measures of poverty and inequality that are consistent with their values (Blackwood and Lynch 1994). It is, however, important to make explicit the value judgements implicit in the measures. Different approaches to measuring poverty exist, which are discussed below in brief.

11.3.1 Income approach – poverty measurements have been dominated by the so-called *income approach*, which assumes that individuals and households are poor if their income or consumption falls below a certain threshold, usually defined as a minimum, socially acceptable level of well-being by a population group. The most widely used income-poverty indicators are the headcount index and per capita GNP. The *headcount index* is based on a poverty line that is established by costing a minimum basket of essential goods for basic human survival, using income, consumption or expenditure data of non-poor households. The incidence of poverty is then calculated as the percentage of population whose incomes fall below that threshold.

Income indicators can also be used to measure the depth and severity of poverty. The *poverty gap index* measures the degree to which the mean income of the poor differs from the established poverty line (i.e., depth of poverty). Distributionally sensitive measures, such as *squared poverty gap index*, capture differences in income levels among the poor (i.e., severity of poverty).

In the absence of household survey data, income poverty is sometimes measured in terms of *per capita GNP*. However, this latter indicator is a very crude measure and can often be misleading since it is possible for per capita GNP to grow while personal incomes remain static or even decline among particular population groups. A related concept, *GNP growth rate*, was utilised by Ahluwalia and Chenery (1974) to address the joint problems of growth and income distribution. Their GNP based model measured more the welfare improvement of roughly the richest 40% of the population having the greatest share of total income, rather than a measure of welfare improvement of the poorest, whose share of total income is smallest[2]. For these reasons, *per capita personal income* is a preferable aggregate income indicator.

Some of the attractions of income poverty indicators are that they are aggregates of multiple inputs; they are expressed in units that are of immediate and widespread relevance and they are theoretically objective, i.e., they weigh inputs to well-being according to how the 'real world' values them. The limitations associated with income indicators have been extensively documented (Greeley 1994, Ravallion 1994). In short, the drawbacks pertain to price and commodity differentials, the exclusion of non-cash and "free" (such as publicly provided goods and services) items, and the omission of other factors such as time required to obtain a commodity.

Although practitioners agree on the inherent limitations of this approach, it nevertheless continues to be the most widely used means of measuring poverty, partly because of the relative abundance of data and partly because of its simplicity.

11.3.2 Basic needs approach – the basic needs concept of poverty takes the income approach one step further. It defines poverty as the deprivation of requirements, mainly material, for meeting basic human needs (Lok-Dessallien 1999). This approach attempts to address some of the limitations of the income indicator family

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[2] A case commonly found in most underdeveloped and developing economies, and developed ones as well.

by distinguishing between private income, publicly provided services and different forms of non-monetary incomes. The basic needs approach to poverty measurement includes access to such necessities as food, clothing, shelter, schooling, health services, potable water and sanitation facilities, employment opportunities, and even touches on opportunities for community participation.

Basic needs indicators add a wide range of dimensions to income measures. The big advantage of the former over the latter is that they measure goods and services directly in terms of human welfare. For example, a rise in housing or essential transport costs would be counted as a decline in well-being using basic needs indicators, while per capita GNP would record this as an increase.

Some difficulties associated with basic needs indicators are that there is no way of aggregating them meaningfully for purposes of in-country analysis and they are usually expressed in terms that do not trigger the same kind of familiarity as the monetary ones.

11.3.3 Human capability approach – the human capability approach to poverty measurement attempts to measure poverty in terms of outcomes or 'ends'. This approach defines poverty as the absence of basic human capabilities to function at a minimally acceptable level within a society. Emphasis is placed on people's abilities and opportunities to enjoy long, healthy lives, to be literate and to participate freely in their society.

Most capability poverty indicators are straightforward: life expectancy, literacy rates, malnutrition etc. However, the set of indicators associated with participation is more tricky. Participation by the poor in their society does not readily lend itself to quantification. Moreover, measurement of participation by the poor is a difficult task, since their roles are not always highlighted.

The biggest advantage of capability indicators, as a whole, is that they measure well-being in terms of final outcomes rather than as proxies for those outcomes. In addition, many of them are considered mainstream in terms of national statistics, so data are often available. The main disadvantages are similar to those of the basic needs group. There are no perfect aggregates for this family of indicators and they are expressed in terms with varying degrees of familiarity. In addition, some capability indicators are group measures and cannot be used to gauge household or individual well-being (e.g. life expectancy). Furthermore, some of the capability indicators are stock variables, which change slowly over time, thus limiting their usefulness for short- and medium-term poverty monitoring.

11.3.4 Other groups of poverty-related indicators – a range of other poverty-related indicators exists that do not fall neatly into a single family. Many of them have emerged relatively recently and are related to the concepts of enabling and empowerment. Of them, three main groups emerge as particularly relevant to poverty measurement: access by the poor to assets, inequity and governance.

Indicators measuring *access by the poor to assets* can be classified into four types: access to productive assets (i.e., land, capital); access to social and physical infrastructure; access to housing and other consumer durables; and access to common property (e.g. certain aspects of the natural environment). This group of indicators is highly relevant for poverty measurement purposes and relatively straightforward.

Indicators of *inequity* are also highly relevant to poverty measurement. This is partly because one of the purposes of poverty measurement is to identify who are the poor. Indicators of inequity help to do just that, and the relationship between poverty and inequity is such that the latter can be used for making educated guesses about the former in the absence of poverty data. There are three main data sources for measuring inequity: income distribution, disaggregation of other indicators by subgroups, and time-use studies. Regarding income distribution, just as per capita GNP is not the appropriate summary index for determining income poverty, so a change in some summary index of income distribution such as the Gini coefficient is not the relevant measure of the change in income distribution. Here, the relevant measure is the change in the appropriate segment of the Lorenz distribution. Although Lorenz curves are usually used for examining income distribution, they can also be plotted for land distribution, which can be revealing from a poverty perspective.

Disaggregating poverty indicators can provide valuable information for determining specific groups of poor and how they fare over time. Disaggregation may be based on numerous criteria, but the most germane from a poverty perspective are: gender, age, ethnicity and location. Disaggregated data can also shed light on intra-household inequity.

Time-use data reveal how population sub-groups differ vis-à-vis the economic value of their work (i.e., paid or unpaid), types of activities performed and sometimes even intensity of activities. These data are often used for measuring gender equity and intra-household divisions of labour.

Governance indicators span a wide range of issues, most of which have not traditionally been either measured or associated with poverty. Those areas of greatest relevance to poverty measurements are: information circulation, institutional regulations and decentralisation. Indicators of information circulation (e.g. the number of newspapers per 1,000 people and the number of radios per 1,000) provide crude measures of the general availability of information to the public, but do not reflect its quality (or, people's ability to access it). For example, a country may have wide newspaper coverage, but a single political party may tightly control the information they contain. Institutional indicators, such as the number of registered civil society organisations and advocacy groups, can provide a rough gauge of freedom to associate, but they must be carefully interpreted from a poverty perspective. Indicators of decentralisation (e.g. the percentage of national revenue allocated to local governments) must also be carefully interpreted. In some instances, decentralisation indicators may reflect empowerment at the grassroots level, while in other cases it may simply mask multiple levels of administrative inefficiency.

11.4 Do different concepts or indicators really matter?

Studies undertaken by different investigators like Lanjouw and Stern (1991) in a village in India, and by Glewwe and van der Gaag (1990) in Cote d'ivoire suggest that the concepts and indicators used to measure poverty do matter a lot in identifying the poor. The overall conclusion that they reach is that different people will be deemed poor when using different conceptions of poverty/deprivation.

Thence the question arises how do the anti-poverty strategies associated with different concepts of poverty diverge? If one's concept of poverty is primarily lack of household income and if one settles for income or expenditure as the single most important indicator of poverty, then the logical strategies to reduce poverty would centre on *economic mobility*. If, on the other hand, one views poverty as having its root in the broader notion of human deprivation, then the indicators to measure poverty would be largely of the human capability poverty group, and the logical strategies to address poverty would centre around building human capabilities to achieve *social mobility*. Although there may be overlap between some of the constituent elements of these two anti-poverty strategies, the underlying assumptions and overall thrust are distinct.

11.5 Poverty lines

Poverty lines are widely perceived as occupying a central role in poverty analysis. In fact, setting a poverty line often receives the bulk of attention and intellectual effort in studies of poverty (Lanjouw 1999). A poverty line is a tool for measuring poverty (Ravallion 1992) which allows the calculation of poverty rates (e.g. the proportion of population that is poor, or some other more complex poverty measures) (Lanjouw 1999). It is generally taken to be a threshold, in terms of income or wealth, below which people can be considered to be 'poor'. Poverty lines can be identified prescriptively, in accordance with some norm, or descriptively, on the basis that people who fall below the line appear to be poor.

Poverty lines may be identified on the basis of observation or the assessment of needs, but some poverty lines have been adopted primarily because they provide a useful or plausible indicator of needs (Gordon and Spicker 1999). The World Bank's estimate of US$370 p.a. is not based on a precise assessment of needs: it has been multiplied up from the arbitrary figure of US$31 per month, a dollar a day (World Bank 1990) to be assessed as the PPP (purchasing power parity)[a]. Those with incomes per capita of less than US$370 are deemed 'poor', while those with less than US$ 275 per year are considered as 'extremely poor'. This standard is simple to comprehend and apply. It does not depend on the arduous and continuous collection and compilation of data about types as well as amounts of resources, changing patterns of necessities and changing construction of standards of living. On the other hand, it is not truly 'global' and is assumed to be applicable for only the poorest countries.

Poverty lines are generally seen as indicators rather than precise measures of poverty, because lack of income is not usually thought of as a sufficient definition of poverty and there is also broad agreement that income is an inadequate measure of welfare (Greeley 1994). Attempts to apply poverty lines with greater precision, for example, to the position of women within households, make the application of poverty lines progressively more complex; there is of course a trade-off between sensitivity and applicability. Both cannot be achieved at the same time with the highest degree of precision.

The conventional approach to the development of a poverty line is to define it in terms of a consumption, expenditure or income level sufficient to meet primary human needs (Greeley 1994). There are very strong practical arguments in favour of consumption as the unit of measure; however, income, when properly calculated, is satisfactory for poverty line estimation. This is usually defined as a point on the income distribution curve where, given the share of food and non-food expenditure in total expenditure, income is sufficient to buy a nutritionally adequate diet. In other words, the poverty line consists of the cost of a nutritionally adequate diet multiplied by the inverse of the Engels's co-efficient for food (Hagenaars 1986). Since this co-efficient tends to fall as income rises, some form of averaging across income size groups is often involved. Otherwise, the poverty line would tend to rise from one income size group to the next.

11.5.1 Relative and absolute poverty lines

Poverty lines can be set in relative and absolute terms (Ravallion 1992). Relative poverty refers to the position of an individual or household compared with average income in the country. Relative poverty lines will vary with the level of average income. Absolute poverty refers to the position of an individual or household in relation to a poverty line whose real value is fixed over time. An absolute poverty line is based on the cost of a minimum consumption basket, centred on the food necessary for a recommended calorie intake. The poverty line is then augmented by an allowance for non-food needs, consistent with the spending patterns of the poor.

In poor countries, use of relative poverty lines diverts attention away from the basic needs of the poorest households (Greeley 1994). By contrast, the absolute poverty line is explicitly linked to a specific welfare level. Anchoring the poverty line in this way allows one to make comparisons over time and across groups (Ravallion 1998). Most countries that have officially recognised poverty lines define these in an absolute sense, interpreting them as a fixed standard of living. Particularly in developing countries, the notion of some level of living below which one can be considered poor in an absolute sense (as opposed to being disadvantaged relative to rest of the society), would seem to have some empirical relevance (Lanjouw 1999)[3].

11.6 A profile of poverty for rural Bangladesh

Poverty in Bangladesh is massive both in terms of absolute numbers and as proportions of total and rural populations (Ahmed *et al.* 1991). Poverty alleviation has been in the mainstream of most Government development plans since the inception of the country. There has been increased concern about poverty in Bangladesh which has led to frequent and periodic studies on the measurement and extent of poverty in the country (Alamgir 1974, Mujahid 1977, Osmani 1980, Ahmad and Hossain 1985, Islam and Khan 1986, Alamgir and Ahmed 1988, Khan 1990, Hossain and Sen 1992, Ravallion and Sen 1996, Ravallion and Wodon 1997, Wodon 1997, World Bank 1998).

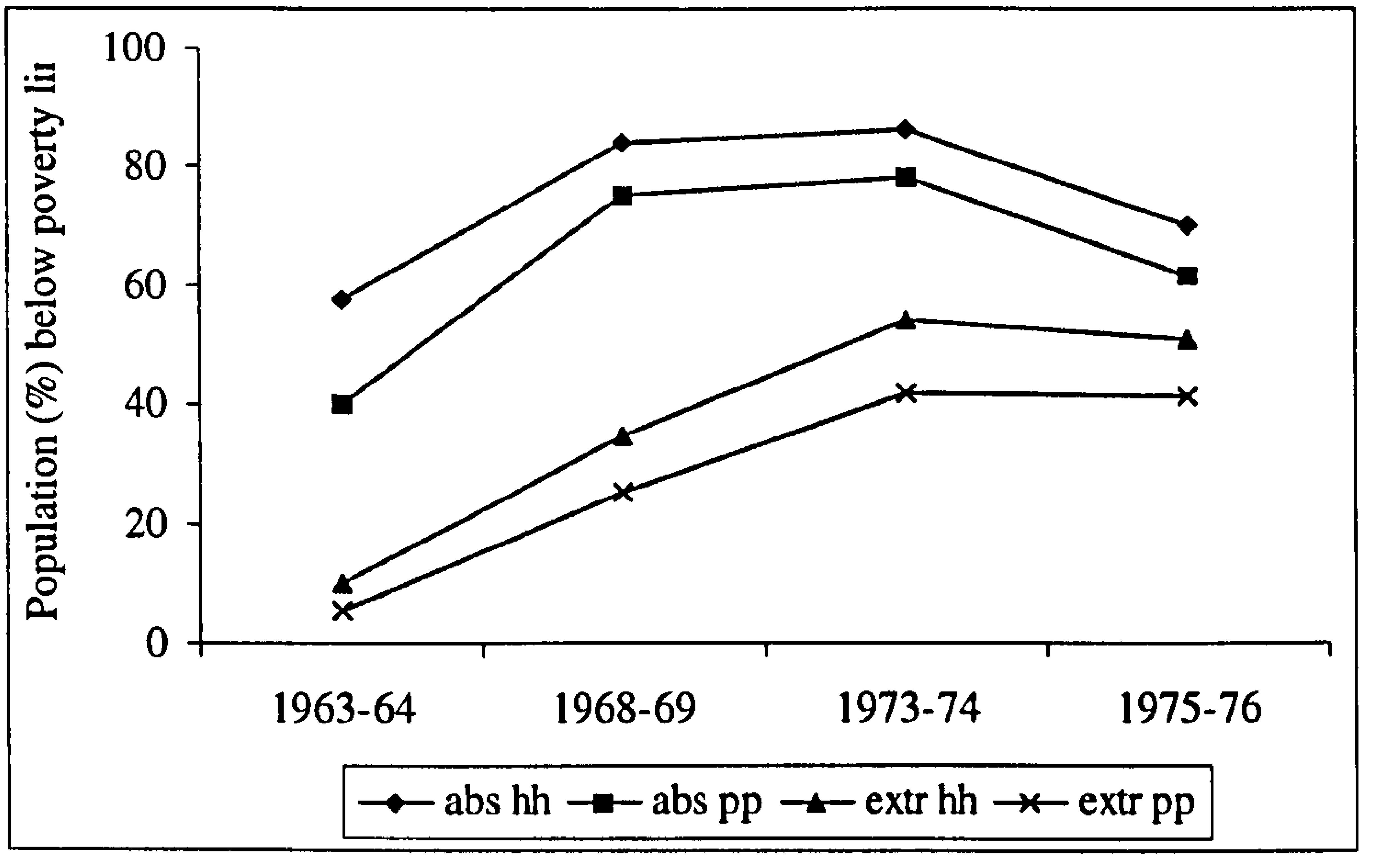
11.6.1 Historical trend of poverty in the country

The earliest account of the poverty situation in Bangladesh can be found in the work of Alamgir (1974) which narrated failure of development attempts to raise rural income and living standards. Khan (1975) prepared a benchmark of the poverty situation in rural Bangladesh for 1963-64 and made assessments for subsequent periods. Defining the absolute poor and extremely poor as those who could not take

[3] For a more detailed discussion on relative versus absolute poverty lines, see Atkinson (1989) and Ravallion (1994).

more than 90% and 80% of calorie requirement respectively[4], he found that 57.7% of the rural households and 40.2% of the population were absolutely poor, while 9.8% of the rural households and 5.2% of the rural population were extremely poor. Figure 8.1 shows the rising trend of rural poverty over a decade, where extreme poverty has risen more acutely compared with absolute poverty and both categories had reached the worst situation during 1973-74, when the country was hit by the horrific famine (Sen 1981).

Figure 11.1 Rural poverty in Bangladesh, 1963-64 to 1975-76



Source: Khan 1977

Notes: abs hh = absolute poor households. extr hh = extreme poor households.

abs pp = absolute poor population. extr pp = extreme poor population.

These earlier estimates of poverty or deprivation were based on the Food Energy Intake (FEI) method of establishing the relevant poverty line. Later on, researchers started to adopt the Cost of Basic Needs (CBN) method of estimating the pertinent poverty line. This method takes into consideration not only food elements, but also non-food expenditures of a population group to estimate the poverty line[5].

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[4] The calorie norm being 2150 Kcal/person/day for this particular study.

[5] For details of both FEI method and CBN method of establishing poverty lines, one can consult BBS (1997) pp 65-68.

Many authors have provided sparse accounts of rural poverty in the country during the eighties and nineties, but Ravallion and Sen (1996) has given a comprehensive picture of the situation for the decade of the eighties.

Table 11.1 Poverty measures for Bangladesh 1983/84 to 1991/92

Population sector	Head-Count Index (%)	Poverty-Gap Index (%)	Squared Poverty-Gap Index (x 100)
Rural:			
1983/84	53.8	15.0	5.9
1985/86	45.9	10.9	3.6
1988/89	49.7	13.1	4.8
1991/92	52.9	14.6	5.6
National:			
1983/84	52.3	14.5	5.7
1985/86	43.9	10.4	3.5
1988/89	47.8	12.5	4.6
1991/92	49.7	13.6	5.1

Source: Ravallion and Sen 1996.

Note: the different indices of poverty measure will be elaborated in section 11.7.1.2

Ravallion and Sen (1996) have made the above revised estimates based on the CBN method. Comparing the end points, 1983/84 and 1991/92, every poverty measure in both rural and national sectors fell. But progress was uneven during the period. All three measures show an increase after 1985/86. Hye (1996) claimed that the dramatic improvement of the poverty situation during the mid eighties had been caused by the convergence of several favourable circumstances: a high *aman* paddy production in the fiscal year 1986, food buffer stock operation of the government (which stabilised prices and helped in keeping real wages up), an upward trend in real wages, and an expansion of the government poverty alleviation programmes with positive impact on income and employment. He also added that this tremendous achievement did not last long due to lack of conscious and careful planning of the government.

11.6.2 Some recent estimates of poverty in the country

The most recent estimates of poverty in Bangladesh can be found in the report of the latest 'Household Expenditure Survey', which took place in 1995/96 (BBS 1997). The CBN method was adopted at the government level for the first time in this project. Poverty estimates promulgated from this scheme are summarised below in Table 11.2.

Table 11.2 Incidence, depth and severity of poverty in 1995/96 using CBN method

Poverty line and level	Incidence- Head-Count Ratio	Depth- Poverty Gap	Severity- Squared Poverty Gap
Upper poverty line [a]			
National	53.1	14.4	5.4
Rural	56.7	15.4	5.7
Urban	35.0	9.2	3.4
Lower poverty line [b]			
National	35.6	7.9	2.6
Rural	39.8	8.9	2.9
Urban	14.3	2.7	0.8

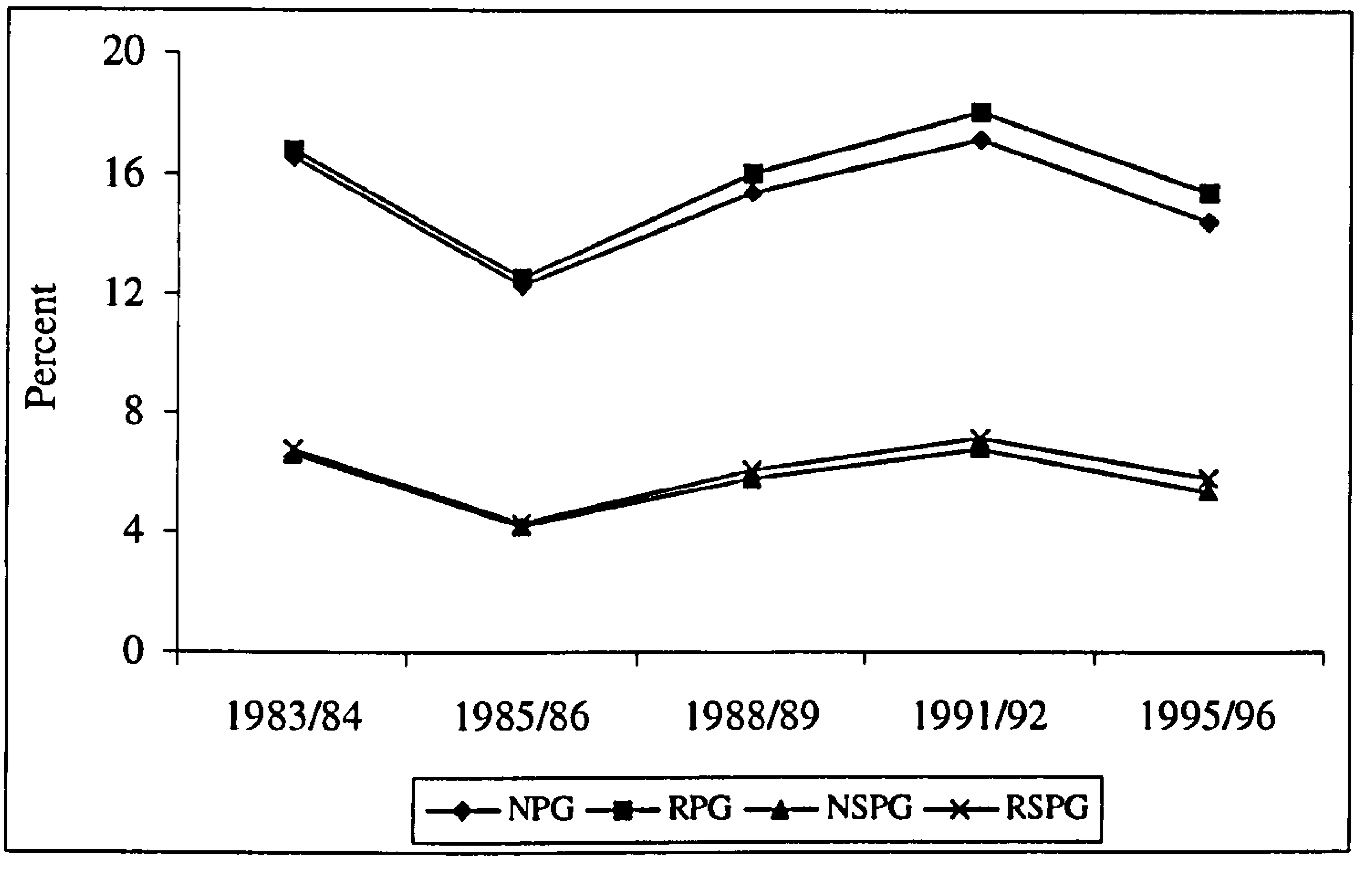
Source: BBS 1997

Note: a, cut-off point of 2122 Kcal per person per day;
b, cut-off point of 1805 Kcal per person per day.

The incidence of rural poverty was found to be higher compared to overall and urban rate of poverty using both the upper and lower poverty thresholds adopted for the country[6]. These have actually pulled down the national situation of deprivation. Poverty has also increased in both national and rural levels – nationally from 49.7% (Table 11.1) to 53.1% and rurally from 52.9% to 56.7% between 1991/92 and

1995/96. However, both the depth and severity of poverty have declined at both national and rural sectors between the last two HES years, i.e., 1991/92 and 1995/96 (World Bank 1998).

Figure 11.2 Poverty Gap and Squared Poverty Gap measures, 1983/84 to 1995/96



Source: World Bank 1998.

Legends: NPG – National poverty gap RPG – Rural poverty gap

NSPG – National squared poverty gap RSPG – Rural squared poverty gap.

Note: World Bank staff estimates based on the 'cost of basic needs' method.

It can be comprehended from the figure that rural poverty is higher than national poverty and it suggests similar trends over time – stagnation during the 1980s and a decline in the 1990s (Figure 11.2). It better be mentioned here that this particular study by World Bank (1998) has been taken up here to illustrate the depth and severity of poverty in Bangladesh over a period of one decade, on the ground that it has provided revised consistent estimates based on the CBN method, whereas studies prior to 1995/96 by BBS were done based on the FEI method and hence, cannot be compared with the latest result.

[6] Rural population share was 83.46% in 1995/96.

11.7 Poverty and Income Distribution of the Participants

11.7.1 Methodology for poverty and inequality assessment

11.7.1.1 Establishing the poverty line for this study

The threshold level energy consumption for Bangladesh has been set at 2122 Kcal per person per day, which has been adopted by many studies referred to here. An attempt has been made here to convert this minimum energy requirement into terms of rural local income needed to obtain the energy. Rice is the staple food in Bangladesh. Calorific value of common rice is 351 Kcal/100 gm (INFS 1992), which sells at the rate of Tk. 14/Kg. So, the income required to obtain a minimum of 2122 Kcal has been established at Tk. 255 per person per month. The questionnaire survey has recorded household income of the sampled households from all possible sources, which has been converted to per capita income per month. Since calories represent only one basic need, this approach to establish poverty line will underestimate the full extent of poverty. To avoid any undue confusion, it should be mentioned here that section 9.4 (pages 184-186) described household income, whereas here, it is the estimate of income needed to satisfy calorie requirement of 2122 Kcal/head/day.

11.7.1.2 Measuring poverty and inequality among the participants

Two poverty measures employed initially in this study are outlined below:

a. Head-Count Ratio: $\mathbf{HCR = n/N}$

where n = number of people below the poverty line

N = total number of people in the sample or population.

b. Poverty Gap Ratio: $\mathbf{PGR = \Sigma\, g / (n * y)}$

where g = gaps = $(y - y_i) * m$, provided $y_i < y$

n = number of people below the poverty line

y = poverty line income

y_i = individual per capita income in the household

m = family size

Income distribution of the participants has been plotted in Lorenz curves, which is a powerful tool for illustrating the inequality of wealth distribution, to show disparities in their income, along with corresponding Gini ratios. For measuring the inequality in the distribution of income among the participants, the coefficient of variation and Gini concentration ratio have been calculated using the expressions given below:

a. Coefficient of Variation: **CV =** $\sqrt{((\Sigma(\mu - y_i)^2) / N)} / \mu$

where μ = mean of per capita incomes

y_i = individual per capita income

N = total number of people in the sample or population.

b. Gini Concentration Ratio: **GCR =** $1 + (1/N) - (2/(N^2 \mu)) * (y_1 + 2y_2 + \ldots + Ny_N)$

where μ = mean of per capita incomes

$y_1, y_2 \ldots y_N$ = individual per capita incomes

N = total number of people in the sample or population.

The main disadvantage of GCR is that an income transfer from a rich to a poor man has a much greater effect on GCR, if the two men are near the middle rather than at either end of the parade (Cowell 1977). The CV is another single measure of inequality, which does not offer a visual effect related to the Lorenz curve, but nonetheless, gives a reliable estimate of inequality (Kakwani 1980). All the calculations have been done for participants in both the schemes, i.e., for agroforestry and woodlot, and for all the sampled agro-ecological zones, as well as for the total sample of participants as a whole.

Finally, another poverty measure, viz., the FGT (Foster, Greer and Thorbecke) index with $\alpha = 2$ (Foster *et al.* 1984) has been adopted to calculate the squared poverty gap index in the following manner:

c. Squared Poverty Gap Index: **SPGI =** $HCR\,[PGR^2 + (1 - PGR)^2 (CV)^2]$

where the notations HCR, PGR and CV have been described above.

11.7.2 Results Obtained

11.7.2.1 Poverty and inequality measures for all participants

Poverty and inequality measures for the sample of social forestry participants as a whole are presented in Table 11.3.

Table 11.3 Poverty and inequality measures for all participants

Levels	HCR (%)	PGR (%)	SPGI	CV	GCR
All participants [a]	21.39	21.94	11.07	0.88	0.35
Rural [b]	47.1	na	na	na	0.38
National [b]	47.5	na	na	na	0.43

Notes: a – author's calculation based on field data

b – BBS 1997b

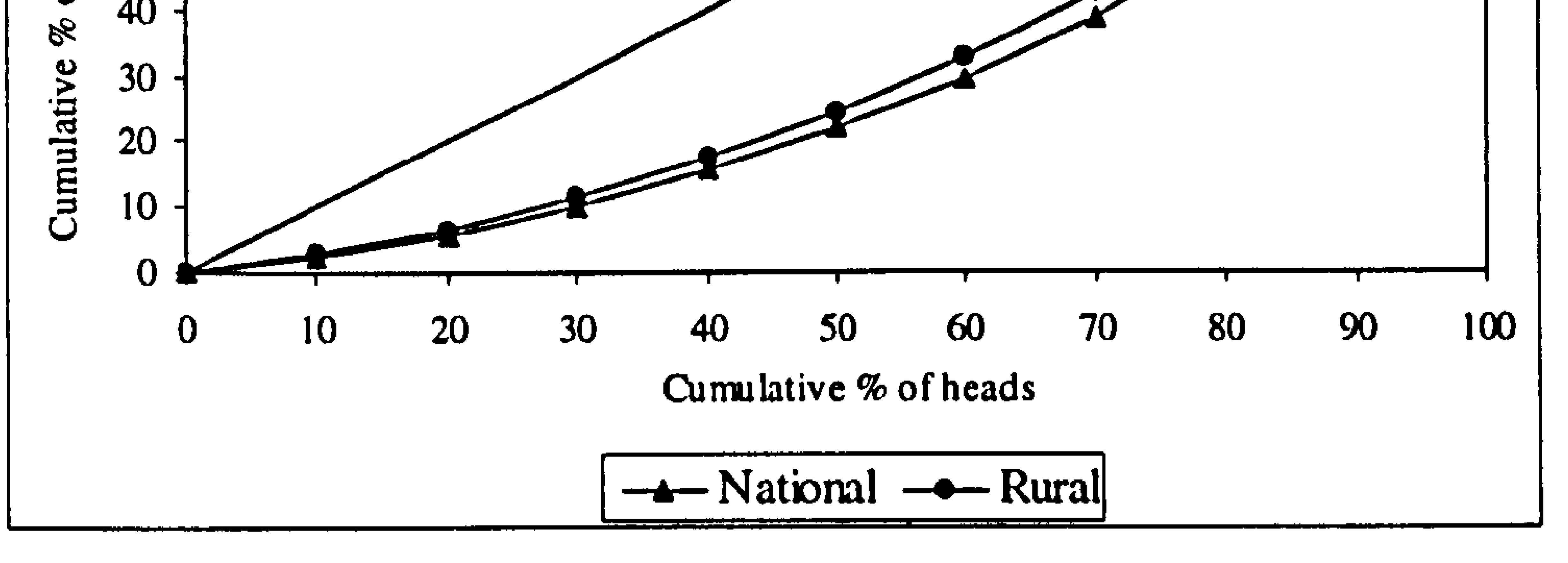
na – not available

It can be comprehended from Table 11.3 that the social forestry participants in north-western Bangladesh are enjoying a better poverty situation compared with overall poverty status of the rural population and the population of the country as a whole based on the measures for which data are available. It should, however, be added here that there was not really any way for ascertaining whether BBS has used the same methodology as that used in the present study. So, the apparent differences may have arisen due to method rather than the sampled population.

About 21% of the participants are lying below the absolute poverty line established according to a daily caloric intake of 2122 Kcal, whereas the latest household expenditure survey of 1995-96 (BBS 1997) has found above 47% of both rural and national population lying below the same poverty threshold. Depth of poverty of the partakers has been ascertained as 22% (PGR), which is not critical for a community of rural farmers in a developing country like Bangladesh. Severity of poverty has been determined at 11.07 (SPGI), which contrasts with 5.36 (national) and 5.74 (rural) as derived by the World Bank (1998) using the CBN method however.

Distribution of income among the participants has been found to be more equal (GCR of 0.35) in contrast with both rural (0.38) and national (0.43) distribution of household income. The other measure of inequality, i.e., CV has been estimated as 0.88. In the absence of CV estimates for Bangladesh, the present finding can be compared with those of the neighbouring countries of India (0.15) and Pakistan (0.30) and a closer match with Russia having a CV of 0.87 (Lancaster *et al.* 1999). It should be added here that there was hardly any similarity found between the poverty and inequality rankings in this piece of work done by Lancaster *et al.* India and Pakistan have low rankings in terms of expenditure inequality but rank quite highly in terms of poverty. The reverse was found in the case of Russia.

Figure 11.3 Lorenz curves showing income distribution of total national population and total rural population of Bangladesh

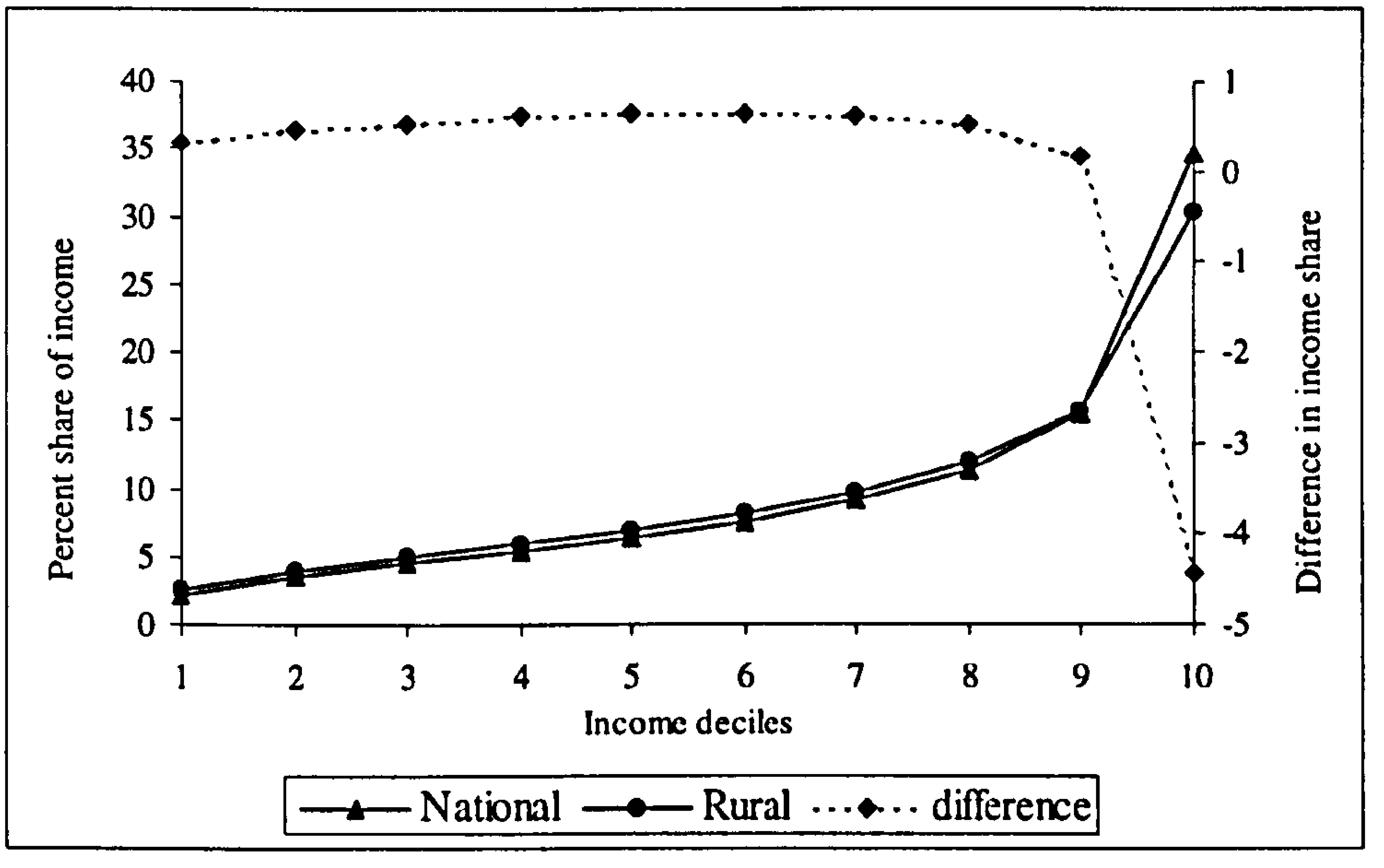


Source: adapted from BBS 1997b

It can be seen from Figure 11.3 that the rural distribution of income lies above the national distribution at all deciles of population, indicating a slightly more equal distribution of income at the rural level compared to that of the national distribution.

Henceforth, all further discussion will take into account only the rural distribution to compare it with those of farmers in different schemes (i.e., agroforestry and woodlot farmers) and for farmers in different agro-ecological zones. If any of these farmers' income distribution shows a more equal status than the rural one, that would indicate a more equal income distribution compared to the national distribution and less income inequality in contrast to the national scenario of income inequality.

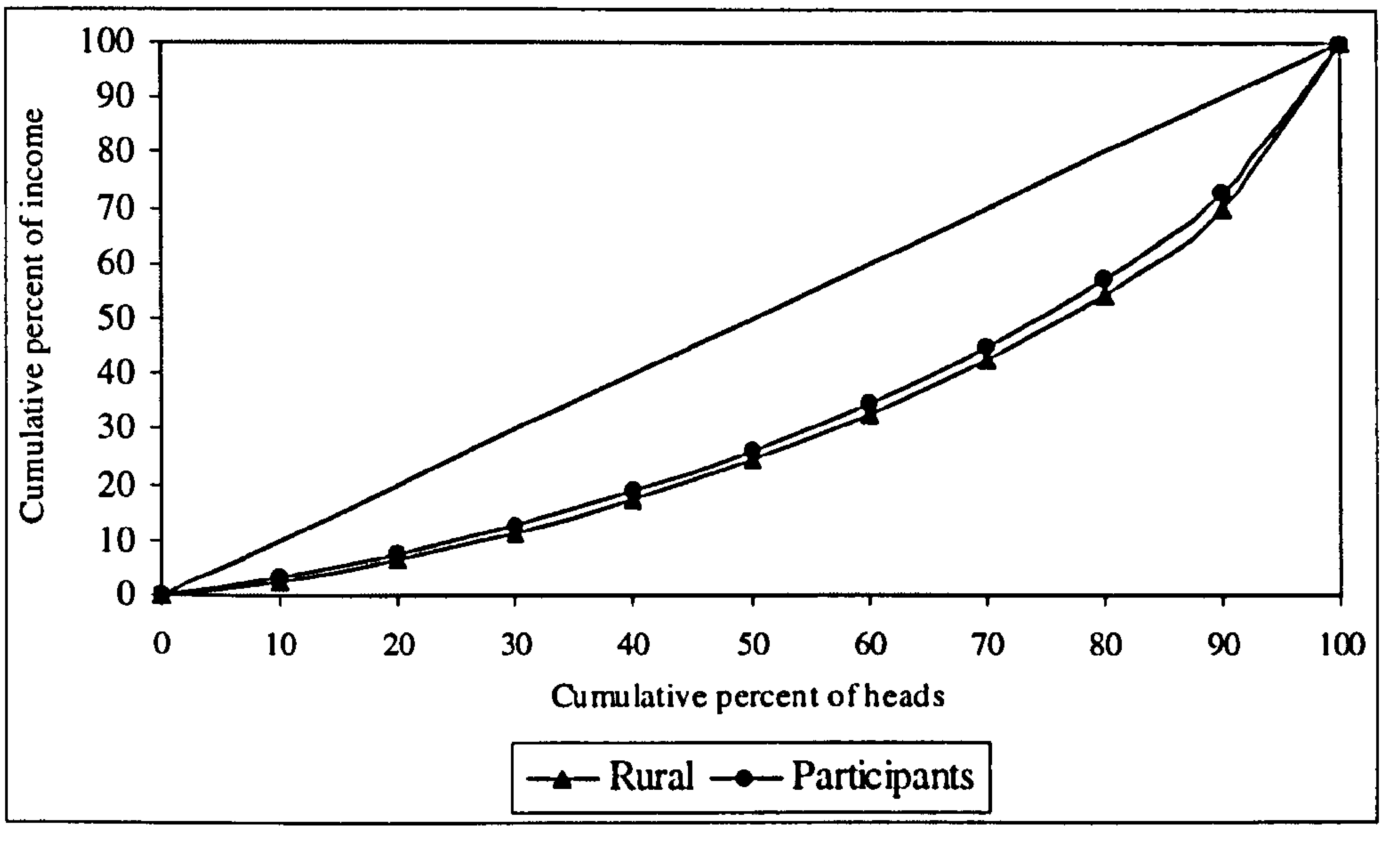
Figure 11.4 Percent share of income at deciles of total population and rural population and differences in income share



Source: BBS 1997b

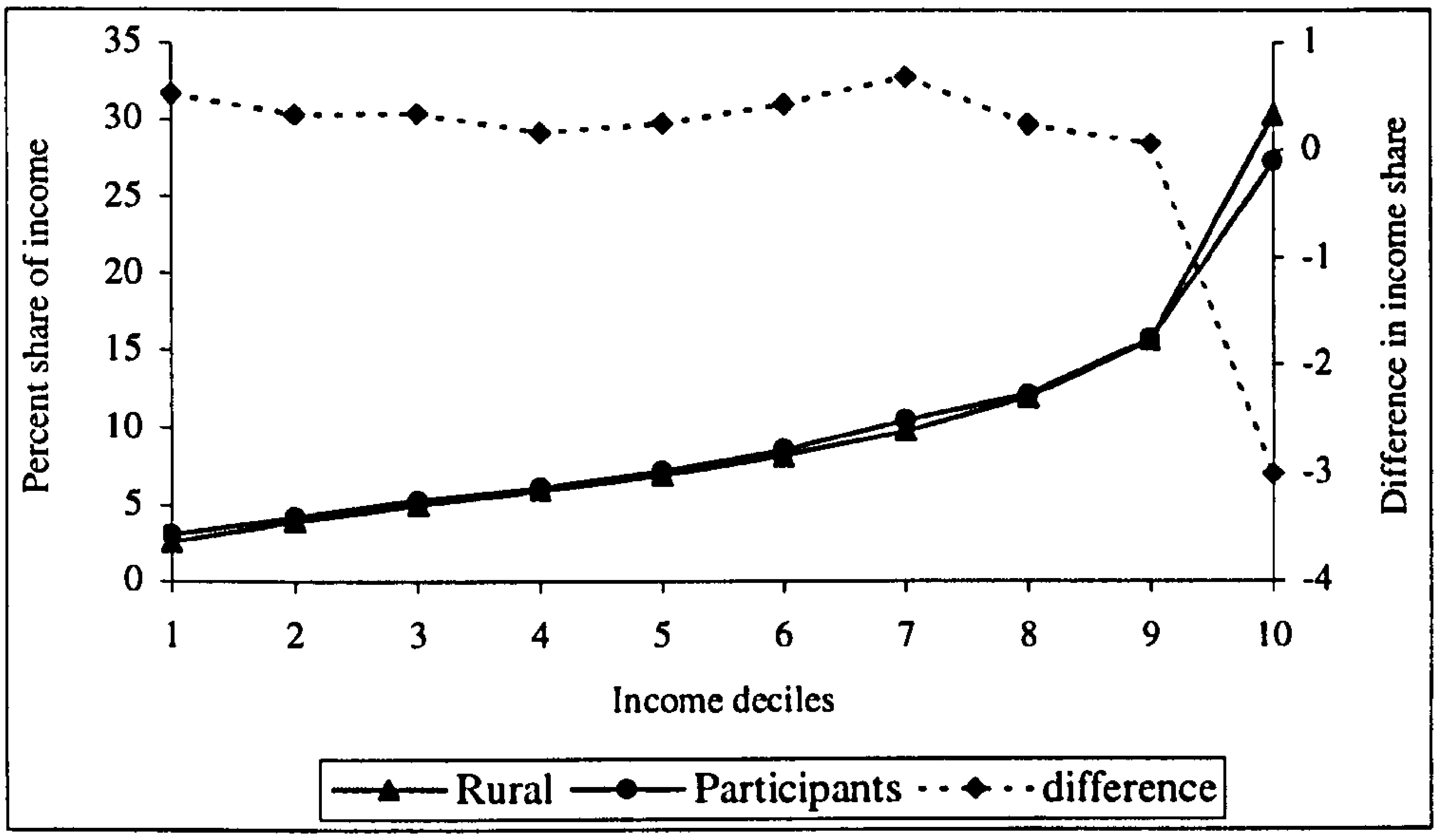
Individual percent shares of income at each decile of total population (national) and rural population have been shown on the primary Y axis of Figure 11.4 and differences in income shares have been depicted on the secondary Y axis. It can be visualised from the figure that the rural population has slightly higher share of rural household income at all the deciles, except for at the highest (10^{th}) decile, where the rural figure falls way below the national share. This has been caused by the large share possessed by the urban sector at the top decile (quoted as 36.05% in BBS 1997b), which has pulled up the national share at that height.

Figure 11.5 Lorenz curves showing income distribution of social forestry participants and rural population



Since the Lorenz curves for these two distributions did not intersect each other, it can be said unambiguously that the income distribution of social forestry participants with curve closer to the diagonal is the more equal, according to standard relative inequality measures (Atkinson 1983, Jenkins 1991). Participants in social forestry projects were found to have more equal distribution of income compared to that of the rural (national) population as a whole (Figure 11.5), indicated by the flatter curve for participants. The participants are part of the rural population, yet they suffer from less income inequality. Participating in a development intervention like the social forestry project might be one possible reason for such a better social status from the point of view of distribution of income. They might have developed a feeling of solidarity among themselves, which has possibly caused this less unequal distribution of income. Another likely reason may be that the project has appealed to a particular group in the rural society which is more homogeneous in income distribution than is the society from which the participants are drawn. This needs further investigation which is beyond the scope of this study.

Figure 11.6 Percent share of income at deciles of rural population and the participants and differences in income share



Individual percent shares of income of participants and those of the rural population have been plotted in Figure 11.6 and the difference between them has also been shown. The figure portrays that the participants do possess higher shares of respective incomes at all the deciles of their population distribution, except for at the highest decile, where the rural population possess 10% higher income (30.23%) compared to that of the participants (27.23%). This can possibly be attributed to the fact that the highest segment of the social forestry participants has much smaller land holding than their counterpart in the rural population, leading the latter to enjoy higher household income.

11.7.2.2 Poverty and inequality measures for agroforestry participants

Poverty and inequality measures for the sample of agroforestry (AF) participants have been presented in Table 11.4. It can be seen from the table (HCR and PGR) that the agroforestry (AF) participants in Rajshahi region are exposed to a poverty situation which is better than that of all the participants considered together and obviously better than that of the rural population and the population of the country as a whole.

Table 11.4 Poverty and inequality measures for agroforestry (AF) participants and their comparisons

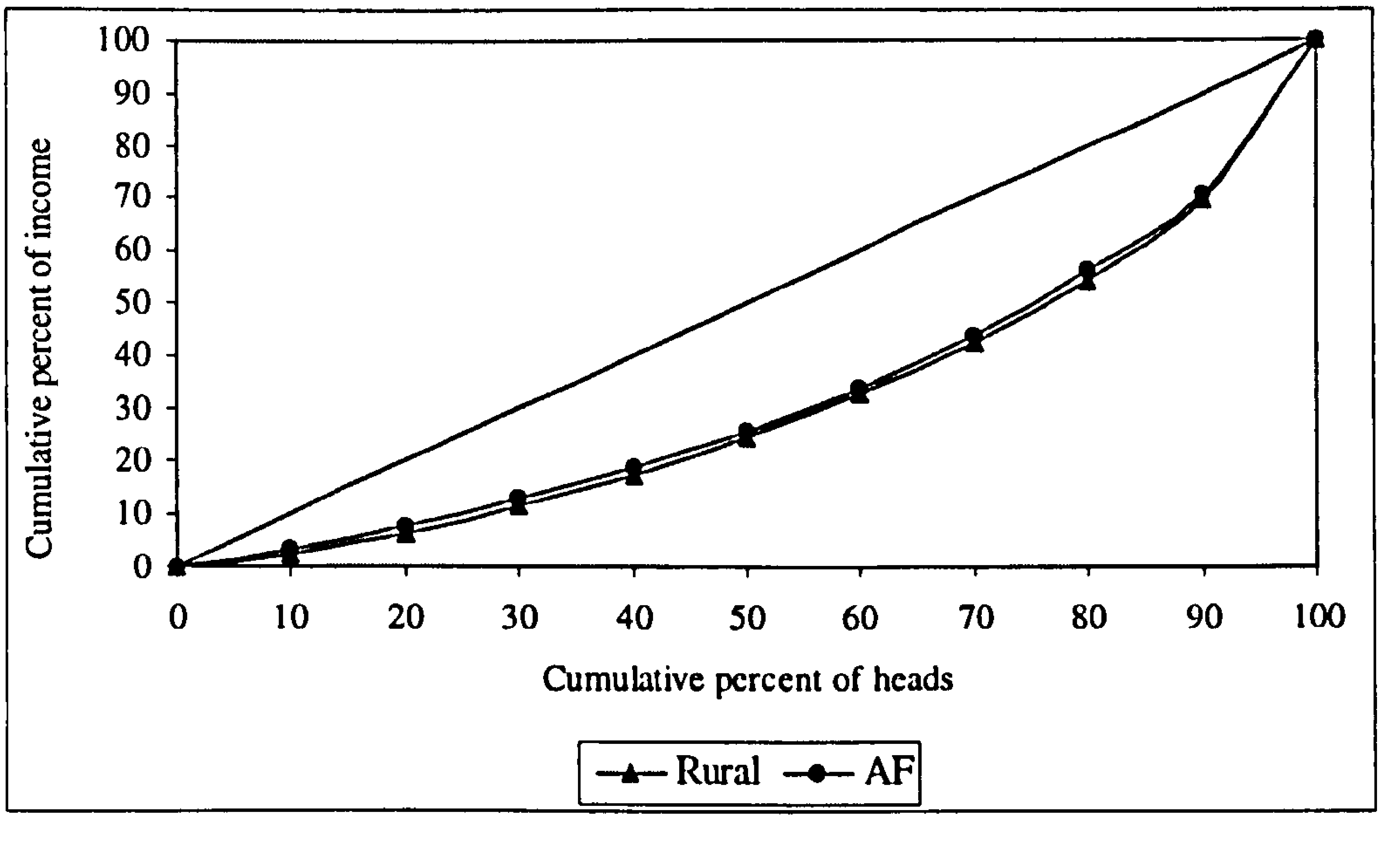
Levels	HCR (%)	PGR (%)	SPGI	CV	GCR
AF participants [a]	20.76	21.19	15.74	1.07	0.37
All participants [a]	21.39	21.94	11.07	0.88	0.35
Rural [b]	47.1	na	na	na	0.38
National [b]	47.5	na	na	na	0.43

Notes: a – author's calculation based on field data;

b – BBS 1997b; na – not available

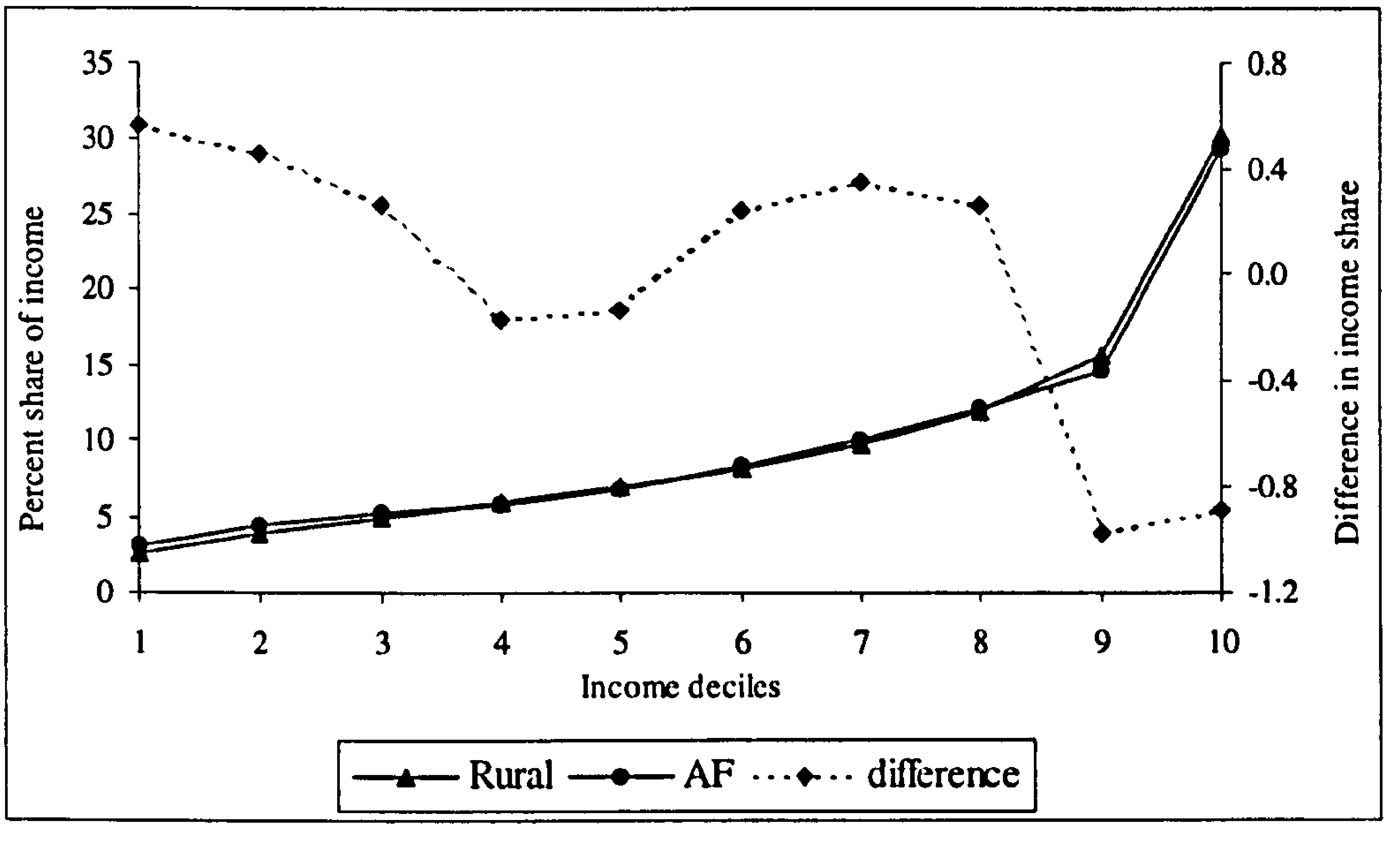
This can be realised by comparing the figures for HCR and PGR at the four levels (Table 11.4). However, severity of poverty has been estimated as 15.74 (SPGI), indicating a worse-off situation than that of all participants together. Distribution of income among the AF participants has been found to be more equal (GCR of 0.37) in contrast with both rural (0.38) and national (0.43) distribution of household income, but a little more unequal than that of all participants (0.35). The other measure of inequality (CV) conforms to this latter finding.

Figure 11.7 Lorenz curves showing income distribution of AF participants and total rural population of Bangladesh



AF participants were found to have more equal distribution of income compared to that of the rural population as a whole (Figure 11.7), indicated by the flatter curve for AF participants, at all deciles of the population groups. The AF participants are part of the rural population, still they suffer from less income inequality. This corresponds to the results demonstrated in Figure 11.5.

Figure 11.8 Percent share of income at deciles of rural population and AF participants and differences in income share



Individual percent shares of income of AF participants and those of the rural population have been outlined in Figure 11.8 and the difference between them has also been shown. The figure portrays that the AF participants do possess higher shares of respective incomes at the majority of deciles of their population distribution. Encouragingly enough, the highest difference occurs at the first decile (0.57), where the AF farmers possess 22% higher income than the rural population. The difference then starts to fall, reaches the negative area (indicating 'rural share>AF share') and then repeats the rise-fall cycle over the latter deciles. The sharpest fall occurs at the ninth decile, where the rural population possess about 6% higher income than the AF farmers. This however, is the indication of a desirable situation in that the rich are getting a smaller share of income.

11.7.2.3 Poverty and Inequality Measures for Woodlot Participants

Poverty and inequality measures for the sample of woodlot (WL) participants are presented in Table 11.5.

Table 11.5 Poverty and inequality measures for WL participants and their comparisons

Levels	HCR (%)	PGR (%)	SPGI	CV	GCR
WL participants [a]	22.05	22.71	06.14	0.62	0.33
All participants [a]	21.39	21.94	11.07	0.88	0.35
Rural [b]	47.1	na	na	na	0.38
National [b]	47.5	na	na	na	0.43

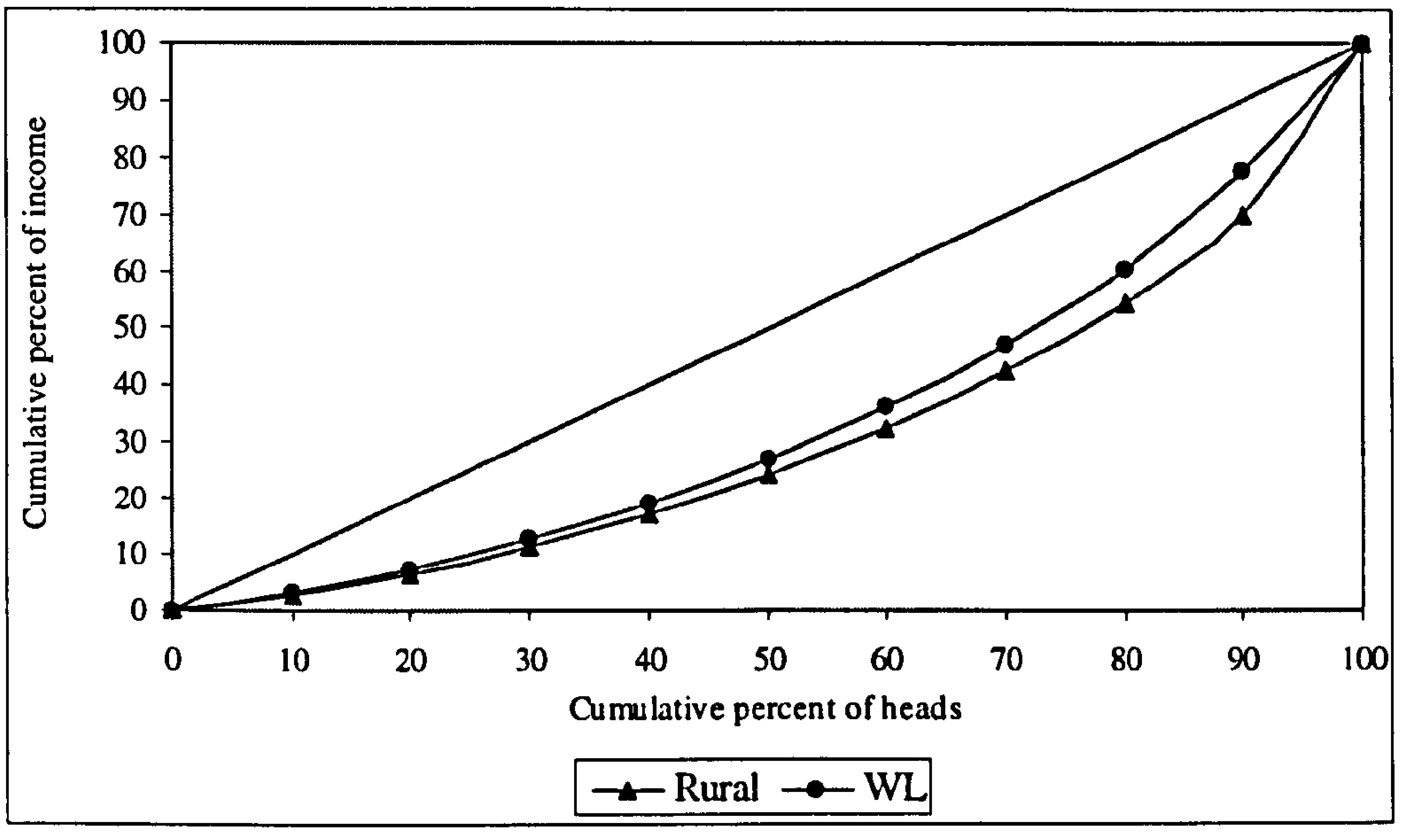
Notes: a – author's calculation based on field data

b – BBS 1997b na – not available

The woodlot (WL) participants in north Bengal are exposed to a poverty situation, wherein they suffer from a higher incidence and greater depth of poverty (as indicated by the HCR and PGR respectively) compared to those of 'all participants' but lying well below the figures for rural and national population of the country (Table 11.5). On the other hand, severity of poverty has been estimated as 6.14 (SPGI), indicating a better-off situation than that of all participants together. These apparently conflicting measures of poverty indicate that the WL farmers' poverty situation is not consistent as those observed for AF farmers and for all social forestry farmers considered together.

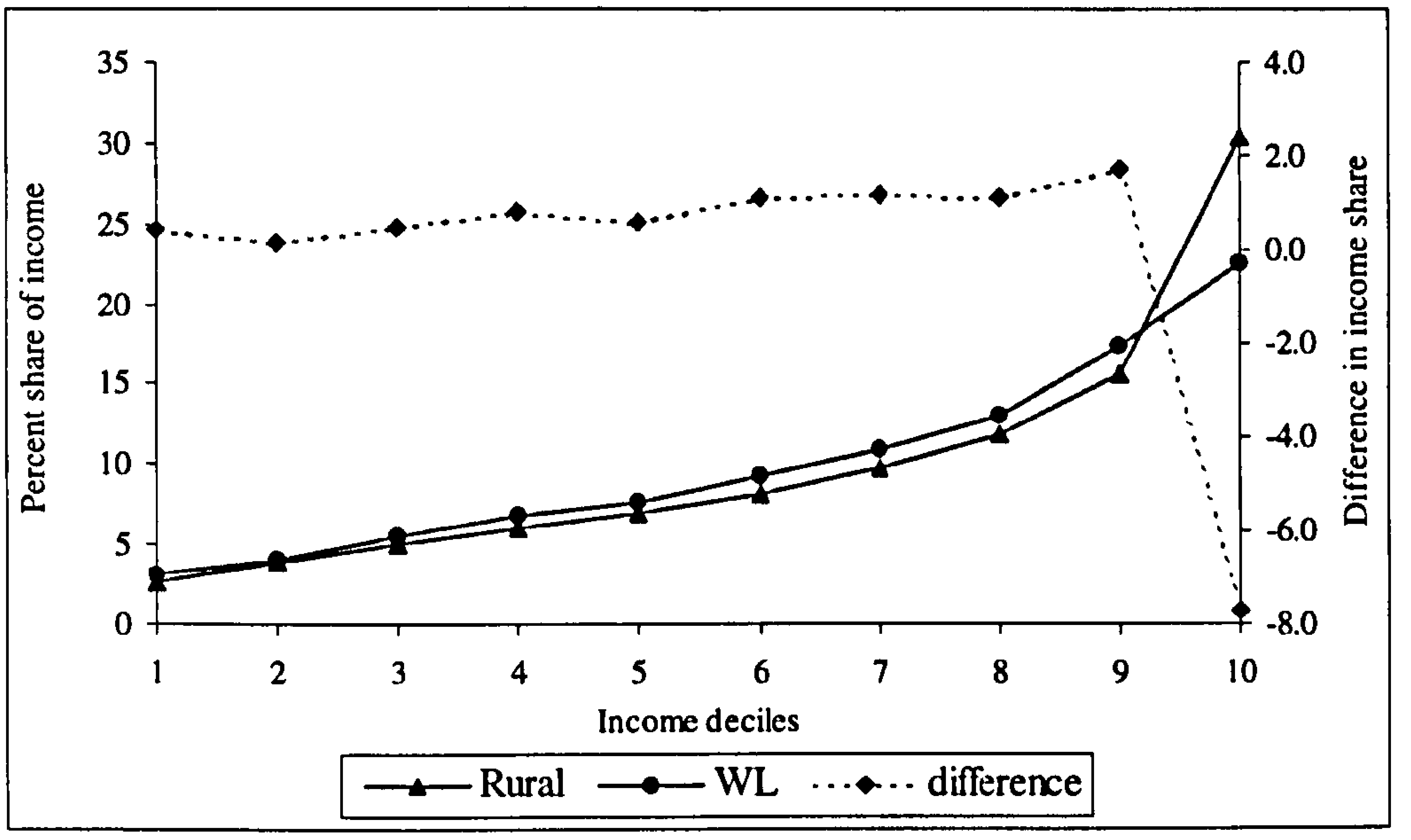
Distribution of income among the WL participants has been found to be more equal (GCR of 0.33) in contrast with both rural (0.38) and national (0.43) distribution of household income, and even more equal than that of all participants (0.35). This has been endorsed by the other measure of inequality (CV) as 0.62, in contrast with 0.88 for all participants.

Figure 11.9 Lorenz curves showing income distribution of WL participants and total rural population of Bangladesh



It can be seen from Figure 11.9 that the WL distribution of income lies well above the rural distribution at all deciles of population, indicating a more equal distribution of income for the woodlot farmers compared with that of the rural distribution. The gap between the two curves widens gradually along the deciles and reaches the maximum at the ninth decile, indicating the greatest difference in inequality between the two distributions. This however, is the result of accumulating differences along the distribution, which has not occurred at the ninth decile on its own. The whole picture reflects a more desirable situation of the WL farmers in a rural income context.

Figure 11.10 Percent share of income at deciles of rural population and WL participants and differences in income share



Individual percent shares of income of WL participants and those of the rural population have been plotted in Figure 11.10 and the difference between them has also been shown. The figure portrays that the WL farmers do possess higher shares of respective incomes at all the deciles of their population distribution, except for at the top decile, where the rural population possess 25% higher income (30.23%) in comparison with that of the WL participants (22.48%). This is perhaps due to the fact that the topmost division of rural population possesses much greater wealth and assets, which results in a higher household income weighed against that of the virtually landless society of the WL farmers.

11.7.3 Poverty and inequality comparison of AF and WL participants

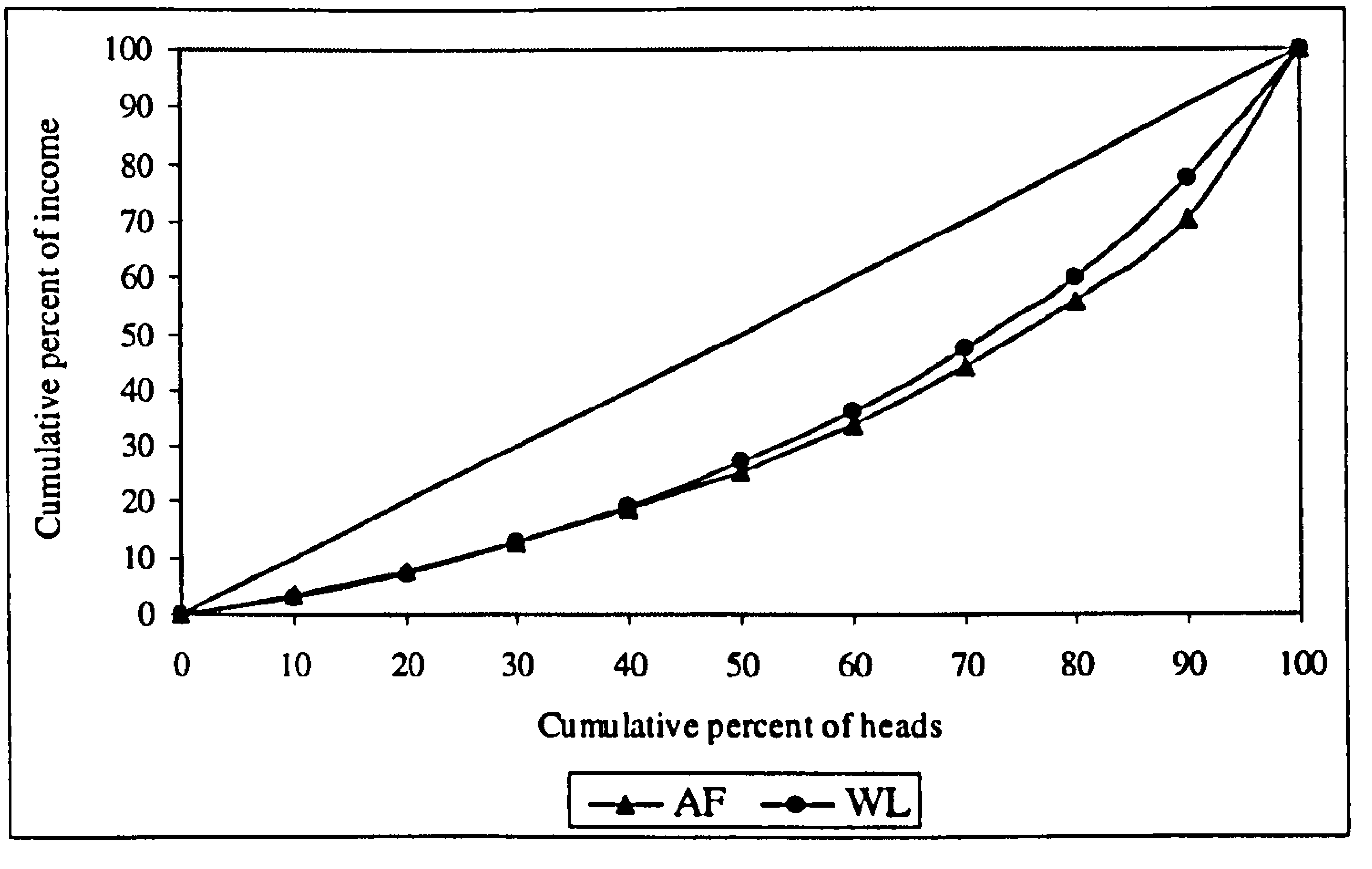
Poverty and inequality measures for the sample of agroforestry (AF) and woodlot (WL) participants have been presented in Table 11.6.

Table 11.6 Comparative poverty and inequality measures for AF and WL participants

Levels	HCR (%)	PGR (%)	SPGI	CV	GCR
AF participants	20.76	21.19	15.74	1.07	0.37
WL participants	22.05	22.71	06.14	0.62	0.33

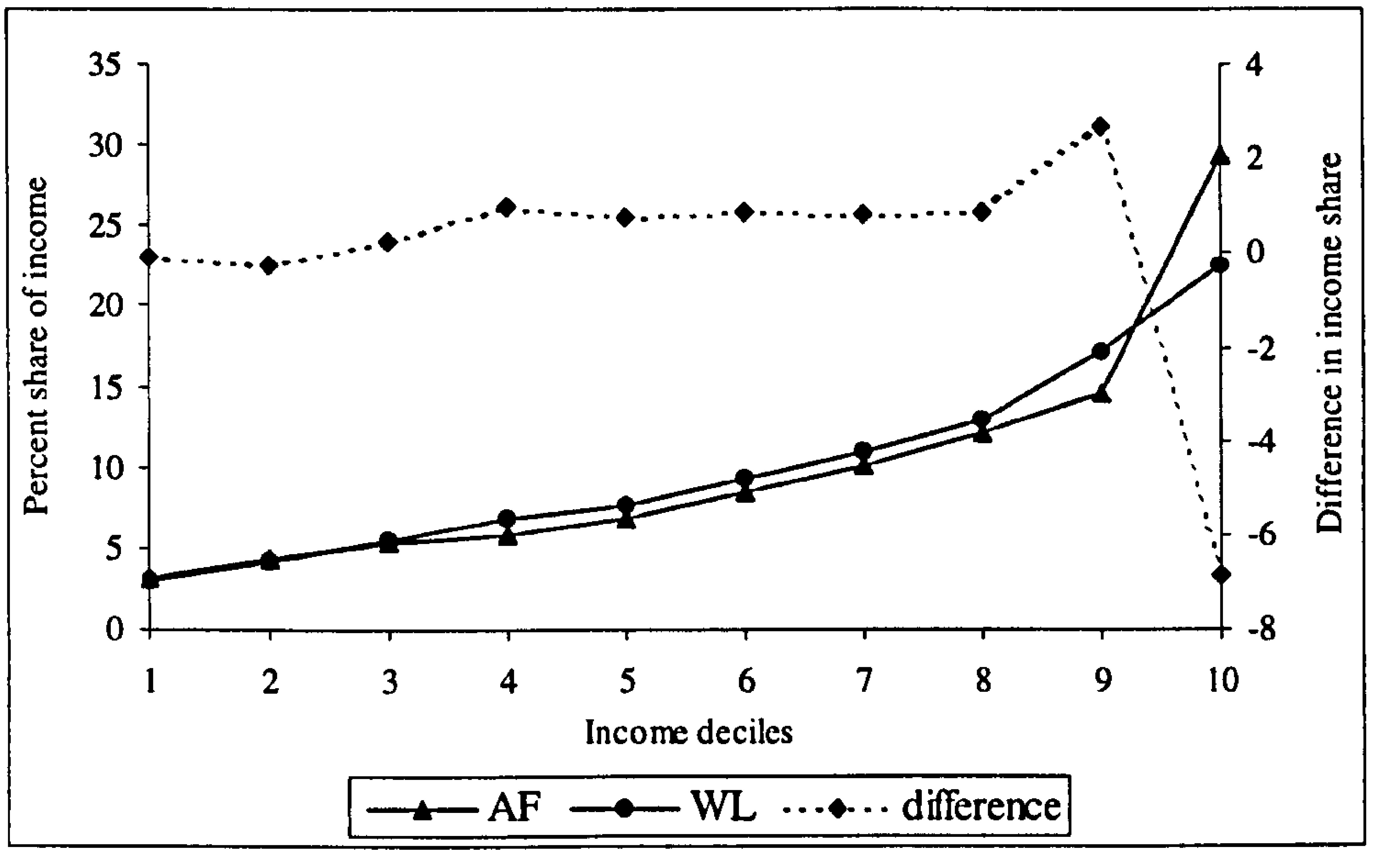
Comparing the poverty status of AF and WL farmers reveals that the latter experience a higher incidence and greater depth of poverty (as indicated by the HCR and PGR respectively) compared with those of the former (Table 8.6). Conversely, their severity of poverty (SPGI of 6.14) is much lower than that of the AF farmers. Distribution of income among the WL participants has been found to be more equal (WL-GCR of 0.33 vs. AF-GCR of 0.37). This has been confirmed by the low coefficient of variation (0.62), in contrast with 1.07 for AF farmers.

Figure 11.11 Lorenz curves showing income distribution of AF and WL participants



It can be seen from Figure 11.11 that the bottom 40% of both AF and WL farmers possess nearly equal shares of respective income. However, the gap starts to widen from the fifth decile, whence the WL farmers enjoy a more equal distribution of per capita income than the AF farmers. The gap reaches the maximum at the ninth decile, indicating the greatest relative difference in inequality between the two distributions.

Figure 11.12 Percent share of income at deciles of AF and WL population and differences in their income share

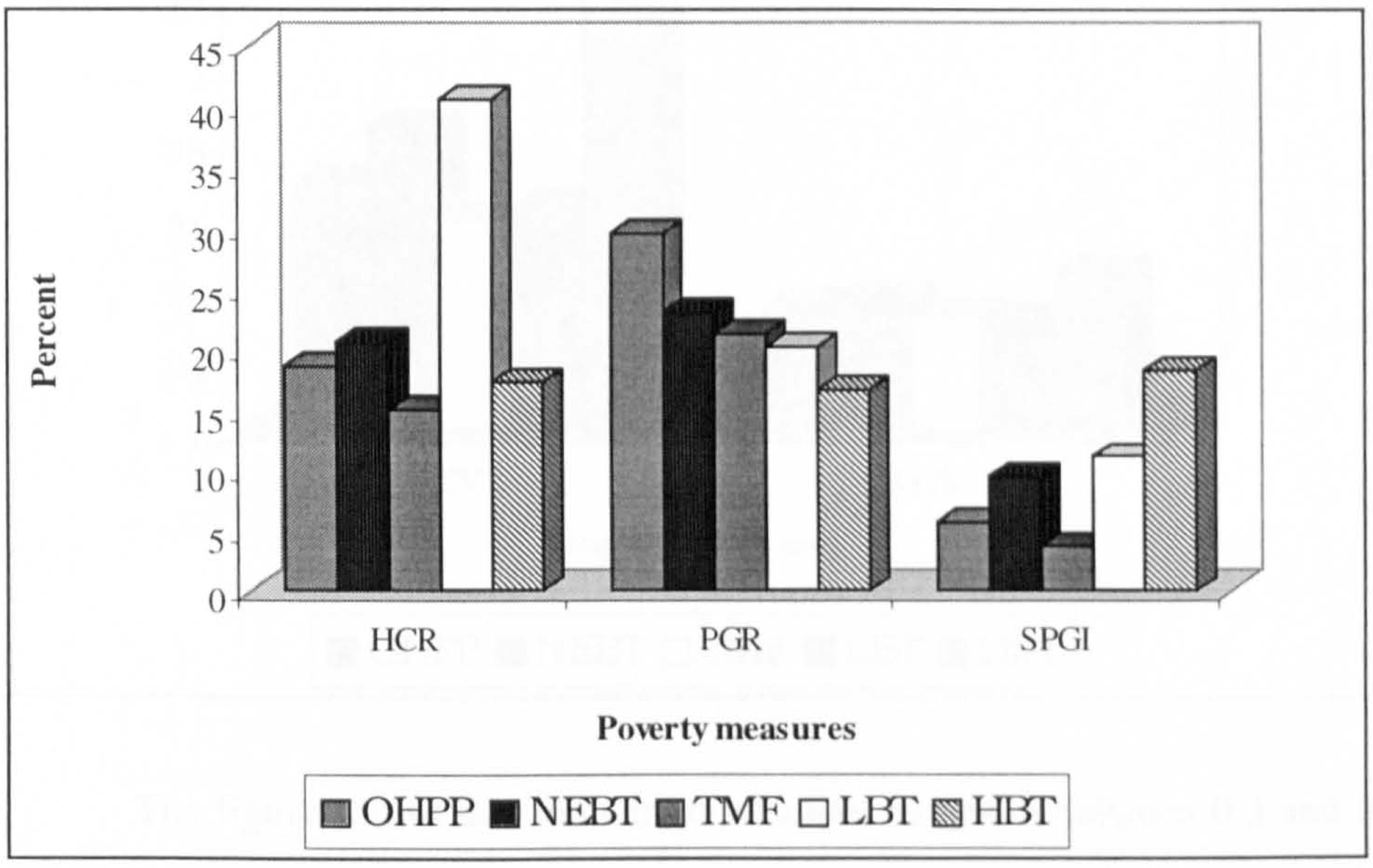


Individual percent shares of income of AF and WL participants have been graphed in Figure 11.12 and the difference between them has also been shown. The figure depicts that the bottom two deciles of AF farmers enjoy slightly higher income share, but then the WL farmers surpass them, reaching the maximum difference in individual income share at the ninth decile. Nonetheless, this trend reverses at the top decile, where the AF participants possess 23% higher income (29.35%) in comparison to that of the WL participants (22.48%). The higher shares in the low deciles correspond to a lower share in the high deciles.

11.7.4 Poverty and inequality measures across agro-ecological zones

The three poverty measures used in this study viz., the head-count ratio, the poverty-gap index and the squared poverty-gap index, have been worked out for the participants in the different agro-ecological zones (AEZs) and the results have been summarised in Figure 11.13

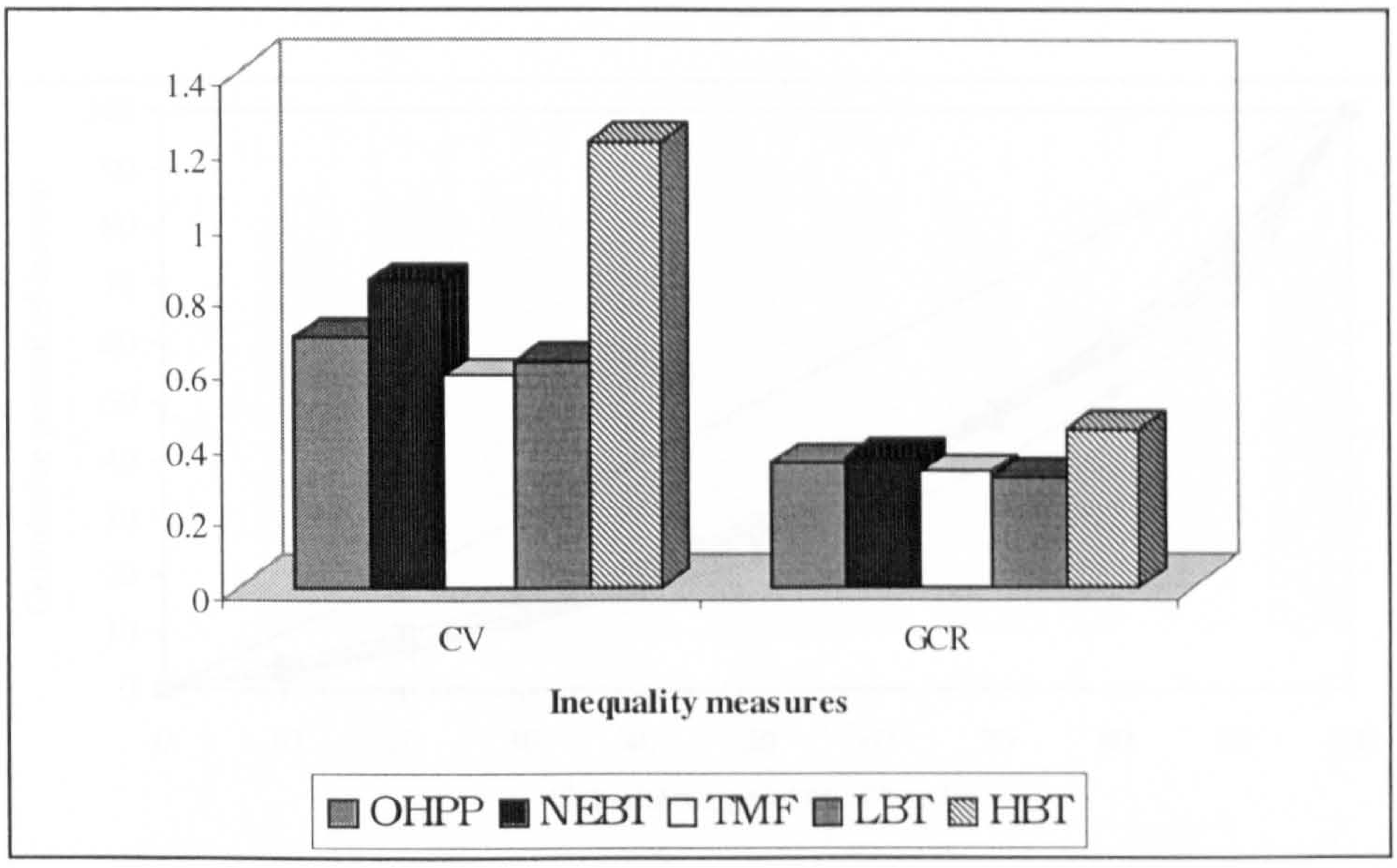
Figure 11.13 Poverty indices across the sampled agro-ecological zones



Incidence of poverty (HCR) was found greatest in Level Barind Tract (LBT) zone and lowest in Tista Meander Floodplain (TMF) zone (41% contrasted with 15%). This occurrence has turned out to be just above twice than that in any of the remaining four AEZs. Depth of poverty (PovGap) has been established as highest in the Old Himalayan Piedmont Plain (OHPP), gradually decreasing along the sequence of AEZs studied (from 30%...) and reaching the lowest figure in High Barind Tract (HBT) zone (...to 17%). However, this latter zone (HBT), suffering from almost equal percentage of all the poverty measures, experiences the most extreme severity of poverty (18%) which comes down to as little as 4% in the TMF zone. Participants in the North East Barind Tract (NEBT) zone were subject to moderate degrees of poverty incidence, depth and severity.

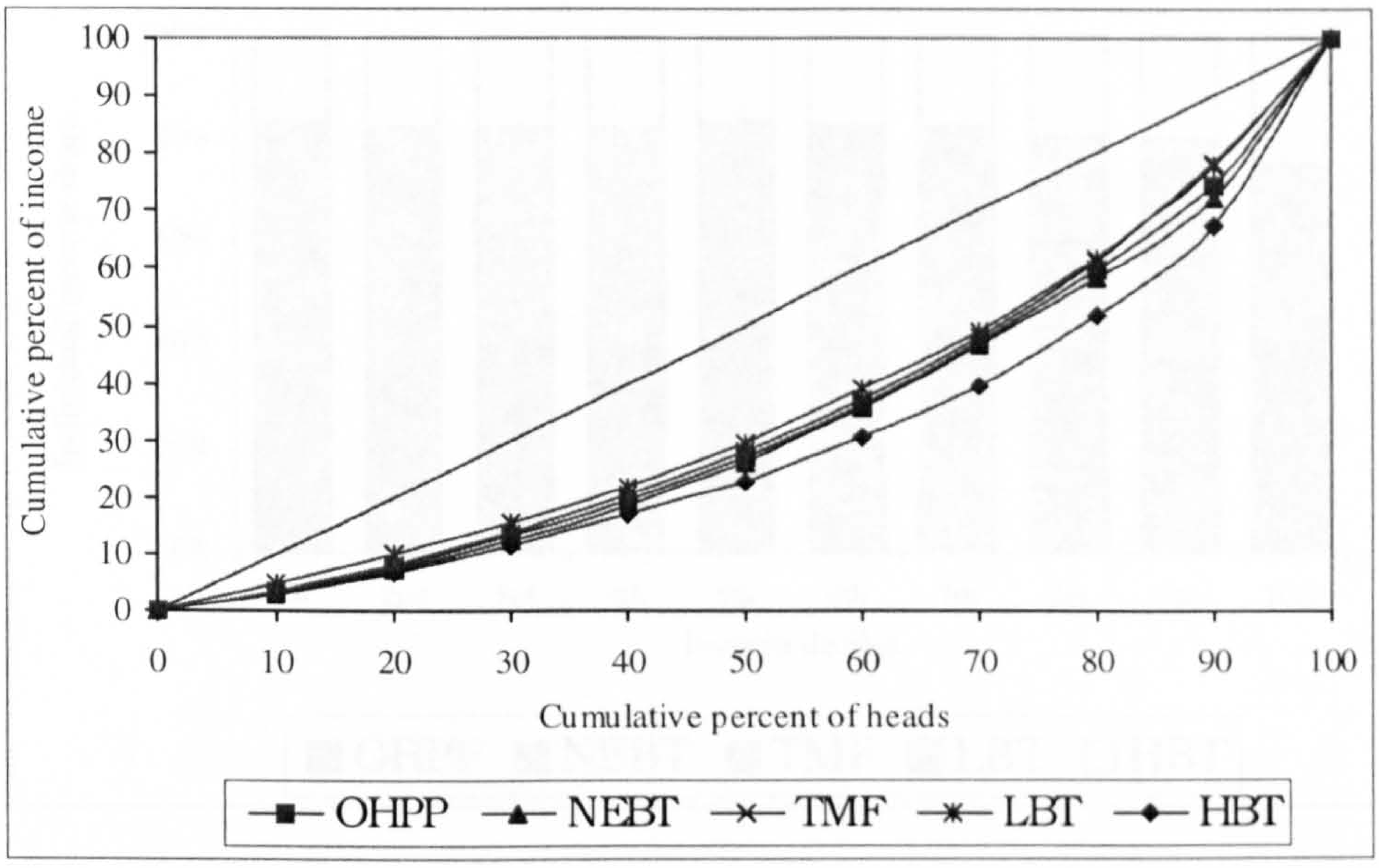
Measures of inequality viz., the coefficient of variation (CV) and Gini concentration ratio (GCR) have been calculated for the participants located at the different AEZs and the results have been illustrated in Figure 11.14.

Figure 11.14 Inequality measures across the sampled agro-ecological zones



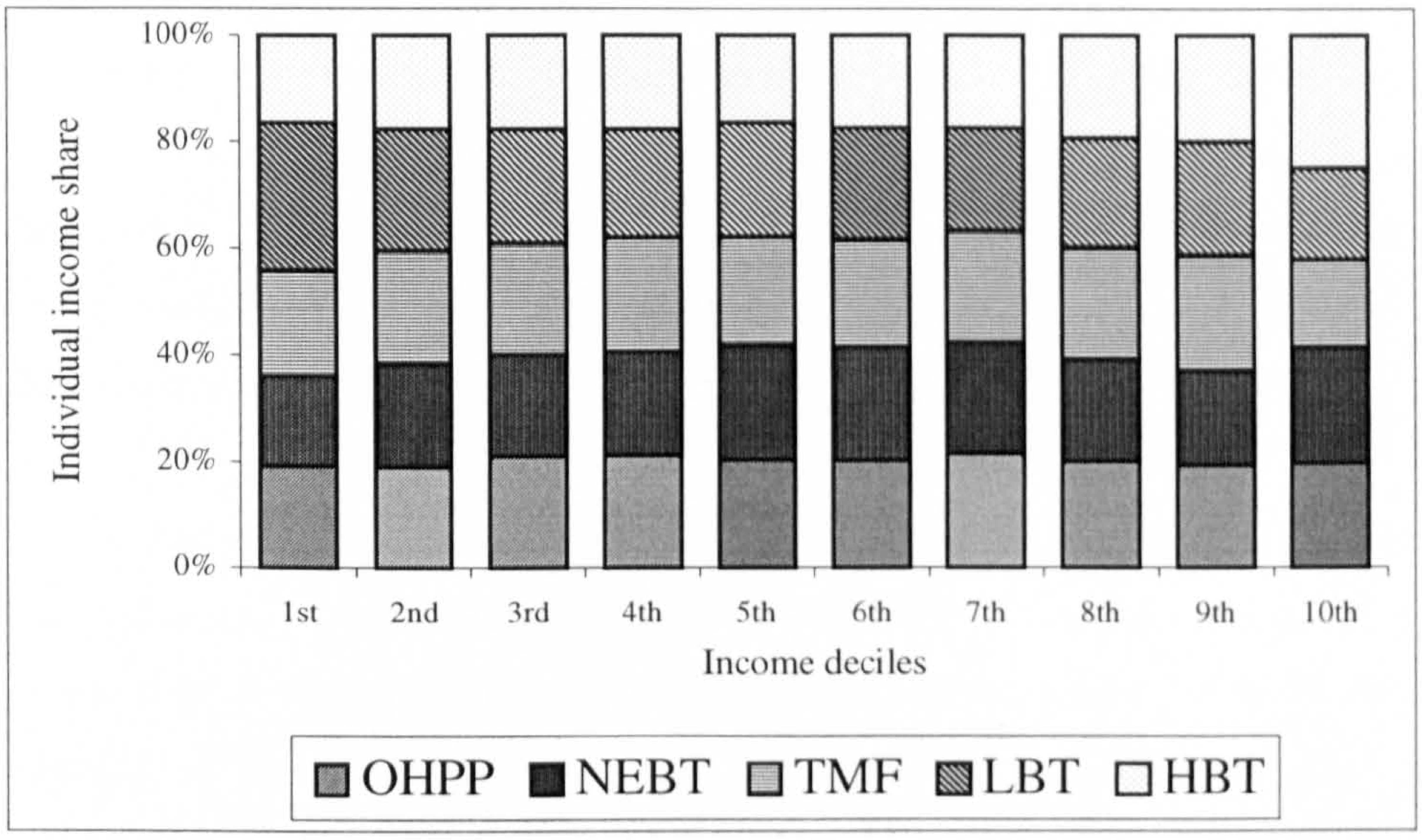
The figure shows that the Gini coefficient ranges in between 0.3 and 0.4 in all the AEZs, whereas the CV varies in the range of 0.6 to 1.2. Highest inequality in per capita income of the social forestry participants was observed in HBT zone in terms of both Gini and CV. Least inequality was noted among participants in LBT as per Gini, but in TMF according to CV. This interesting disparity has been caused by the difference in the mode of calculation of the two measures of inequality and by their mode of interpreting the extent of inequality.

Figure 11.15 Lorenz curves showing income distribution of social forestry participants across the sampled agro-ecological zones



It can be seen from the figure that throughout the continuum of population of the social forestry participants, those in the LBT zone enjoys the greatest degree of equality (with the lowest Gini of 0.298). On the contrary, those in HBT zone endures the greatest degree of inequality (Gini 0.425), as indicated by the curve farthest away from the line of perfect equality (the diagonal). Participants in the other three AEZs (i.e., OHPP, NEBT and TMF) experience more or less similar degree of income inequality across the deciles of their population distribution.

Figure 11.16 Individual income shares of deciles of social forestry participants in different agro-ecological zones



Participants in the HBT zone suffer from the worst situation of income distribution in that, all the deciles in that zone possess the lowest share of income, except for in the 8th and the 9th deciles (wherein, the farmers from NEBT possess the lowest shares) and highest share in the topmost decile (with lowest share occupied by those in TMF). These two extreme conditions has rendered the worst situation in HBT. On the other hand, participants in the LBT zone have the benefit of the best order of income distribution in that, the bottom three deciles have the highest shares of respective incomes. This is the situation desirable from the point of view of 'reducing income inequality'.

[a] Purchasing Power Parity (PPP) is a special conversion factor designed to equalise purchasing powers of currencies in respective countries (World Bank 1990, p.257). this can be defined as the number of units of a country's currency required to buy the same amounts of goods and services in the domestic

market as one dollar would buy in the United States. The computation of PPP involves obtaining implicit quantities from national accounts expenditure data and specially collected price data and revaluing the implicit quantities in each country at a single set of average prices. The PPP rate thus equalises dollar prices in every country, and intercountry comparisons of GDP based on them reflect differences in quantities of goods and services free of any price level differentials.

Chapter Twelve

Financial Analysis of Schemes of the Social Forestry Project

A conceptual framework for the FCBA, or simply, financial analysis, was elaborated in Chapter 6. Using the methodology delineated there, the computation for financial costs and benefits for the 180 plots (90 each from agroforestry and woodlot) has been carried out. The computations are based partly on primary data collected through field survey and partly on secondary data obtained from forest offices of BFD at different levels (e.g., beat office, range office, division office and head office).

This chapter describes and discusses the *modus operandi* and results of the financial evaluation. Section 1 illustrates the actual computations, while a summary of results after computation is presented and described in section 2. Finally, the possible reasons for variation in the financial profitability amongst the various zones and project-components are examined and elaborated in section 3. It should be mentioned here that, some of the financial benefits were moneysworth, rather than in Tk., e.g., grasses used by the participants.

12.1 Procedure for the financial evaluation

Financial evaluations as performed here are directed primarily towards assessing the financial profitability of the project components and secondarily, to examine their comparative financial performance. Using the data collected through the primary and secondary sources and following the steps as outlined in Chapter 8, the computation for financial evaluation of the project components in different agro-ecological zones of Rajshahi Division was undertaken. The procedures and results are described below.

12.1.1 Identification of inputs and outputs

The individual details of the inputs and outputs involved in each component were identified from field survey as well as from the official records of BFD. The list of significant inputs and outputs identified is presented in Table 12.1. The inputs involved in the project were of two types namely, (a) direct inputs and (b) indirect

Table 12.1 List of inputs and outputs identified in the agroforestry (AF) and woodlot (WL) schemes

Schemes	List of inputs and outputs			
	Inputs		Outputs	
	Direct	Indirect	Agricultural products	Forestry products
Agroforestry	a. Land b. Labour c. Seeds d. Seedlings e. Polyethylene bags f. Fertilizer g. Insecticides h. Tools and implements	i) Establishment a. Staff Salary b. Office maintenance c. Motor vehicle maintenance d. Buildings maintenance ii) Overheads a. Research b. Training c. Monitoring & Evaluation d. Protection	i) Food grain crops a. Paddy b. Maize c. Black gram d. Sesame ii) Vegetables & fruits a. Potato b. Bean c. Gourd d. Lady's finger e. Pineapple iii) Others a. Straw b.	i) Intermediate products a. Grasses b. Twigs and branches c. Leaf litter d. Loppings ii) Final products a. Timber b. Fuelwood
Woodlot	Same as in agroforestry	Same as in agroforestry but merged with it or with some other schemes of TANDP	Nil	Same as in agroforestry

Source: From questionnaire survey and from 'Plantation Journals' of Forest Offices at the Beat, Range and Division level.

inputs. The direct inputs included land, labour, seeds of agricultural and forestry crops, seedlings, polythene containers, organic (cow dung) and chemical fertilisers, insecticides and tools and implements. The indirect inputs, on the other hand, were of two main types viz. (a) establishment costs and (b) overhead costs of the project. The inputs under establishment included those involved in payment of salaries and allowances of the permanent staff, maintenance of offices, vehicles and buildings of the project. The inputs under overhead charges included the costs involved in training, monitoring and evaluation (if any) as well as protection of the activities involved in the project.

The identification of outputs in financial evaluation is confined only to the direct outputs (Selvavinayagam 1991). The direct outputs obtained from the project components were of two types namely, (a) agricultural products and (b) forestry products. The former comprises the food grain crops such as paddy, maize, black gram, sesame as well as fruits like banana, pineapple and various vegetables. The trees from the agroforestry and woodlot components provided a variety of outputs. They were, in turn, of two main categories; firstly the intermediate products and secondly the final products. The intermediate products consisted of grasses, dry leaves, twigs and dry branches. These products were mainly used as fuel for cooking, while the grass was used as fodder.

The intermediate products were derived from the third year onward of the inception of the project. Final products to be obtained from these schemes are also of three kinds – fuelwood, pole and timber. The present study attempts to quantify and evaluate each of such products. It better be stated here that two groups of actors namely, project participants and project management, i.e., the BFD have been combined in the financial analysis on the ground that these two groups have provided inputs into the project jointly and they would share the final outputs jointly.

12.1.2 Quantification of inputs and outputs

Annual quantities of each of the direct inputs used in an individual agroforestry and woodlot plot were found similar, or close to each other, because of the fixed input norm prescribed by the project authority. The details of the annual requirement of various inputs incurred in the agroforestry and woodlot components are given below in Table 12.2. The prescribed norm did not include the inputs required for harvesting of the standing trees and for meeting the indirect expenses. Therefore, these two input items were estimated separately.

Table 12.2 Annual requirements of inputs in the AF and WL schemes

Year of operation	Types of inputs	Units per hectare	
		Agroforestry	Woodlot
Planting year (first year)	1. Labour (man days)	255	330
	2. Materials		
	a. Seed (Kgs)	0.03	0.03
	b. Polybag (No.s)	3840	4670
	c. Organic fertiliser (Kgs)	2230	2750
	d. Chemical fertiliser (Kgs)	190	210
	e. Insecticides (Kgs)	0.06	0.04
	f. Tools and implements	LS *	LS
Post-planting year (second year)	1. Labour (man days)	45	75
	2. Materials		
	a. Seed (Kgs)	nil	nil
	b. Polybag (No.)	nil	nil
	c. Organic fertiliser (Kgs)	nil	85
	d. Chemical fertiliser (Kgs)	75	45
	e. Insecticides (Kgs)	nil	nil
	f. Tools and implements	nil	nil
Total	1. Labour (man days)	300	405
	2. Materials		
	a. Seed (Kgs)	0.03	0.03
	b. Polybag (No.s)	3840	4670
	c. Organic fertiliser (Kgs)	2230	2835
	d. Chemical fertiliser (Kgs)	265	255
	e. Insecticides (Kgs)	0.06	0.04
	f. Tools and implements	LS	LS

Note: * LS indicates lumpsum quantity since it is practically not possible to give the physical quantities of various tools and implements used in the plantation process, and hence a lumpsum annual quantity is prescribed.

Source: Compiled from office records of BFD, various forest divisions (BFD 1992).

The annual quantities of each of the outputs (except for the final products from the final harvest of the eucalyptus and acacia trees) were gathered directly from the individual beneficiaries of the project, sometimes supplemented by official records of yearly outputs. The quantities of the final products were estimated on the basis of approximated yield of timber and fuelwood by using field information concerning the growth and survival percentages of the trees. This aspect has already been discussed in detail in Chapter 8. Average quantities of the intermediate and final products of the project components have been presented in Table 12.3.

Table 12.3 Average quantities of forestry outputs from AF and WL plots for the project period (8 years)

Products	units	Project components	
		Agroforestry	Woodlot
(a) **Intermediate products**			
i. Leaf litter	Q/ha	760.0	1560.0
ii. Grasses	Q/ha	30.0	12.0
iii. Twigs and branches	Q/ha	287.0	500.0
(b) **Final products (estimates)**			
i. Timber	m^3/ha	4.93	6.45
ii. Poles	m^3/ha	40.25	52.66
iii. Fuelwood	m^3/ha	23.28	30.45
Total wood	m^3/ha	68.46	89.56

Note: Q is quintal (100 Kg)

Source: Questionnaire survey, field measurements and BFD records (see Annexure 12.4 for details of intermediate products).

12.1.3 Valuation of inputs and outputs

Market prices were taken as the basis for the valuation of inputs and outputs in the financial analysis. Annual market prices for the individual inputs and outputs were collected through both official sources and field survey. Annexure 12.1 presents the annual unit prices of the various inputs and outputs involved in the project. Multiplying these prices by the annual quantities of inputs and outputs, the financial valuation of inputs (except harvesting and indirect inputs) and outputs (except the final products) were carried out. The estimation of the harvesting costs, costs for indirect inputs and the valuation of the final products of the project components were undertaken as described below.

12.1.3.1 Estimation of the harvesting costs

It was observed in the field records of previous years' operations that about 95% of the harvesting cost of trees comprise the cost of labour involved in different operations such as felling of trees, trimming off of branches, logging into suitable marketable pieces and transportation to the disposal point. The remaining 5% of harvesting cost were incurred in obtaining tools and implements. *Eucalyptus camaldulensis* and *Acacia auriculiformis* were the two tree species standing in the field ready for harvesting. Based on the procedure described in Chapter 8, the timber, pole and fuelwood yield from the eucalyptus and acacia trees were estimated for each individual plot. The average harvesting costs (involving both eucalyptus and acacia) were calculated from records of BFD (BFD 1993) and information provided in a related article (Rahman and Islam 1997). Table 12.4 provides detailed information on harvesting cost of agroforestry and woodlot plots per unit area and per unit of different types of wood harvested, on the basis of an average estimate that there are 1.6 times trees (or, 1.3 times volume) in per unit of woodlot plantation to per unit of agroforestry plantation.

Table 12.4 Harvesting cost of agroforestry and woodlot plots

Harvesting cost (Taka)		
Units	Agroforestry plantation	Woodlot plantation
Per ha of plantation	2825.00	4237.50
Per m^3 of total wood harvested	37.25	55.90
Per m^3 of timber harvested	517.55	776.30
Per m^3 of pole harvested	63.30	95.00
Per m^3 of fuelwood harvested	109.65	164.50

Note: all costs are based at 1993 prices

12.1.3.2 Estimation of the indirect costs

Indirect costs were derived from the PP (Project Proposal-revised) of TANDP (GPRB 1994), which happened to be the only authenticated source of information in many respects. The first year's (1991-92) expenses (or, costs) were given in the PP in broken down manner as they are presented in Annexure 9.1 under 'indirect costs', but for all the project components for that particular year. These consolidated figures have further been broken down into constituents of indirect cost for agroforestry and woodlot sub-projects per unit area, in proportion to the amount allocated for agroforestry and woodlot respectively.

The indirect costs for subsequent years were provided in the PP as a total amount only, without any further break down. So, these amounts were broken down into different components of indirect costs in proportion to that of the first year's one as well as on the basis of information gathered through personal communication with the officials of BFD (Ahmed 1999, Alam 1999). It was observed that indirect costs constituted about 28% of total cost for agroforestry and woodlot schemes on the whole. This estimated 28% of indirect cost was further divided into two parts: 22% on the establishment charges and 6% on the overhead charges. Within the total indirect costs, about 80% were occupied by the establishment costs and the remaining 20% by the overhead costs for both the sub-projects on an average.

12.1.3.3 Valuation of the final products

A moratorium has been imposed in Bangladesh since 1989 on removal or harvesting of forest trees from government forest reserves (ADB 1993), except for bamboo and softwood harvest in Chittagong Hill Tracts for Karnaphuli Paper Mills and gewa (*Excoecaria agallocha*) and deformed or dying sundri (*Heritiera fomes*) from the Sundarbans for Khulan Newsprint Mills. Hence, there was a paucity of current information regarding the final value of woody materials harvested from forest reserves. The only reliable source of information in this regard were the records of Dinajpur Forest Division (BFD 1993), which contained data and information on the first logged over agroforestry plantation under participatory approach in the country.

Analyses based on the information contained in those records reveal the stumpage price of timber and firewood. According to these rates, the wood prices for mixed eucalyptus and acacia was Tk. 932 (±38) per cubic metre and that of firewood was Tk. 192 (±12) per cubic metre. On an average, final return from one ha of agroforestry plantation came down to Tk. 45,650 (±2830), while that from one ha of woodlot plantation could be as high as Tk. 73,040. Using this information, financial valuation of the final products of the agroforestry and woodlot schemes has been carried out.

Annexures 12.2 and 12.3 give the details of the financial costs and Annexures 12.4 and 12.5 the financial benefits involved in the agroforestry and woodlot components of the social forestry project. A break-down of the average revenue generated from the intermediate and final products of the two sub-projects is provided in Annexures 12.5 and 12.7.

12.1.3.4 Adjustment for inflation

The market values of the inputs and outputs computed above refer to different points in time. In order to make them comparable, these values needed to be converted to equivalent values at a particular period of time. This was achieved by multiplying the market values of the annual costs and benefits by the inflating factors of the respective years with the base year set at 1997-98 to give the actual values. The converted values were called the 'actual values', which took into account the price rises (inflation) over the period. The wholesale price index of Bangladesh for all the commodities was used to compute the inflating factors. Table 12.5 presents the all-product wholesale price index and inflating factors with respect to the base year of 1998-99.

Table 12.5 Index numbers of wholesale prices for all commodities (Bangladesh) and inflating factors

Financial year	Base year 1969-70 = 100	Base year 1998-99*	Inflating factors
1990-91	1276	72.2	1.38
1991-92	1323	74.9	1.34
1992-93	1346	76.2	1.31
1993-94	1413	80.0	1.25
1994-95	1479	83.7	1.19
1995-96	1559	88.2	1.13
1996-97	1568	88.7	1.13
1997-98	1648	93.3	1.07
1998-99	1767	100.0	1.00

Note: * computed figures

Source: Compiled from GPRB (1997) and BBS (1999c).

12.1.4 Choosing a suitable discount rate

Inflation adjusted market rate of interest represents the real interest rate for discounting in financial appraisal. Considering the average bank rate of interest during the project period as 8% (IMF 2000) and average inflation rate over the same period as 5% (World Bank 2000), the real rate of interest, i.e., the discount rate has been calculated by using the formula:

$$\mathbf{r = [(1+m) / (1+i)] - 1}$$

where, r is the discount rate

m is the money (bank) interest rate and

i is the inflation rate.

Thence

$$r = [(1+0.08) / (1+0.05)] - 1$$
$$= [1.08 / 1.05] - 1$$
$$= 0.0286 \text{ or } 2.86\% \text{ or apprx. } 3\%.$$

However, the market rate is often subsidised in the developing countries and the rate of interest is not necessarily the opportunity cost of capital, rather it can be expected to be lower than the opportunity cost of capital. The above two reasons suggest that higher rates of interest can be used. Thus, a discount rate of 10%, commonly used for financial evaluation of forestry projects (Khan 1993, Singh 1995, Shukla 1996, Sharma 1996) in similar socio-economic conditions in India has been chosen for the calculation of financial net present value (NPV) and benefit-cost ratio (BCR). Nonetheless, to verify the results of these calculations, a sensitivity analysis has also been carried out using discount rates ranging from 0% to 20%.

12.1.5 The selection of decision criteria

There are five principal criteria in investment appraisal: net present value (NPV), internal rate of return (IRR), return on capital employed (ROCE), payback (P/B) and benefit-cost ratio (BCR). Of these, the NPV and IRR methods are superior in that they evaluate the incremental cash flows that arise over the whole of a project's life (Lumby 1985, Price 1989, Price 1992) and NPV, IRR and BCR take into account the idea of the time value of money (Lumby 1985, ODA 1988). Furthermore, of the two discounted cash flow techniques, the NPV method can be held to be the better, since it approaches investment appraisal more correctly than IRR, when faced with mutually exclusive decisions. The NPV method also avoids some unfortunate results (e.g. multiple rates of return) that can sometimes occur with the IRR. For fuller discussion, please see section 6.3.4.3 in Chapter 6.

NPV, IRR and BCR have been used to examine the net financial profitability of agroforestry and woodlot components of the social forestry project. These are the most commonly used economic tools in financial cost-benefit analysis when applied to forestry and social forestry projects, among others.

12.1.6 Computation of the financial NPV, IRR and BCR

Following the various steps described above, the actual annual costs and benefits were computed for both agroforestry and woodlot components. This was followed by preparing actual annual cash-flows. Finally, the NPV, IRR and BCR have been computed using a standard spreadsheet package (MS Excel). Separate spreadsheets have been developed for each of the project components. The analyses included under each spreadsheet show the values of the annual actual costs and benefits, net cash flows and the values of NPV, IRR and BCR. Summary tables of each component has been compiled and presented in Annexures 12.9 – 12.10, in order to provide a means of comparing the financial NPVs, IRRs and BCRs. The next section presents and discusses the various financial analyses.

12.2 Results of the financial evaluation

12.2.1 The financial NPV

The means of the financial NPVs of the two schemes under the five agro-ecological zones at 10% discount rate, complied from Annexures 12.7 – 12.8 are presented below in Table 12.6.

Table 12.6 Average financial NPV of the two schemes at 10% discount rate

(figures in Tk./ha at 1998-99 prices)

AEZs	NPVs of projects		Zonal averages
	Agroforestry	Woodlot	
OHPP	80,598	135,711	108,155
NEBT	116,274	159,825	138,050
TMF	127,131	176,617	151,874
LBT	122,070	190,813	156,442
HBT	123,314	203,716	163,515
Rajshahi (average)	113,877	173,336	143,607

In summary, woodlots amongst the two schemes and the HBT zone amongst the AEZs show the best financial performance in terms of per ha NPV. The gap in financial profitability between agroforestry and woodlot across all the agro-ecological zones ranges in between Tk. 43,000 and Tk. 80,000 per ha and the largest difference occurs in the HBT zone as well. It is also worth noting here that the TMF and LBT zones are in different sequence in the two schemes, but the other AEZs fall into the same sequence. Evidently, the variation between agroforestry and woodlot schemes in each zone is very wide and seems to depend largely on survival of the trees and also on tree vigour (growth). The factors affecting these are discussed later in Chapter 14.

Overall results of the financial NPVs at 10% discount rate based on the percentage of plots having a positive NPV are presented below in Table 12.7.

Table 12.7 The percentage of plots with positive NPV at 10% discount rate

AEZs	Percentage of plots with positive NPV		
	Agroforestry	Woodlot	Overall for the project
OHPP	47	33	42
NEBT	100	95	97
TMF	87	80	83
LBT	100	85	90
HBT	100	100	100
Overall for Rajshahi Division	87	82	84

Almost 87% of the agroforestry plots, 82% of the woodlot plots and 84% of plots from both the schemes appeared to have positive NPVs. The plots with negative NPVs were the ones having no surviving tree at all. Of those that had at the least low survival (up to 15 trees per sample plot, or 750 trees per ha), all were viable at the 10% discount rate. Interesting enough is the association between Tables 12.6 and 12.7. For example, NPV of agroforestry plots in the OHPP zone came up to Tk. 80,600 with only about 50% plots having positive NPV (i.e., survival percent of 50%), while the same figure for HBT zone resulted into Tk. 123,000 with cent percent positive NPV. This inconsistency can perhaps be assigned to two reasons: firstly, the former zone has got trees with relatively greater vigour, promising higher financial return at the end. And secondly, the latter zone has incurred greater establishment cost in the agroforestry plantation than in the former, resulting into relatively lower NPV.

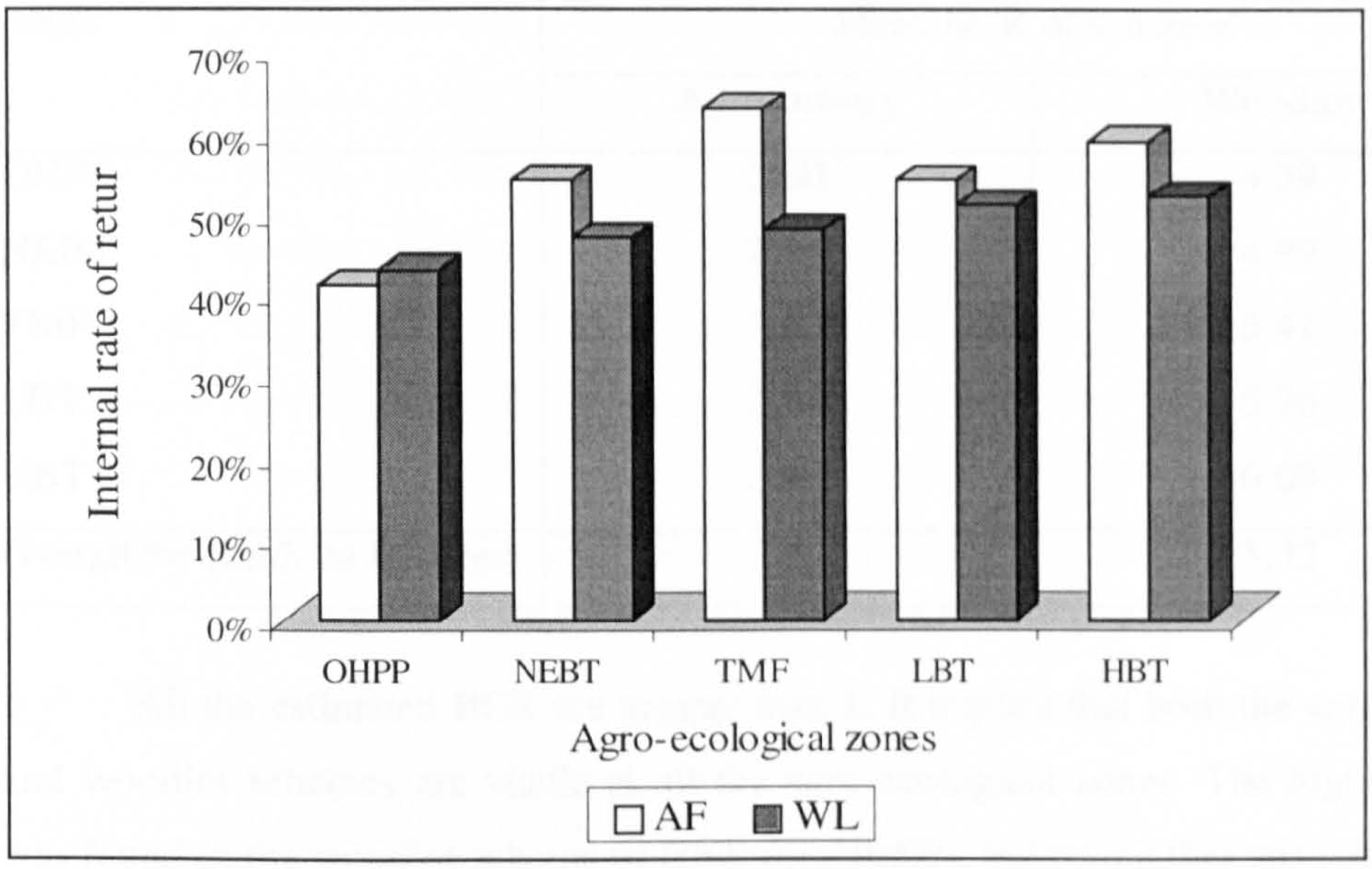
12.2.2 The financial IRR

The overall mean financial IRR by schemes and by AEZs presented below in Table 12.8 and Figure 12.1 bears a similar picture to that of the NPV.

Table 12.8 Mean financial IRRs for different schemes by AEZS

AEZs	Mean IRRs of schemes	
	Agroforestry	Woodlot
OHPP	41%	43%
NEBT	54%	47%
TMF	63%	48%
LBT	54%	51%
HBT	59%	52%
Overall for Rajshahi Division	57%	48%

Figure 12.1 Mean financial IRR of AF and WL schemes for each AEZs



Note: mean per scheme per ha.

All the IRRs show profitability when compared to the discount rate. The agroforestry scheme and the TMF zone have the highest IRR amongst the schemes and agro-ecological zones respectively. The high IRR of agroforestry scheme is due to its early returns. The only exception was observed in the OHPP zone, where the woodlot scheme has slightly higher IRR. This can possibly be attributed to the relatively higher growth rate of woodlot plots in the OHPP zone than the agroforestry plots. The widest variation in IRRs within a zone was found in the TMF zone as well.

12.2.3 The financial BCR

Financial BCR of both the schemes across all the agro-ecological zones have been presented in Table 12.9 below.

Table 12.9 Mean financial BCR of different schemes at 10% discount rate

AEZs	Mean BCR of schemes	
	Agroforestry	Woodlot
OHPP	2.30	4.39
NEBT	2.96	4.99
TMF	3.67	5.41
LBT	3.87	5.76
HBT	3.40	6.09
Overall for Rajshahi Division	3.32	5.32

All the estimated BCR are greater than 1. It implies that both the agroforestry and woodlot schemes are viable at all the agro-ecological zones. The highest BCR was found in the woodlot scheme of HBT zone (6.09), indicating that this scheme has proved to be the most profitable investment among all, across all agro-ecological zones under the study. It is noteworthy that the LBT and HBT zones have a different sequence for the two schemes.

Table 12.10 Results of financial analysis from similar previous studies in the social forestry sector

Author/s	Year	DR	NPV	IRR	BCR
Karch, G.E.	1992	25%	58,240 cfa	> 50%	3.11
Khan, J.A.	1993	10%	-1,675 Rs.	4.80%	0.62
Sekar, C. and Karunakaran, K.R.	1993	16%	9,871 Rs.	40.83%	1.65
Singh, J.P.	1995	10%	26,836 Rs.	36%	3.05
Mgeni, A.S.M and Nsolomo, V.R	1995	na	62,800 Tsh.	na	3.70
Kihiyio, V.B.M.S	1996	6.5%	96,810 Tsh.	23.5%	na
Singh, G. *et al.*	1997	18%	34,820 Rs.	na	2.06
Rahman, A. and Islam, S.S.	1997	15%	70,711 Tk.	42%	1.95

Note: DR – discount rate, na – not available.

12.3 The analysis of financial results

The financial results presented and described in the earlier sections indicate that there is an obvious variation in the profitability between the two schemes and also between the different agro-ecological zones. The variation in the results between agroforestry and woodlot is not only due to the addition of agricultural crops in agroforestry but also due to greater variation in the survival percentage of trees at the time of yield estimation, greater initial tree density in the woodlot scheme and the greater volume per tree. The average figures for the survival percentage of trees in different zones and schemes given below in Table 12.11 indicate that the agroforestry plots tend to have higher percentage of survival than the woodlot in the region.

Table 12.11 Mean survival percentage of trees in different schemes

AEZs	Mean survival percentage of trees		
	Agroforestry	Woodlot	Overall for the zone
OHPP	47	33	42
NEBT	100	95	97
TMF	87	80	83
LBT	100	85	90
HBT	100	100	100
Overall for Rajshahi Division	87	82	84

The higher survival percentage appears to be due to active participation and greater interest shown by participants in the agroforestry scheme. The recurrent accrual of agricultural crops from agroforestry plots during the first four years encourages the beneficiaries to pay regular visits to their respective plots, which in turn leads to better protection and achieves a higher survival of trees. Table 12.12 given below presents the comparative picture of the mean annual revenue generated both from agroforestry and woodlot schemes. It is obvious that the accrual of benefits from the agroforestry scheme during first three years is much higher than those in woodlots, mainly due to revenue generated from agricultural crops. However, in the latter years, woodlot plots have provided the beneficiaries with higher revenues, generated mainly out of the intermediate products. Also the estimated final products in the forms of fuelwood, pole and timber have shown to be of greater value in the woodlot plots compared to the agroforestry plots (see Annexures 12.5 and 12.7).

Table 12.12 Mean annual revenues from the AF and WL schemes

(figures in Tk/ha/year)

Plantation year	Mean annual revenues from different schemes			
	Agroforesty			Woodlot
	Agricultural crops	Forestry crops	Total	
1	11174	300	11474	120
2	8484	540	9024	220
3	5516	325	5841	125
4	3533	3600	7133	7000
5	0	10660	10660	19800
6	0	21100	21100	41200
7	0	33450	33450	64500
8	0	180352	180352	260240
Total	**28,707**	**250,327**	**279,034**	**393,205**

Another reason for the higher NPV and BCR in woodlot plots appears to be due to better out turn from trees, which ultimately results from their better growth, leading to greater volume per ha than those in agroforestry. A comparative picture of the average tree density and yield of trees per ha in agroforestry and woodlot plots, presented below in Table 12.13, corresponds to this statement.

Table 12.13 Present status and projected yield from AF and WL plots

AEZs	n/.02 ha	n/ha	Vol/ha	Fuelwood	Pole	Timber	Total vol
				AF			
OHPP	22	1107	48.40	16.46	28.56	3.39	48.40
NEBT	26	1287	73.40	24.96	43.31	5.14	73.40
TMF	30	1475	74.14	25.21	43.74	5.19	74.14
LBT	34	1717	73.49	24.99	43.36	5.14	73.49
HBT	29	1463	73.42	24.96	43.32	5.14	73.42
All zone	**28**	**1410**	**68.57**	**23.31**	**40.46**	**4.80**	**68.57**
				WL			
OHPP	36	1800	76.03	25.85	44.86	5.32	76.03
NEBT	43	2128	82.93	28.20	48.93	5.80	82.93
TMF	46	2275	94.35	32.08	55.66	6.60	94.35
LBT	51	2556	92.41	31.42	54.52	6.47	92.41
HBT	52	2620	102.69	34.91	60.59	7.19	102.69
All zone	**46**	**2276**	**89.68**	**30.49**	**52.91**	**6.28**	**89.68**

[initial tree density, AF = 1270 trees/ha, WL = 1667 trees/ha, as per govt. document]

12.3.1 The sensitivity analysis

In order to test the effects on profitability at various discount rates and under differing cost and benefit situations, a sensitivity analysis was carried out and its results are presented below in Table 12.14, 12.15 and Figure 12.2 and further results of the test can be found in Annexures 12.9 and 12.10. It can be comprehended from the table and the figure that, with increasing discount rates, there is a decrease in NPV in zones as well as in the schemes, which is the expected effect. Even at 20% discount rate, the NPVs of both the schemes and in all the zones have been found positive.

Table 12.14 Mean financial NPVs of schemes at various discount rates

Discount rates	NPVs of the schemes (Tk./ha at 1998-99 prices)	
	Agroforestry	Woodlot
0%	237,835	362,249
5%	165,398	249,730
10%	116,176	173,117
20%	58,110	82,571

Table 12.15 Mean financial NPVs of schemes at differing cost/benefit situation

Cost/benefit situation	NPVs of the schemes (Tk./ha at 1998-99 prices)	
	Agroforestry	Woodlot
Base calculation (at 10% discount rate)	116,176	173,117
Costs increased by 10%, Benefits remaining same	111,171	169,111
Benefits decreased by 10%, costs remaining same	99,553	151,800

With the change in discount rates and under differing cost/benefit situations, the ranking of the schemes with regard to their financial profitability remains unchanged, as compared to what exists at 10% discount rate. The performance of both the schemes of the TANDP appears to be robust in a number of site and cost conditions. So, such development interventions can be replicated in the future with due considerations to the site and climatic factors.

Chapter Thirteen

Identification of basic needs goods and estimation of basic needs income for Rajshahi

The theoretical framework for basic needs evaluation outlined in Chapter 7 has been applied in this chapter to assess the impact of the social forestry project (or, the schemes under the project) in terms of its role in fulfilling the basic needs of the participating farmers. The basic needs evaluation is to be carried out in terms of the average net annual basic needs impacts per ha in each of the agro-ecological zones and for each scheme of the project under this study.

Details of the project, for which both financial and basic needs analysis have been carried out, are provided in Chapter 4 and Chapter 8. It is clear from these discussions that this project aims primarily to meet the basic consumption needs of the rural poor. The dominant tree species in the agroforestry and woodlot schemes is *Eucalyptus camaldulensis*, followed by *Acacia auriculiformis*, both with a rotation of 7 years (GPRB 1994). The eucalyptus and acacia wood, harvested at the end of the rotation, would constitute the final products. Prior to harvesting, the participants have utilised intermediate products in the form of grasses, leaf-litter and twigs and branches. Details of the financial costs and benefits of the two schemes have already been provided in Chapter 12. The break-downs of the annual expenditures on various inputs of the two schemes has been given in Annexures 12.2 and 12.3, and that of the annual benefits from various outputs in Annexures 12.5 and 12.6.

The identification of basic needs goods and estimation of basic needs income are the two pre-requisites for the application of basic needs analysis. These are important because basic needs goods directly enter the consumption basket and basic needs income provides the necessary purchasing power. What constitute basic needs goods and what do not, however, is a debatable and subjective issue. An attempt has been made to identify the basic needs goods and estimate the basic needs income in line with the methodology developed by Nair (1981) and modified by Singh (1995) and here further developed. Emphasis has been given to the identification of the goods and services which are particularly relevant to the social forestry project in Rajshahi.

13.1 Identification of basic needs goods

Based on the ILO's (1976) definition, the goods and services needed to maintain a minimum standard of living in Rajshahi can be grouped into (a) private consumption goods, such as food, clothing, fuelwood, shelter and (b) public utilities services such as education, health care, drinking water and sanitation. A brief description for identification of each item is given below.

13.1.1 Private consumption goods

13.1.1.1 Food

Various studies have been undertaken to work out the requirements of a minimum balanced diet in terms of per capita calorie and protein intake sufficient to maintain the human's physiological functions. The average per capita calorie norm prescribed for Bangladesh ranges between 2100 and 2300 Kcal (INFS 1992, BBS 1997a). An intake norm of 2122 Kcal per day has been adopted by the Rural Poverty Monitoring Survey of BBS (1998c), while the Household Expenditure Survey (BBS 1997b) uses an absolute level intake of 2122 Kcal and a hardcore level intake of 1805 Kcal for estimating poverty in Bangladesh. Wodon (1997) worked out a daily per capita need of 2112 Kcal in his attempt to measure poverty in Bangladesh.

The usual procedure adopted to estimate the basic needs income (or the estimation of poverty line) in Bangladeshi conditions is that the minimum prescribed diet is costed at market prices. The figure so obtained is then adjusted using a ratio of food to total expenditure in order to know the necessary minimum expenditure on non-food items.

Under the constitution of Bangladesh, the public utilities services are supposed to be provided free by the concerned government authorities (GPRB 1998). But in reality, the rural people do incur some monthly expenses for children's education and health care purposes. So the costs incurred in these two sectors have been included in the consumption expenditure of an individual. It might be assumed here in line with Deb (1986) that the calorie requirement pattern of the rural population in different parts of the country follows the all Bangladesh pattern, and the price structure of the consumption basket and the price trends are identical in rural areas across regions.

However, there are important inter-regional differences in terms of population and activity status as well as in micro-climate and topography which need to be reflected in calorie requirements. Accordingly the normative calorie requirement would differ slightly from region to region within Bangladesh. It is also inherent in the poverty line concept that non-food expenditures such as fuelwood, clothing and housing are not normally estimated in the same way as food components. Rather a food:non-food ratio is fixed in order to account for necessary minimum expenditure on non-food items.

Household surveys generally fail to take into account the consumption derived from the non-monetised sector, especially free goods such as fuel from the forest and cattle dung from fields and common paths. This is because of the difficulty in estimating quantities and imputed prices.

Hence, a practical and realistic approach to the estimation of basic needs income will have to be based on:

(a) the estimation of the region-specific poverty line which would reflect the inter-regional differences in population, activity composition, climate, topography and price structure;
(b) the estimation of monetary value of non-monetised goods and
(c) the estimation of both food and non-food expenditures.

In line with the above approach, a household survey of 180 rural farmers was undertaken. Appendix 8.1 gives a set of questions (q. no. 7 – 11) used for this purpose. Using this information, consumption baskets containing food and non-food items for the five sampled agro-ecological zones were prepared. Table 6.4 in chapter 6 presents the consumption baskets for the three zones. The average of the five zones was computed to identify the consumption basket for Rajshahi as a whole. Then nutrient availability with regard to the calorie and protein contents of the food components was estimated with the help of the nutritive value book (INFS 1992). Finally, the monthly expenditure on each item was estimated. Table 13.1 below gives the components of the food basket, daily requirements and nutrient availability, and Table 13.2 gives monthly expenditure for the consumption basket for the five agro-ecological zones under the study and for Rajshahi Division as a whole.

Table 13.1 Average per capita per day basic food consumption and nutrient availability in Rajshahi

Food items	Quantity consumed (gm/head/day)	Energy derived (Kcal/head/day)	Protein derived (gm/head/day)
1. Rice	560	1945	44.8
2. Pulse	20	69	4.9
3. Edible oil	13	119	0.0
4. Vegetables	221	69	4.8
5. Fruits	12	7	0.1
6. Milk	88	59	2.8
7. Fish	49	54	8.7
8. Meat	22	23	5.1
9. Egg	7	13	1.0
10. Sugar	17	69	0.0
Total	**1002**	**2427**	**72.4**

Total food consumed (1002 gm/capita/day) by social forestry participants in Rajshahi is considerably higher (22%) than the average quantity of food consumed by an individual in rural Bangladesh. Per capita, per day calorie consumption (2427 Kcal) and protein consumption (72.4) among the participants in rural Rajshahi is also higher than the national-rural average figures (10% and 18% respectively). This is mainly due to the higher consumption of cereals, particularly rice, by the majority of the population who are engaged in physical work such as agricultural labour. Rice alone contributes about 56%, 80% and 62% of total food consumed, energy derived and protein derived respectively. As expected in a rural society, vegetables occupy the second position in terms of quantity consumed (22%), but they contribute a mere 3% and about 7% of per capita per day energy derived and protein derived respectively.

Table 13.2 Average per capita monthly basic needs consumption expenditure in five agro-ecological zones of Rajshahi

Food and non-food items	Average per capita monthly consumption expenditure in agro-ecological zones					Average of five zones
	OHPP	NEBT	TMF	LBT	HBT	
a. Food						
i. Rice	210.00	221.97	212.77	253.27	246.20	226.56
ii. Pulse	22.84	18.73	17.36	21.29	19.76	19.42
iii. Edible oil	28.39	16.73	25.06	26.26	24.01	23.86
iv. Vegetable	52.77	55.23	32.23	33.71	33.08	39.96
v. Fruit	15.27	9.73	15.13	5.58	9.44	11.53
vi. Milk	27.85	25.08	30.54	27.68	33.82	29.16
vii. Fish	27.54	34.45	29.29	25.49	22.93	28.40
viii. Meat	36.23	39.56	32.94	22.46	30.65	32.58
ix. Sugar	9.20	16.37	15.35	11.21	15.45	14.06
Total (food)	**430.10**	**437.84**	**410.68**	**426.95**	**435.35**	**425.52**
b. Non-food						
i. Clothings	43.88	40.74	44.82	34.79	44.90	41.83
ii. Fuel	69.51	62.36	58.20	44.70	46.00	56.15
iii. Light	16.00	11.55	11.33	11.06	12.80	12.20
iv. Housing	15.88	14.06	14.68	14.01	19.19	15.35
v. Health	17.97	15.11	17.03	13.67	15.88	16.01
vi. Education	24.83	15.50	15.42	18.83	18.37	17.75
Total (non-food)	**188.07**	**159.32**	**161.48**	**137.06**	**157.14**	**159.29**
Total(food+non-food)	**618.17**	**597.16**	**572.16**	**564.01**	**592.49**	**584.81**

13.1.1.2 Clothing

Clothing is one of the most important non-food items in the basic needs consumption basket of the rural poor. Although it is difficult to estimate precisely the requirement of clothing merely on biological needs, it is plausible to assume that low income groups in Rajshahi (as well as elsewhere in the country) usually consume the cheapest quality of coarse cotton and synthetic textile garments (BBS 1997c).

13.1.1.3 Fuelwood

Fuelwood is the major source of cooking energy for the rural poor in Bangladesh (Douglas 1981). National level surveys generally underestimate the value of fuelwood consumed because a major portion of the fuelwood is procured free from forests and wastelands. Several studies have been made to estimate the quantity of fuelwood needed for domestic consumption (Briscoe 1979, Kennes *et. al.* 1984, Howes 1987, Biswas and Lucas 1997). Douglas 1981 (in GPRB 1985a) estimated the daily per capita fuelwood consumption in north-west Bangladesh villages as 1kg[1] while, Openshaw and Morris (1979) suggested 2.7 kg for the developing world as a whole. Douglas' estimate for firewood consumption can be used as a rough estimate for Rajshahi.

Most of the poor farmers in rural areas do not purchase fuelwood directly, but their time and effort spent in procuring the firewood cannot be ignored (Bhatt *et. al.* 1994, Sarkar 1998). Thus the forgone value of time and effort can be considered as the imputed price of the firewood.

Farmers in rural Rajshahi were reported to spend about half a day to collect approximately 10-12kgs of firewood from the nearby plantations (Amin 1999, Rahman 1999). The questionnaire survey under this study has also come up with a figure close to Amin's and Rahman's estimates. Assuming per capita per day consumption of 1kg (after Douglas 1981 and Sattar 1998) of firewood, one person can

[1] Douglas (1981) reported a consumption of 5.05 GJ/person/year for the north-west region of Bangladesh comprising sample (greater) districts of Bogra, Dinajpur, Rajshahi and Rangpur. Sattar

arrange about 10 days' cooking firewood collected from half a day's effort. The marginal productivity of this labour is estimated as 33% of a fully employed worker (see Chapter 16, forthcoming) and current daily wage rate for labour employed in the Social Forestry Project in Rajshahi is Tk. 50/working day. Using this information, the forgone wage benefits in the collection of 10 Kgs of firewood would be Tk. 8.25 (i.e., 50 x ½ x 0.33). Thus the imputed price of 1kg of firewood would be approximately Tk. 0.80, which is less than the market price (Tk. 2-5 per kg) of firewood in rural Rajshahi.

13.1.1.4 Light

Light usage in rural areas of Bangladesh is limited to the use of kerosene lanterns and/or hurricanes mostly and electricity to a very minor extent. Electricity in the villages is provided by the Rural Electrification Board (REB). The REB has managed to supply electrification to 24,876 villages out of about 68,000 villages up to 1997-98 (BBS 1999a). This ends up in about 36% coverage. However, the questionnaire survey reveals that only about 8% of the sampled households utilise electricity for lighting purposes, while the rest (92%) rely solely on kerosene. The average expenditure for lighting purposes stands at Tk. 12.20 per person per month (Table 13.2). This figure can be taken as the basic needs cost of lighting for the social forestry participants.

13.1.1.5 Housing

Unlike the prescribed norm for the minimum food requirement, no precise information is available as to what constitutes the minimum housing requirement. However, the average amount spent on construction and repair of low cost houses owned by the rural poor can be considered as the basic needs requirement on housing (Nair 1981). This has been estimated through the household survey. Houses owned/occupied by poor farmers in rural Bangladesh are made from locally available materials: mainly mud walls with thatched or tinned roofs. The information gathered from the household survey indicates that on average, Tk. 15 per capita per month is

(1998) calculates that 1GJ corresponds approximately to the combustion energy of 71 Kg of wood. Therefore, 5.05 GJ comes to (5.05 x 71=) 358.55 Kg/person/year, or 0.98 Kg/person/day.

spent on construction and/or repair of these houses. Thus, this amount is taken as the basic needs expenses of housing (Table 13.2).

13.1.2 Public utilities services

13.1.2.1 Education

ILO (1977) has prescribed primary education as an important component in the basic needs strategy. This issue has further been emphasised by many researchers – Colclough (1978) and Stewart (1985) are just a few to name. GPRB (1998) views education as the basic tool for socio-economic transformation and advancement of the nation. Hasina (1997), the prime minister, emphasises primary education as a constitutional obligation. The government is obligated to extend free and compulsory primary education to all children to such a stage as determined by law.

To this end, 'The Primary Education (Compulsory) Act' was passed in 1990 and has been implemented all over the country from 1993 (Haq 1997). To enhance the drive for universalising education, a 'Food for Education' scheme has been undertaken. Under this scheme, children of selected poor families of primary school age receive 15-20 Kg of wheat every month for attending school regularly. This programme has significantly increased enrolment and attendance and has reduced drop-out (Haq 1997). Another praiseworthy scheme of the government is the FSSP (Female Secondary Stipend Project), wherein girl students of level 6 to level 10 were provided with a monthly stipend subject to the conditions of:

i. at least 75% attendance in each academic year;
ii. at least 45% mark in the final examination; and
iii. remain unmarried up to the SSC examination or the age of 18 years.

These three conditions were devised to act as a social strength (GPRB 1996).

Despite all these efforts, children's education was not free in its true sense. Parents had to bear expenses for books and stationery and sometimes for private tutors. Thus an average cost of Tk. 17.75 (Table 13.2) was incurred in the education sector of the participating farmers.

13.1.2.2 Health care

Providing medical health care is also a constitutional obligation of the government. The constitution mandates that: 'it shall be a fundamental responsibility of the state to attain ... improvement in the ... standard of living of the people ... to securing to its citizens the provisions of the basic necessities of life, including ... medical care' (GPRB 1998). With an aim to implement this vision, the government has established health centres at upazila/thana headquarter. Such centres are manned by one or more qualified physician/s and a number of health workers. Check-up, treatment and available medicines are provided to rural people free of cost. Health workers are supposed to pay periodic visits to village homesteads to inquire of their health conditions and act as health-extensionists (WHO/HD 1994).

But in reality, rural people can seldom avail themselves of the services of government health centres. Even at times when they can manage to visit the centre often at long distances from their home villages, they do not get the proper treatment. The questionnaire survey has revealed that most of the respondents rely on village-medics or local unqualified doctors to fulfil their healthcare needs. This results in a regular monthly expenditure, which amounts to an average of Tk. 16 per person per month (Table 13.2). This matches closely with the BBS (1998c) figure of Tk. 13 per person for health expenditure of the landless and small farmers' groups.

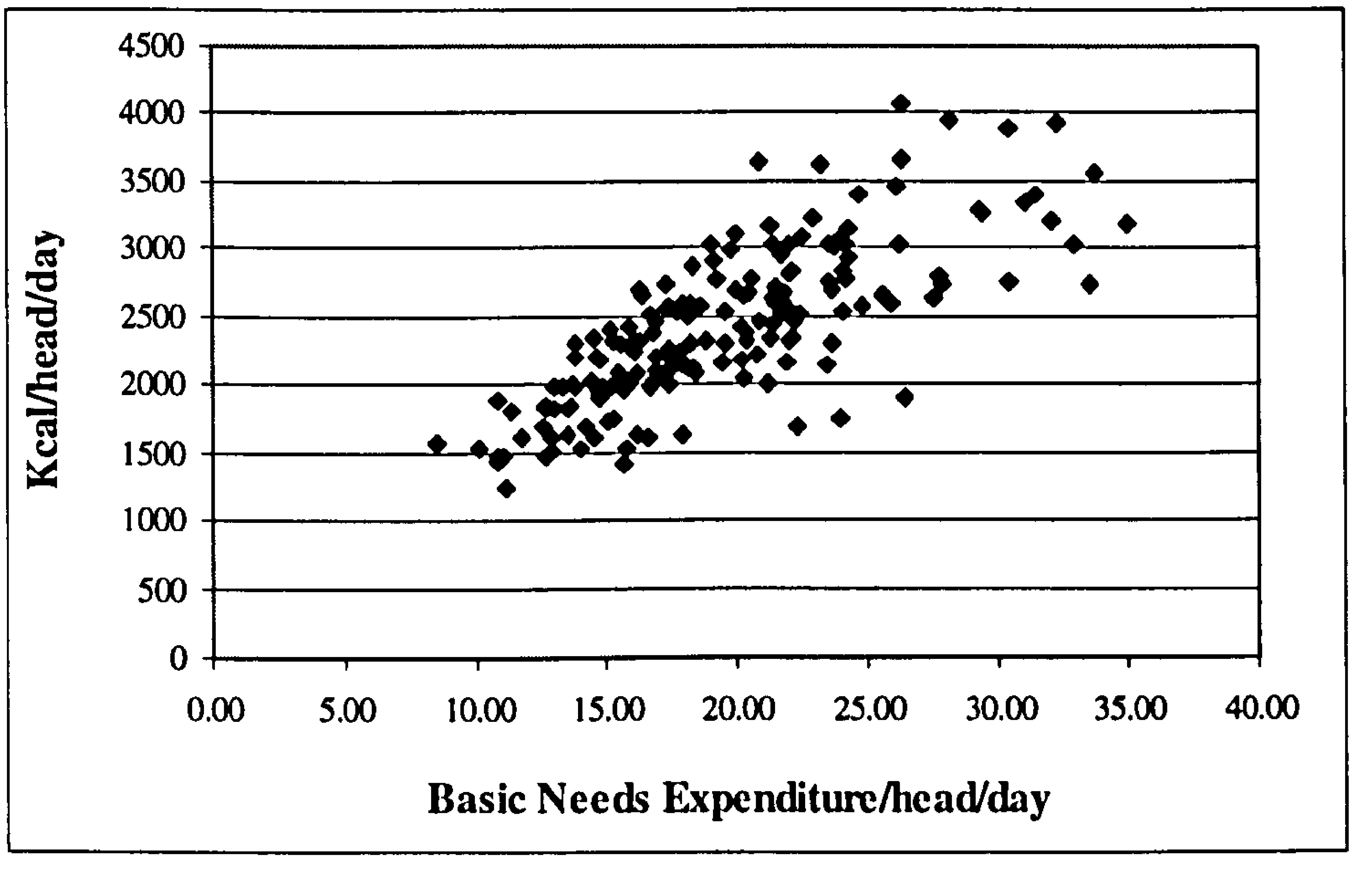
13.2 Estimation of basic needs income

Based on the methodology suggested in Chapter 7, the basic needs income has been estimated from the quantities and expenses of various components listed in the average basic needs basket for Rajshahi. The following paragraphs describe the details of the estimation of the basic needs income for Rajshahi.

Per capita, per day basic needs expenditure is determined by adding up the per capita, per day expenditure on basic needs items, both food and non-food (including clothing, fuel, shelter, light, education and health) for all the sampled households from all five agro-ecological zones and from both the schemes of the social forestry project under this study.

Chapter 10 has described the Kcal consumption per capita per day from all major food items. Those Kcal/capita/day figures were regressed on the basic needs expenditure/capita/day (BNX) for all households. Figure 13.1 shows the scatter diagram of Kcal regressed on basic needs expenditure.

Figure 13.1 Basic needs expenditure and energy consumption per head per day



The regression analysis has resulted into a regression equation as:

Kcal = 796.3448 + BNX * 82.92 $[R^2 = 0.598, p=0.00]$

Applying the above equation on the minimum prescribed calorie requirement for Bangladesh of 2122 Kcal (BBS, various years) gives a per capita, per day basic needs income (BNI) of Tk. 15.97, or Tk. 16.00. Applying the same equation for the WHO recommended calorie intake for a subsistence farmer of 2780 Kcal, the BNI comes to Tk. 23.90, i.e., Tk. 24.00.

These per capita, per day BNI figures were then multiplied by the number of family members to derive the per household, per year BNI for all sampled households. The average of those figures brings up the BNI/household/year as Tk. 31,185 on the basis of BBS calorie requirement and Tk. 46,671 on the WHO prescription. We shall use the BBS figure for any further analysis, and use the WHO figure for occasional comparative purposes.

The beauty of this approach is that it incorporates all the basic needs goods, both food and non-food, and converts the minimum requirement in terms of necessary income to satisfy those requirements without any undue sacrifice.

Chapter Fourteen

Estimation of Basic Needs Conversion Factor (BNCF) for goods

The basic needs conversion factor (BNCF) is a co-efficient which indicates the proportion of inputs and outputs that directly or indirectly enter the basic needs basket. The values of BNCF are used to estimate the social value of inputs or outputs in terms of basic needs fulfilment. The social values are obtained by multiplying the BNCF by the market value of goods. It was realised in Nair's (1981) approach that precise estimation of the BNCF depends on the identification of the actual use of inputs and outputs. In line with the improvement devised by Singh (1995), an attempt is made here to estimate the BNCF of inputs and outputs involved in the social forestry project in Rajshahi. This has been done with the help of the information gathered both through the questionnaire survey and from official sources.

14.1 Estimation of BNCF of outputs

Table 14.1 below gives a list of outputs derived from the social forestry project in Rajshahi. These outputs are of two types (a) agricultural outputs and (b) forestry outputs. Estimation of the BNCF of each output is undertaken as follows.

14.1.1 BNCF of agricultural outputs

Agricultural outputs comprise mainly food grain crops, some vegetables and fruits and agricultural by-products. Responses gathered through the questionnaire survey indicate that about 57% of this output was directly consumed by the producer, 37% was partly consumed and partly sold and the remaining 6% was sold in the local markets. The portion of the output consumed came directly into basic needs fulfilment. The remainder was sold in the market. The portion of agricultural outputs sold in the market increases supply of basic food items, thereby enhancing the accessibility of such food to the local people, which could eventually be consumed to satisfy basic food needs. This implies that all agricultural produce directly enter into the basic consumption basket. It is therefore reasonable to estimate a BNCF of 1.00

for each agricultural output. Details of the questionnaire responses are presented in Chapter 9.

Table 14.1 Outputs from agroforestry and woodlot schemes of the TANDP

Types of outputs	Details of outputs		
	Local names	Scientific names	
1. Agricultural outputs	**i) Food grain crops**		
	a. Paddy	*Oryza sativa*	
	b. Maize	*Zea mays*	
	c. Black gram	*Phaseolus mungo*	
	d. Sesame	*Sesamum indicum*	
	e. Pigeon pea	*Cajanus cajan*	
	ii) Vegetables & fruits		
	a. Potato	*Solanum tuberosum*	
	b. Bean	*Phaseolus lunatus*	
	c. Gourd	*Lagenaria siceraria*	
	d. Lady's finger	*Hibiscus esculentus*	
	e. Pineapple	*Ananas sativus*	
	iii) Others		
	a. Straw		
	b. Rice husk		
2. Forestry outputs			
i. Intermediate products	a. Grasses	-	for year 1 and 2 only
(up to final harvest)	b. Twigs and branches	-	from year 3 onward
	c. Leaf litter	-	from year 3 onward
	d. Loppings	-	from year 4 onward
ii. Final products	a. Timber	-	girth > 47 cm
(after final harvest)	b. Pole	-	girth 19–47 cm
	c. Fuelwood	-	girth < 19 cm

14.1.2 BNCF of forestry outputs

As shown in Table 14.1, forestry's outputs are of two types, namely intermediate products and final products. Intermediate products are those which are utilised before final harvest of the main crop, i.e., the trees. This also includes agricultural products in agroforestry projects, but they have been dealt with separately in the preceding paragraph, on account of their relative importance in the rural economy of Bangladesh. Final products on the other hand are obtained after final harvest of the main crop.

14.1.2.1 BNCF of intermediate products

Social forestry projects in Rajshahi have provided a number of intermediate products before the tree-harvest. These include mainly leaf litter, dry branches and twigs, and occasional loppings from healthier trees of *Eucalyptus camaldulensis* and *Acacia auriculiformis* chiefly and to some minor extent *Cassia siamea* and *Lagerstroemia speciosa* etc. All the plantations also provided forage grasses during the first two years of establishment.

All these intermediate products have various uses for the rural poor. For example, forage grass and leaf fodder are used for cattle feeding, dry leaves as essential cooking fuel, and the twigs and branches of various species as firewood, fencing and repair material of rural houses. In other words, all these intermediate products are directly utilised by the rural poor for their basic consumption needs. Since all the intermediate products directly enter the basic consumption basket, a BNCF of 1 seems to be appropriate for each of the intermediate products and, like the agricultural products, a BNCF of 1.00 is estimated for all the intermediate products together.

14.1.2.2 BNCF of final products

Estimation of the BNCF (goods) of the final products needs detailed examination to know the utility of the several components which constitute the final products.

The trees planted under the social forestry project in 1991-92 have not yet been harvested, despite reaching their rotation age of 7 years (GPRB 1994) in 1999. Even the plantations established as far back as 1987-88 have also not been harvested. Red-tapism and other bureaucratic complications are to be blamed for this abominable situation. It was thus not possible to assess directly the exact utilisation pattern and uses of the final products from these plantations. So, the author had to rely on secondary information to come up with a BNCF (goods) of the final products.

Records of BFD (1993) show that the final harvest was divided into three parts as: timber, having girth of above 47 cm; poles, with girth in between 19 cm and 47 cm; and firewood with girth less than 19 cm.

Under the prevailing socio-economic circumstances of rural Rajshahi region, it is quite plausible to assume that the fuelwood would be used locally and regionally as basic cooking fuel, and the poles (19-47 cm girth) would also be used locally for rural house construction and/or repairing purposes, and for making agricultural implements. Thus, these two output components can readily be assigned a BNCF (good) of 1, being used wholly for basic needs satisfaction in the local context. The timber component (above 47 cm girth) remains for further examination. It was observed among the rural farmers' community that eucalyptus and acacia timber is considered as good quality timber (being of foreign origin; a common belief in rural areas is that anything of foreign origin is better than local goods). On the contrary, these woods are not in demand in urban centres, where timbers like teak, mahogany and *garjan* (Dipterocarps) are available and in vogue. Eucalyptus and acacia wood are treated as inferior goods among the urban consumers. On this ground, it is reasonable to assume that all the timbers produced from social forestry projects are also used locally to satisfy rural people's basic wood needs and thence, can be assigned a BNCF (goods) of 1. Based on the above discussion, it would seem quite credible to assign a BNCF (goods) of 1.00 to the final products.

14.2 Estimation of BNCF of inputs

The BNCF of inputs are needed to know the proportion of inputs utilised for basic needs satisfaction. The important inputs involved in the social forestry project are seeds, fertilisers, insecticides, polythene bags and tools and implements.

14.2.1 Seeds

Eucalyptus and acacia seeds used in the plantations are either purchased locally or used up from the FD's stock. Rahman (1998) opined that about 30% of the seed required for each year's plantation is used up from FD stock of previous year, and the remaining 70% is purchased by local forest offices from local farmers. These local farmers are mostly participants in social forestry projects. The opportunity cost of labour used in seed collection should be taken into account here, thus giving a BNCF of 0.23 (0.7 x 0.33) to be used for seed.

14.2.2 Fertiliser

Assuming elastic supply of fertiliser in the Bangladesh context, extra demand from the project will entail diversion of resources into extra fertiliser production. Therefore, the BNCF of fertiliser must relate to the production of basic needs goods forgone as a consequence. Consideration of the cost of these resources is based on the distribution pattern of income in fertiliser production (see Chapter 15). This is further discussed in Chapter 16.

14.2.3 Insecticides

Insecticide is an imported commodity in Bangladesh and thus the question of resource diversion does not arise. So, a BNCF of 0.00 is taken for insecticides. It should be added here that the small pool of foreign exchange in the country is largely used for importing luxury goods, so there is no basic needs goods effect of foreign exchange.

14.2.4 Polythene bags

As with fertiliser (section 14.2.2), resource diversion into the production of polythene bags is assumed to mirror the pattern of income distribution in their production. This is considered in Chapter 15.

14.2.5 Tools and implements

The tools and implements used in social forestry projects in Rajshahi typically include the traditional agricultural implements such as hoes, shovels, scythes, sickles, ploughs, spades etc. This is mainly due to non-mechanised land use practices and agricultural backwardness (Ahmed 1981, Ullah 1996). The tools used in these practices are made from locally available materials and are used by small farmers who cultivate primarily to meet their basic needs. Thus, demand for more tools can be assumed to lead to the diversion of resources from producing basic needs goods within the area. In the absence of any information on factor shares, it is assumed that the cost of tools would be made of 60% of material inputs and 40% labour. If both sets of resources would have been used in basic needs goods production, a BNCF of 1 would be appropriate. However, since the labour may not have been employed elsewhere, the labour element is adjusted by a factor of 0.33 (details discussed in Chapter 16). Thus the BNCF of tools is considered as 0.73 (i.e. 0.6 + [0.4 x 0.33]).

14.2.6 Funds

The basic needs opportunity cost of funds is considered in Chapter 16 (section 16.3).

Based on the above estimation, a list of the BNCF of all outputs and inputs is given below in Table 14.2. It is however, important to point out that the values of BNCFs estimated here, although based on the actual field information, have been subject to some simplifying assumptions. Furthermore, the estimates made here are restricted to the particular conditions that exist in rural Rajshahi; the application of these values to other regions of Bangladesh or elsewhere needs further modification depending on the conditions prevailing in that region or country.

Table 14.2 BNCF (goods) of outputs and inputs involved in the social forestry project

Input/output	Products/components	BNCF (goods)
1. Output	a. Agricultural products	1.00
	b. Forestry products	
	i. Intermediate products	1.00
	ii. Final products	1.00
2. Input	a. Labour	0.33
	b. Seeds	0.23
	c. Polythene bags	0.06
	d. Fertilisers	0.05
	e. Insecticides	0.00
	f. Tools and implements	0.73

Source: Chapter 14, 15 and 16

Using the BNCF values of outputs, the social value of goods (goods effect) produced from agroforestry and woodlot schemes in the five sampled agro-ecological zones of Rajshahi has been computed and is presented below in Table 14.3. The goods effect for inputs in the project has been considered in Chapter 16 (Table 16.2).

Table 14.3 Basic needs value of goods (goods effect) of the agroforestry and woodlot schemes by agro-ecological zones

AEZs	Outputs	BNCF (goods)	Agroforestry		Woodlot	
			Financial value of output (Tk/ha)	Basic needs value of output (Tk/ha)	Financial value of output (Tk/ha)	Basic needs value of output (Tk/ha)
OHPP	Agricultural product	1.00	30,038.00	30,038.00	0.00	0.00
	Forestry product:Int.	1.00	99,320.00	99,320.00	165,540.00	165,540.00
	Forestry product:Fin.	1.00	101,591.00	101,591.00	159,594.00	159,594.00
	Total value		**230,949.00**	**230,949.00**	**325,134.00**	**325,134.00**
NEBT	Agricultural product	1.00	33,440.00	33,440.00	0.00	0.00
	Forestry product:Int.	1.00	104,280.00	104,280.00	193,610.00	193,610.00
	Forestry product:Fin.	1.00	154,069.00	154,069.00	174,065.00	174,065.00
	Total value		**291,789.00**	**291,789.00**	**367,675.00**	**367,675.00**
TMF	Agricultural product	1.00	29,485.00	29,485.00	0.00	0.00
	Forestry product:Int.	1.00	108,750.00	108,750.00	202,540.00	202,540.00
	Forestry product:Fin.	1.00	155,626.00	155,626.00	198,034.00	198,034.00
	Total value		**293,861.00**	**293,861.00**	**400,574.00**	**400,574.00**
LBT	Agricultural product	1.00	19,847.00	19,847.00	0.00	0.00
	Forestry product:Int.	1.00	111,970.00	111,970.00	229,390.00	229,390.00
	Forestry product:Fin.	1.00	154,251.00	154,251.00	193,962.00	193,962.00
	Total value		**286,068.00**	**286,068.00**	**423,352.00**	**423,352.00**
HBT	Agricultural product	1.00	30,723.00	30,723.00	0.00	0.00
	Forestry product:Int.	1.00	107,680.00	107,680.00	233,745.00	233,745.00
	Forestry product:Fin.	1.00	154,100.00	154,100.00	215,548.00	215,548.00
	Total value		**292,503.00**	**292,503.00**	**449,293.00**	**449,293.00**
All AEZ	Agricultural product	1.00	28,707.00	28,707.00	0.00	0.00
	Forestry product:Int.	1.00	106,400.00	106,400.00	204,965.00	204,965.00
	Forestry product:Fin.	1.00	143,927.00	143,927.00	188,240.50	188,240.50
	Total value		**279,034.00**	**279,034.00**	**393,205.50**	**393,205.50**

Note: Forestry product: Int. – Intermediate forestry product; Forestry product: Fin. – Final forestry product.

Source: Annexures 12.5-12.8

Chapter Fifteen

Estimation of Basic Needs Income from Inputs and Outputs of the Project

Based on the methodology discussed in Chapter 7, basic needs income generated from the project has been estimated. Details of the input costs are given in Annexures 12.2 and 12.3 and output values in Annexures 12.5 and 12.6. The expenditure details have been disaggregated to identify the distribution of payments for inputs between basic income, non-basic income and savings and investments. From the expenditure details, it is clear that the inputs involved in the projects are of two types namely (a) direct inputs and (b) indirect inputs. Direct inputs consist of the inputs directly involved in various operations of plantation and harvesting. Plantation operations include the inputs such as land, labour, seeds, fertilisers, insecticides, polythene bags as well as tools and implements. Indirect inputs involve firstly the inputs in establishment of the projects such as staff's salaries and allowances, maintenance of offices, vehicles and buildings and secondly the inputs in overhead charges such as in training, publicity, monitoring and evaluating and protection of the project's activities. The following section describes the details of the estimation of the basic needs income generated by each of the inputs.

15.1 Estimation of basic needs income from inputs

15.1.1 Direct inputs

15.1.1.1 Land

Land used in the social forestry project originally belongs to the government FD and was made available for the project free of cost. Since no payment was made to the owner of the land, it does not require to take into account the estimation of basic needs income in case of land. Thus the basic needs income generated by the use of land is considered as zero to the owner. However, the basic needs income opportunity cost of land is considered under section 15.2.

15.1.1.2 Labour

Expenditure details presented in Annexures 12.2 and 12.3 show that the major portion of expenditure in the project goes towards the payment of wages to the labourers (59% and 63% of total direct cost for agroforestry and woodlot schemes respectively). These labourers are mostly semi-skilled and non-skilled and are drawn mostly from the agricultural sector. They are primarily the landless unemployed or seasonally employed. It is estimated that even if these labourers were employed throughout the year at 1998-99 wage rate (i.e., Tk. 50 per man day), their annual income would not exceed the basic needs income (Section 13.2). This means, the entire payment made to these labourers is utilised in meeting the basic consumption needs and hence, the total labour cost incurred in the project is considered as basic needs income.

15.1.1.3 Fertiliser

The use of fertiliser in any project can be estimated by disaggregating the fertiliser into its various factors of production and identifying the value added and other income amongst the various factors of production. Income generation from fertiliser depends on the place of its production i.e. whether it is produced domestically or imported. If the entire requirements of a project are met through imported fertiliser then basic needs income is considered as nil, due to no involvement of local factors of production. On the other hand, if locally produced fertilisers are used in the project then the expenditure on fertiliser is considered as payment to the local factors of production. Government data show that nearly 15% of total fertiliser requirements are still met through imports with the remainder met through domestic production (BBS 1999a). Disaggregation of the various components of fertiliser production and their payments to the owners of the factors of production are described below.

Approximately 6% of the total expenditure on fertiliser in Bangladesh is spent on transportation and 10% on the wholesale and retail margin (BCIC 1997). Inputs related to transportation involve both imported as well as domestically available goods and services in the proportion of 70% and 30% respectively. Imported inputs in the fertiliser transport sector include automobile (truck) engines and chassis, fuel (i.e., diesel and petrol) and lubricants, while the local inputs include truck bodies and the labour involved in making the truck bodies. Using Nair's approach, the ex-factory cost of domestically produced fertiliser can be disaggregated into (a) value added, margin etc. as 65% and (b) material inputs as 35%. About 40% of the expenditure on the material inputs are spent on imported raw materials such as petroleum and chemicals (BCIC 1997) and the remaining material inputs are procured from the local markets. The allocation of expenditures on purchase of fertiliser worth Tk. 1.00 are disaggregated and shown below in Table 15.1.

Table 15.1 Breakdown of the input costs of fertiliser worth Taka 1.00

Input cost components	Percent share	Allocation in Taka
Total input (A)	100%	1.00
1. Transport	6% of (A)	0.06^
1.1 Imported materials (engine, fuel etc.)	70% of 1.	0.04
1.2 Locally supplied materials	30% of 1.	0.02*
2. Whole sale and retail margin	10% of (A)	0.10^*
3. Direct import of fertilisers	15% of (A) – (1+2)	0.12^
4. Local production	85% of (A) – (1+2)	0.72^
4.1 Value added	65% of 4.	0.47*
4.2 Material input	35% of 4.	0.25
4.2.1 Imported material input	40% of 4.2	0.10
4.2.2 Local material input	60% of 4.2	0.15*
Payment made to local factors of production (Σ of * marked items)		0.74

Note: ^ marked items add up to Taka 1.00

Source: BCIC (1997) information applied to methodology of Nair (1981).

In Table 15.1, the outlays shown on items 1.1, 3 and 4.2.1 involve the direct and indirect expenditure on imports of fertiliser and hence are excluded from estimation of the basic needs income. On the other hand, the outlays on local factors of production presented in items 1.2, 2, 4.1 and 4.2.2. are considered for estimation of basic needs income. The outlay on local factors of production is further disaggregated to identify the distribution of income to the different owners of factors of production. The distribution of payments to local factors of production is given below in Table 15.2.

Table 15.2 Distribution of local factors of production amongst various groups of the society.

Local factors of production	Total payment	Distribution amongst different groups		
		Group I	Group II	Group III
1. Transport-local materials	0.02	0.01	0.005	0.005
2. Whole sale and retail margin	0.10	0.04	0.04	0.02
3. Value added	0.47	0.07	0.21	0.19
4. Local inputs	0.15	0.03	0.09	0.03
Total	0.74	0.15	0.345	0.245

Group I (the basic needs group, see Chapter 7) receives only Tk. 0.15 out of every Tk. 1.00 cost of fertiliser. Thus a factor of 0.15 is used for estimating the basic needs income generated from use of fertilisers in the project.

15.1.1.4 Insecticides

All the insecticides and pesticides used in Bangladesh agriculture are imported (BBS 1999a). Since there is no local production involved, none of the expenditure incurred in insecticide procurement goes to the local population groups, except for a very minor part of the transportation expenditure from the port to the government warehouses and thence to the different local dealers. Accordingly the distribution of payment to group I is nil and a factor of 0.00 is taken for estimating the basic needs income generated from use of insecticides in the project.

15.1.1.5 Polythene bags

One of the most important inputs in any plantation activity is polythene bags due to their use in seedling raising in the nursery. Polythene bags used in plantation activity in Bangladesh are 100% locally produced, though made from imported raw materials. It better be mentioned here that unlike fertilisers, polythene bags in Bangladesh are produced in the private sector, mostly in small scale factories in and around urban areas. No state enterprise produces polythene bags yet. Unlike fertiliser, the polythene bag is very light in weight and involves less cost in transportation and handling. It is estimated that the cost of transport of polythene bags amounts to some 4% of the total outlay (Hawladar 1999). Similarly 6% of total cost is regarded as payment against wholesale, covering the wholesale and retail margin. Considering the existing situation of polythene manufacturing in Bangladesh, outlay on various factors of production of polythene is disaggregated and is shown below in Table 15.3.

Table 15.3 Breakdown of the input costs of polythene bags worth Taka 1.00

Input cost components	Percent share	Allocation in Taka
Total input (A)	100%	1.00
1. Transport	4% of (A)	0.04^
1.1 Imported materials (engine, fuel etc.)	70% of 1.	0.03
1.2 Locally supplied materials	30% of 1.	0.01*
2. Whole sale and retail margin	6% of (A)	0.06^*
3. Local production	100% of (A) – (1+2)	0.90^
3.1 Value added	60% of 3.	0.54*
3.2 Material input	40% of 3.	0.36
3.2.1 Imported material input	80% of 3.2	0.29
3.2.2 Local material input	20% of 3.2	0.07*
Payment made to local factors of production (Σ of * marked items)		0.68

Note: ^ marked items add up to Taka 1.00

Source: Hawladar (1999) information applied to methodology of Nair (1981).

Payments made to local factors of production include the items under 1.2, 2, 3.1 and 3.2.2 and are presented above in Table 15.3. These payments are further distributed between the different income groups in line with Nair's approach as shown below in Table 15.4.

Table 15.4 Distribution of income amongst various groups of the society

Local factors of production	Total payment	Distribution amongst different groups		
		Group I	Group II	Group III
1. Transport-local materials	0.01	0.01	0.00	0.00
2. Whole sale and retail margin	0.06	0.02	0.03	0.01
3. Value added	0.54	0.14	0.30	0.10
4. Local inputs	0.07	0.01	0.04	0.02
Total	0.68	0.18	0.37	0.13

Table 15.4 shows that the payment received by group I comes to around Tk. 0.18 for every one Tk. worth of polythene bags. Thus a factor of 0.18 is estimated for computing the basic needs income from the use of the polythene bags in the social forestry project.

15.1.1.6 Seeds

Seeds used in agroforestry and forestry plantations in Rajshahi are mostly collected locally. Subsequently, these seeds are used to raise the seedlings for plantation purposes. Usually semi-skilled and non-skilled labourers are engaged in collecting seeds and raising seedlings. Since the wages earned by these labourers are entirely used for basic needs consumption, it is plausible to assume that all the expenditure accruing in collection of seeds is basic needs income. Hence, a factor of 1.00 is considered appropriate.

15.1.1.7 Tools and implements

As stated in Chapter 14, the tools and implements used in social forestry activities mainly include indigenous instruments and are produced largely by the rural poor using locally available materials. Hence 100% of income from the sale of tools is assumed to be of a basic needs nature. Thus a factor of 1.00 can be estimated to compute the basic needs income generated from investment in tools and implement.

15.1.2 Indirect inputs

Expenditures under each item of indirect inputs in Annexures 12.2 and 12.3 are used to estimate the generation of basic need income. These are described below.

15.1.2.1 Establishment

Cost incurred in the payment of wages, salary (other than daily wages labours), travelling expenses and maintenance of office, building and motor vehicle constitute the establishment cost. Nearly 80% of the total indirect cost has been spent under establishment charges (BFD 1992, GPRB 1994). The basic needs income generated from the various inputs involved in establishment charges is described below.

15.1.2.1.1 Salaries and allowances to staffs

Official documents show that no qualified forest officers (ACFs, i.e., Assistant Conservator of Forests) have been recruited under the social forestry project in field offices, although 61 ACFs were recruited under this project to be posted at district or DFO offices. These ACFs had to perform a number of forestry administrative duties and could hardly contribute directly to any field plantation activities.

Very few permanent field staff (only about 20% of all staff recruited during the project's life of 8 years) are engaged exclusively for the plantation activities in the social forestry project in Rajshahi (GPRB 1994). These are mostly from the semi-skilled type having primary to secondary education only. Their nature of work is mainly supervisory such as watch and ward of the plantation, maintenance of field plantation records and recording attendance of the labourers. Such staff get slightly higher wages than unskilled daily wage labourers. However, their annual earnings do not exceed the required basic needs income (Alam 1999). So the entire expenditure of the projects under staff salary is considered as basic needs income and hence a factor of 1.00 is used to compute the basic needs income from this input.

15.1.2.1.2 Office expenses

Office expenses include expenditure on day to day requirements for telephone, fax, postage and stationery items. The records of BFD do not have any clear indication as to where exactly these amounts were spent. Due to non-availability of information on disaggregation of expenditure between various factors of production, it is difficult to estimate precisely the generation of basic needs income from office expenses. However, Nair's (1981) estimate of equal distribution between the three income groups can be used for the purpose, giving a factor of 0.33.

15.1.2.1.3 Maintenance of vehicles

All the vehicles used in the social forestry project are imported, except for a very few small trucks. The fuel used to run those vehicles is also imported. None of the factors of production of these items incur income to the basic needs group (group I) of the society. However, the drivers recruited to run these vehicles are from the semi-skilled labour force, whose salary constitutes about 3% of the staff-salary outlay. Another about 1% of the fund has been utilised for maintenance of vehicles by semi-skilled automobile mechanics. These workers' annual income does not exceed the basic needs income as estimated in Chapter 13. Thus, a basic needs factor of 0.04 can be taken for maintenance of vehicles.

15.1.2.1.4 Construction and maintenance of buildings

Costs of construction and repair of buildings in the social forestry project in Rajshahi are split between wages (nearly 30%) and material inputs (70%) such as bamboo, sand, cement, steel-rod and bricks (BFD 1992). Usually the buildings constructed under the social forestry project are located in the remote rural areas and the labour employed in the construction of these buildings is mainly the unskilled, seasonal or part-time workers. Based on estimated distribution of value added and other income in rural housing, it is plausible to assume that approximately 90% of the payments are received by group I (BFD 1992). Hence a factor of (0.3 x 0.9=0.27) or, 0.30 has been used in estimating the basic needs income generated from the construction and repair of buildings in the projects.

15.1.2.2 Overhead

15.1.2.2.1 Training

The social forestry project of Rajshahi organised regular training both for field staff and farmers with a purpose to create awareness amongst the persons involved in the project. Although the expenses incurred under staff training constitute only about 2.1% of total expenses (see Appendix 12.2 and 12.2), its impacts in terms of generation of basic needs income could be quite substantial. It was also learnt that the social forestry participants were given an incentive of Tk. 500 for attending each training course (Copy of a training course certificate awarded to a participant appended at the end of the Appendices). Although it is difficult to get an accurate proportion, BFD officers (e.g. Alam 1999) opined that nearly 60% of total payments made during training is received by the people within group I (the basic needs group). Hence a factor of 0.60 is appropriate to use for estimating the generation of basic needs income from investment in the training component.

15.1.2.2.2 Protection

The plantations under the social forestry project in Rajshahi are usually protected by engaging labourers during the first three years of the establishment (BFD 1998). It is estimated that nearly 80% of the protection costs are paid to the labourers who are unskilled and illiterate (Amin 1998), belonging to the basic needs group. Thus a factor of 0.80 is considered for estimating the basic needs income from expenditure on protection.

A summary table showing the proportional distribution of payments to local factors of production and the payments received by the basic needs income group is given below in Table 15.5.

Table 15.5 Proportional distribution of expenditure on inputs

Inputs	Total expenditure	Expenditure On local factors Of production	Payment received by basic needs income group (Group I)
A. Direct inputs			
i. Land	0.00	0.00	0.00
ii. Labour	1.00	1.00	1.00
iii. Seed	1.00	1.00	1.00
iv. Polythene bags	1.00	0.68	0.18
v. Fertiliser	1.00	0.74	0.15
vi. Insecticide	1.00	0.00	0.00
vii. Tools and implement	1.00	1.00	1.00
B. Indirect inputs			
a) Establishment			
i. Salary and allowances	1.00	1.00	1.00
ii. Office expenses	1.00	1.00	0.33
iii. Vehicles	1.00	0.04	0.04
iv. Buildings	1.00	1.00	0.30
b) Overhead			
i. Training	1.00	1.00	0.60
ii. Protection	1.00	1.00	0.80

15.2 Estimation of basic needs income from outputs

Estimation of the basic needs income from the outputs needs detailed examination to know the utility of the several components which constitute the intermediate and final products.

The intermediate products are consumed wholly by the farmers (directly or indirectly).

The trees planted under the social forestry project in 1991-92 have not yet been harvested, despite reaching their rotation age of 7 years (GPRB 1994) in 1999. Even the plantations established as far back as 1987-88 have also not been harvested. Red-tapism and other bureaucratic complications are to be blamed for this abominable situation. It was thus not possible to assess directly the exact utilisation pattern and uses of the final products from these plantations. So, the author had to rely on secondary information to come up with the basic needs income of the final products.

Only one block of five agroforestry plantations established in 1985, belonging to five farmers, each of an area of 1.21 ha, were harvested in 1993 at Modhyopara Range of Dinajpur Forest Division. The official records of that harvesting operation and benefit sharing between the farmers and the FD (DFD 1993) has served the invaluable purpose of essential secondary information. The research article by Rahman and Islam (1997) in an attempt to gauge the financial viability of agroforestry practice under participatory approach has also proved to be quite useful, being based on the actual data from that harvesting operation.

However, the benefit sharing mechanism (discussed in detail in Chapter 4) and the deed of participation (appended in Chapter 4) expresses that the agroforestry participants would get 50% of the final harvest and the woodlot farmers would get 40% of the same. Records of DFD (1993) show that the final harvest was divided in to three parts as: timber, having girth of above 47 cm; poles, with girth in between 19 cm and 47 cm; and firewood with girth less than 19 cm. After the final felling, the harvested components were sold through open auction. The money collected through such auction was then distributed between the two parties (the first party being the

FD, i.e., the GPRB, and the second party being the participant) according to the agreement.

The amount of money thus received by the participant out of the sales proceeds constitutes the framework for estimating the basic needs income of the final products. In general, as the participants would receive 50% or 40% of the sales proceeds, so a BNCF of 0.5 or 0.4 might be taken as a starting point. Now it remains to be examined what proportion of that money would be spent on basic needs purposes. The questionnaire survey reveals that, 96% of the respondents wished to buy either draught animals or farming land or invest in small business, which in turn would be utilised to satisfy some of the very basic needs of this rural farming community. The rest (only some 4% of the respondents) wanted to buy some luxury goods like motorcycle or irrigation pump, being more affluent in wealth status of the participants. A personal visit and conversation by the author with one of the 1993 Modhyopara farmer (Kari 1999), who now runs his own small grocery store in the local village market, exposes the very true nature of the participants' intention of utilising the derived final benefit from participating in a social forestry project in a basic needs oriented manner.

As stated in Chapter 7, the basic needs income generated from the output of the project is calculated from the proportion of benefit which is spent on basic needs consumption. The project proforma of the TANDP (GPRB 1994) state that the beneficiaries would be the recipients of 50% of agroforestry revenue and 40% of woodlot revenue respectively. But unlike the inputs, there will be no distribution of this value added (50% and 40%) amongst other groups of the society.

From agroforestry, the agricultural and intermediate forest products are directly consumed by the rural poor for basic consumption needs. As regards the share of revenue (50%) received after the final harvest of trees, the responses from the household survey suggest that 4% of that revenue would be utilised for luxury consumption.

The calculation stage for derivation of the basic needs income from outputs can be described stepwise as follows:

i. Basic needs income per household per year has been determined in Chapter 13 (see section 13.2). It can be termed as **B**.

ii. We have an estimate of the present household returns from the project, i.e., the intermediate products of the year when the survey was done. Let us call it **C**.

iii. We have an estimate of the (constant) annual opportunity cost of the project to the household, i.e., the forgone agricultural returns. This is the agricultural return of year 1 as presented in Appendix 12.6. Let us call it **D**.

iv. We can estimate the sustained annual returns from the project to the household as the sum of [intermediate agri-crops + Intermediate forestry products + ({50% or 40% of final forestry returns} x 0.96)] / 8. It can be termed as **F**.

v. We can also estimate the household's without project income, **A**, as E – C + D, where, **E** is the household basic needs expenditure. E has already been calculated to derive B in Chapter 13.

vi. We can also estimate the household's with project income, **G**, as A + F – D.

We can finally estimate the basic needs income effect of the project. Assuming that the project improves people's sustainable income i.e., **G > A**, then

- if G ≤ B, then all of G – A is basic income increase;
- if A ≥ B, then none of G – A is basic income increase;
- if G ≥ B ≥ A, then some of G – A is basic income and some is not. The amount that is basic for this last group is simply B – A.

If however, **A > G**, then in all the above cases A and G would interchange place, and the basic needs income effect of the project would become negative, as might happen where the trees have failed to survive or were stolen.

All these criteria have been taken into account and put into a spreadsheet calculation to derive the basic needs income contribution of the project in each agro-ecological zone and for both the schemes of the project under consideration. Basic needs income according to the calorie requirements given by BBS and WHO are shown in Table 15.6

Table 15.6 Basic needs income to participants in the social forestry project broken down by scheme and agro-ecological zone (Tk./ha)

	Agroforestry		Woodlot	
	BBS	WHO	BBS	WHO
OHPP	13,298	6,035	7,262	15,922
NEBT	19,039	44,401	-26,779	-29,319
TMF	82,863	267,087	74,622	77,198
LBT	207,594	285,730	162,804	222,153
HBT	140,919	190,512	184,452	204,051

These results match somewhat closely with the financial NPVs calculated in chapter 12 (table 12.6). Basic needs income figures for agroforestry plots have followed similar progression across the agro-ecological zones as those of the NPV figures, except that the highest income has occurred at LBT zone (under both the calorie norm calculations), whereas the highest NPV has been found in the HBT zone. Woodlot NPVs increase gradually from OHPP to HBT zone, but woodlot incomes show a dismal picture with NEBT plot having negative figures. Such an anomaly requires in-depth exploration which is beyond the scope of this study.

Using the BNCFs for the generation of basic needs income, the basic needs income generated from each input have been calculated, and direct computation of average basic needs income from outputs involved in the agroforestry and woodlot schemes in Rajshahi have been done and are presented below in Table 15.7.

Finally, the income accruing to FD i.e., 60% of woodlots and 50% of agroforestry has been multiplied by 0.75 (the approximate proportion of public revenue going to poor members of the community). In line with assumptions made in costing investment funds (see section 16.3) none of the project revenues are assumed to be reinvested.

Table 15.7 Basic needs income (income effect) from the inputs and outputs of the social forestry project

Inputs and outputs of the project	Factors for estimating the basic needs income generated from inputs	Agroforestry		Woodlot	
		Financial cost of inputs (Tk./ha)	Basic Needs Income (Tk./ha)	Financial cost of inputs (Tk./ha)	Basic Needs Income (Tk./ha)
1. Inputs					
A. Direct inputs					
i. Land	0.00	0.00	0.00	0.00	0.00
ii. Labour	1.00	10773.71	10773.71	16568.87	16568.87
Iii. Seed	1.00	161.00	161.00	173.17	173.17
iv. Polythene bags	0.18	1153.11	207.56	1401.99	252.36
v. Fertiliser	0.15	1682.68	252.40	1853.80	278.07
Vi. Insecticide	0.00	34.55	0.00	33.06	0.00
Vii. Tools and implement	1.00	2303.64	2303.64	3298.31	3298.31
B. Indirect inputs					
a) Establishment					
i. Salary and allowances	1.00	4433.44	4433.44	4744.71	4744.71
ii. Office expenses	0.33	1267.93	418.42	1356.94	447.79
Iii. Vehicles	0.04	400.96	16.04	429.12	17.16
iv. Buildings	0.30	320.89	96.27	343.42	103.03
b) Overhead					
i. Training	0.60	625.44	375.26	669.36	401.62
ii. Protection	0.80	1111.50	889.20	1111.50	889.20
Total of inputs		24268.85	19926.94	31984.25	27174.29
2. Outputs (net of forgone Agricultural returns)			102109.00		78500.00
3. Government revenue*			104637.75		176942.50

Source: Compiled and computed from Tables 14.3 (GE x 0.50 or 0.60 x 0.75)*, 15.5 and Annexures 12.2, 12.3, 12.5 and 12.7

Chapter Sixteen

Estimation of social costs of goods and social costs of income

Based on the improvements suggested to Nair's approach in Chapter 7, the social costs of resources in the context of basic needs fulfilment are estimated in terms of forgone production of basic needs goods and forgone generation of basic needs income. The details of the resources used in the projects are given in Annexures 12.2 and 12.3 and estimation of the social cost of each of them incurred in both the production of basic needs goods and generation of basic needs income are described below.

16.1 Direct inputs

16.1.1 Land

16.1.1.1 Social cost of land incurred in the production of basic needs goods

As stated in Chapter 14, the land used in the project falls under the category of degraded forest owned by the BFD. Landless beneficiaries have been provided with such land free of costs. However, although land is free, its social cost has been estimated in terms of the production of basic needs goods forgone in its alternative uses. The alternative use of land was identified through the questionnaire survey and official information (BFD 1993). About 70% of these lands were used for agricultural purposes, while 10% were under use for grazing purposes. The remainder was lying almost barren and degraded without any particular use prior to their diversion for the project.

In view of the above facts it is appropriate to estimate the opportunity cost of land in terms of forgone agricultural benefits from 70% of the land under use. The average annual value of agricultural production per hectare after diversion of land for the project has been estimated from the questionnaire survey, which comes to Tk.17,160 per ha for an average ha of these lands under agroforestry and woodlot plantations. Therefore, with 70% utilisation, the land would have produced agricultural crops (mainly paddy) worth about Tk. 12,000 per ha per annum. In other words, the per hectare social cost of land for the project period under examination would be Tk. 96,000 (12,000 x 8). This forgone value of the agricultural benefit is only an approximation to illustrate the true cost of the land. Precise estimation would require detailed information on loss of productivity of crops due to forgone agricultural benefits which is not possible owing to time and resource constraints.

16.1.1.2 Social cost of land incurred in the generation of basic needs income

The land used under the social forestry project would generate no basic needs income in the absence of the projects because the owner of the land (the government) would not receive any payment. Hence the diversion of the land for the project has not affected income generation of the government. However, its withdrawal has affected income of the encroachers who were utilising part of the land. This is included in calculating the net basic needs income effect to participants, on the ground that the participants would be among the encroachers.

16.1.2 Labour

Based on the methodology suggested in Chapter 7, the social cost of labour in the context of basic needs is estimated on the principle of the forgone marginal productivity i.e. in terms of the forgone marginal production of basic needs goods and forgone marginal generation of basic needs income.

16.1.2.1 Social cost of labour incurred in the production of basic needs goods

The Labour Force Survey (LFS) of Bangladesh (BBS 1996) divides the total rural workers by employment status into five main categories from which a broader category can be derived by activity status into two main types, part-time workers (PTW) and full-time workers (FTW). FTWs are those who have worked more than 4.75 days (or, 38 hours) in a reference week while PTWs are those who have either worked less than or equal to 4.75 days or did not work at all in the week. Table 16.1 below gives the average estimates of these two types of workers on the basis of their average number of employment and unemployment days per week. This shows that FTWs were unemployed for an average of 0.129 day, while PTWs were unemployed for 2.73 days in a reference week.

Table 16.1 Distribution of rural work force by activity status in Bangladesh.

(method based on Khan 1993)

Activity status	Employed (days/week)	Unemployed (days/week)
PTW	1.641	2.734
FTW	6.625	0.129

Occupational status in the division of Rajshahi shows that out of the total working population (45.12% of total population), FTW and PTWs constitute 35.64% and 9.47% respectively. Although it has been pointed out repeatedly that labour employed in the social forestry project in Rajshahi is mostly drawn from PTWs, it is plausible to assume that some 'FTWs' are also employed (based on Sharma 1990). Hence, it is assumed that the workers for social forestry will be drawn in proportion to the total labour days of unemployment from FT and PT workers as shown in Table 16.1. Following Khan (1993), the ratio of marginal to main workers can be estimated as:

$$\frac{\text{PTW days}}{\text{FTW days}} = \frac{\text{\% of PTW x average number of days unemployed for PTW}}{\text{\% of FTW x average number of days unemployed for FTW}}$$

$$= 9.47 \text{ x } 2.734 \,/\, 35.64 \text{ x } 0.129$$

$$= 25.891 \,/\, 4.5976$$

$$= 5.63$$

This means, if the total labour days needed in social forestry are 6.63 then 5.63 labour days are withdrawn from the PTWs and remaining 1 from the FTWs. Accordingly the proportion of labour days withdrawn from FT and PT workers can be computed as:

FTWs = 1 / 6.63 = 15.08% or 15%

PTWs = 5.63 / 6.63 = 84.92% or 85%

In other words, nearly 85% of the total labour days generated by social forestry in Rajshahi will go to the PTWs and 15% to the FTWs. These estimates closely match the estimate made by Khan (1993) as 80% and 20% for marginal and main workers respectively for the Social Forestry Project in Gujarat, India.

The LFS report suggests that on average FTWs were employed for 6.6 days and the PTW for 1.6 days. If the daily wage is taken as 'w' then the marginal product of FTW and PTW can be computed as:

$$\text{Marginal product of FTW} = \frac{\text{No. of days employment for FTW in a week}}{\text{Total number of days per week}} \times \text{wage rate}$$

$$= 6.6w / 7$$

$$= 0.94w$$

$$\text{Marginal product of PTW} = \frac{\text{No. of days employment for PTW in a week}}{\text{Total number of days per week}} \times \text{wage rate}$$

$$= 1.6w / 7$$

$$= 0.22w$$

Hence, by employing one labourer for social forestry in Rajshahi, the weightage value or marginal product forgone by society (per worker day) would be:

$$(0.15 \times 0.94) + (0.85 \times 0.22)w = (0.14 + 0.18)w = 0.33w$$

Thus 0.33w is the estimated shadow wage rate for Rajshahi. This matches the estimate made by Khan (1993) as 0.41W for Gujarat and by Kumar (1988) as 0.47W for Karnataka states in India. This forgone marginal product for Rajshahi can be treated as the forgone production of basic needs goods because the labour employed in the project is drawn almost entirely from the rural labour force who mainly contribute to semi-subsistence agricultural production. Thus 0.33w is the appropriate figure to be used as the social cost of labour for basic needs analysis.

16.1.2.2 Social cost of labour incurred in the generation of basic needs income

While estimating the basic needs income in Chapter 15, generated by employing labourers in the project, it was found that the entire wages received by labour can be considered as basic needs income. However, the opportunity cost of labour in terms of forgone production of basic needs goods was estimated as only 33% of the wage. Thus it is reasonable to assume that 33% of the wage would also be forgone in the generation of basic needs income by employing the labourer in the project. Hence, a factor of 0.33w has been estimated for computing the generation of basic needs income by employing labourers in the project.

16.1.3 Seeds

16.1.3.1 Social costs of seeds incurred in the production of basic needs goods

As discussed in Chapter 14, seeds used in the project comprise both seeds for agricultural crops as well as for forestry crops. Although there is no shortage of supply for these seeds in the market, there is also no surplus in the market. The simplifying assumption is made here that, should further seeds be required, they can be collected for the purpose. The labour used for this would have been unemployed for part of the time. Hence, a social cost factor of 0.33 is estimated for computing the social cost of seeds used in the project for production of basic needs goods.

16.1.3.2 Social costs of seeds incurred in the generation of basic needs income

As stated in Chapter 15, the entire wages paid to labourers employed in the collection of seeds are treated as basic needs income. When we consider the diversion of these labourers from the traditional sector to the project, it can be assumed that the forgone basic needs income that a labourer would have generated in the absence of the project would be their forgone earnings (i.e., 33%). Thus, the social costs of seeds in terms of forgone basic needs income of labour would be 33% of the market costs of seeds. Hence, a social cost factor of 0.33 is assumed to be appropriate for computing the social cost of seeds in terms of generating basic needs income.

16.1.4 Polythene bags

Polythene bags are one of the most important inputs directly used in plantation activities. These are used to raise the seedling stocks for plantation. In order to cover the increasing area under plantations, the requirement for polythene bags in Rajshahi is increasing every year. To meet the increasing demand of polythene bags, production has increased substantially and is assumed to further increase to meet the needs of various plantation schemes. This means, its diversion will not cause an adverse effect on its existing uses.

16.1.4.1 Social cost of polythene bags incurred in the production of basic needs goods

Chapter 15 shows the production of Tk. 1 worth of polythene bags adds Tk. 0.18 to basic needs income. So, it can be assumed that these recipients only will produce basic needs goods. However, this factor of 0.18 needs to be weighted by 0.33 to take account of likely unemployment. This gives a factor of 0.06 (i.e., 0.18 x 0.33).

16.1.4.2 Social cost of polythene bags incurred in the generation of basic needs income

It was seen in Chapter 15 that the use of polythene bags worth Tk. 1 generates a basic needs income of Tk. 0.18. Hence, the diversion of resources to produce polythene bags for the project would cause a 18% loss in generation of basic needs income weighted by the unemployment factor of 0.33. In other words, the social cost of polythene bags in generation of basic needs income would be 6% of the total market value of the polythene cost, and hence a social cost factor of 0.06 (i.e., 0.18 x 0.33) is used.

16.1.5 Fertilisers

Bangladesh has become nearly self-sufficient in the production of fertilisers (except for muriate of potash, which accounts for 15% of the national demand, being imported from China), meeting 85% of its domestic demand. Fertilisers are in heavy demand in the agricultural sector and during the peak season of agricultural operations its short term supply becomes almost inelastic. However, it is assumed here that the extra demand from within the project is met by extra production of fertiliser.

16.1.5.1 Social cost of fertiliser incurred in the production of basic needs goods

Extra fertiliser production will entail the diversion of resources from elsewhere. Information provided in Chapter 15 shows that, Tk. 1 spent on fertiliser would result in Tk. 0.15 of basic needs income. It can be assumed that these recipients would work wholly in the production of basic needs goods. However, since they may otherwise be unemployed, the figure of 0.15 is weighted by 0.33, giving a factor of 0.05 (0.15 x 0.33).

16.1.5.2 Social cost of fertiliser incurred in the generation of basic needs income

While estimating the basic needs income generated from the use of fertiliser in Chapter 15, it was found that Tk. 1 investment in fertiliser generates a basic needs income of Tk. 0.15. This means a diversion of fertiliser to the project would also cause a loss in generation of basic needs income of 15% of its market value. However, since again basic needs income recipients may be unemployed, the figure is weighted by 0.33. Hence, the social cost of fertiliser in the generation of basic needs income can be assumed as 5% of total investment in fertiliser and therefore a social cost factor of 0.05 (i.e., 0.15 x 0.33) is used.

16.1.6 Insecticides

16.1.6.1 Social cost of insecticides incurred in the production of basic needs goods

All of the insecticide demand in Bangladesh is met from imports. Since there is no insecticide production in the country, the question of loss of production of basic needs goods due to labour diversion does not arise. Thus a factor of 0.00 can be used for estimating the social cost of insecticides in the production of basic needs goods.

16.1.6.2 Social cost of insecticides incurred in the generation of basic needs income

For the same reason as mentioned in 16.1.6.1, a social factor of 0.00 can be used for estimating the social cost of insecticides in the generation of basic needs income.

16.1.7 Tools and implements

Tools used in the project under study are mostly locally made and are in abundant supply in the market. The withdrawal of these tools would affect the production of basic needs goods and the generation of basic needs income via the diversion of resources into their production.

16.1.7.1 Social cost of tools and implements incurred in the production of basic needs goods

Chapter 14 suggests a BNCF for tools and implements as 0.73. Hence, a factor of 0.73 is used in estimating the social cost of tools and implements in the production of basic needs goods.

16.1.7.2 Social cost of tools and implements incurred in the generation of basic needs income

Chapter 15 similarly suggests a factor of 0.73 for the social cost of tools and implements incurred in the generation of basic needs income. Hence, a social factor of 0.73 is used.

16.2 Indirect inputs

As with most of the direct costs, the use of indirect inputs in the projects is assumed to have entailed the diversion of resources from other uses. As a simplifying assumption, the extent to which this has reduced the production of basic needs goods and receipt of basic needs income is computed directly in line with the pattern of basic needs income detailed in Chapter 15. These figures have been adjusted by a weighting factor of 0.33 to account for unemployment.

16.3 Government funds

The funds involved in the TANDP are met partly (12%) by the government of Bangladesh and largely by the ADB (83%) and the UNDP (5%). The government of Bangladesh has diverted the funds for this project from funds allocated for rural plantation and other forestry development programmes like forest plantation, rubber plantation, conservation/wildlife etc. (GPRB 1990). Had these funds not been diverted to social forestry plantations, they would have probably been utilised for other forestry development projects and activities.

Rural plantation projects, like other rural development interventions, aim primarily to meet the basic needs of rural poor and to generate rural employment to raise their income. It is estimated that approximately 75% of the rural development funds in Bangladesh are being utilised for various forms of basic needs fulfilment (Asaduzzaman 1999). This means that the diversion of funds in indirect cost would cause 75% reduction in the production of basic needs goods and generation of basic needs income elsewhere. The use of the 88% of the funds provided by ADB and UNDP would not probably affect the production of local basic needs goods and generation of local basic needs income. This is because in absence of the project, ADB and UNDP might not have given the funds to GPRB and they would not necessarily have been utilised in rural development in Rajshahi. However, the use of these funds in other projects would have also involved diverting resources from possible basic needs goods and income generation elsewhere.

As pointed out in Chapter 6 that there are problems with costing investment funds in the traditional way of SCBA. During the 1990's, there has been a move to cost funds in a way which does not involve reinvestment. While this has been contentious, as argued by Price (1996), it fits in with ideas that suggest compound growth may be constrained in the long run, and it makes it possible to put a cost on investment funds even when there is no discount rate.

A 10% rate of return has been used as a discount rate in the financial appraisal (see Chapter 12), and it would be desirable to be consistent, even though the opportunity cost of capital rate might be higher. Both Cline (1992) and Livingstone and Tribe (1995) have calculated costs of investment funds on the basis of one-off investments lasting 15 years. An annual return of 13.2% for 15 years, followed by no further return, gives an IRR of 10%. Therefore the opportunity cost of investment fund is:

$$0.132 \times 15 \times 75\% = 1.485$$

which is the BNCF for goods from investment funds.

It is also assumed that 75% of income from such investment projects is distributed to fulfil basic needs, so an income BNCF of 1.485 is also used.

Price (1990) argues the case for treating government revenues from projects differently from funds invested into projects. Consistently with the assumption made above, i.e. that there is no reinvestment of revenues from government investment, the FD's share of revenue from sale of final products is considered to be consumed immediately, and given a BNCF of 0.75 for both income and goods effects.

A summary showing the factors for each input for computation of social cost in goods production and income generation is presented below in Table 16.2.

Table 16.2 Factors for social costing of inputs incurred in the production of basic needs goods and generation of basic needs income

Inputs	Social cost factor for production of basic needs goods	Social cost factor for generation of basic needs income
A. Direct inputs		
i. Land	0.00*	#
ii. Labour	0.33	0.33
iii. Seed	0.33	0.33
iv. Polythene bags	0.06	0.06
v. Fertiliser	0.05	0.05
vi. Insecticide	0.00	0.00
vii. Tools and implement	0.73	0.73
B. Indirect inputs		
a) Establishment		
i. Salary and allowances	0.33	0.33
ii. Office expenses	0.11	0.11
iii. Vehicles	0.01	0.01
iv. Buildings	0.10	0.10
b) Overhead		
i. Training	0.20	0.20
ii. Protection	0.26	0.26
c) Government funds	0.50	0.50

Note: * in case of land, a lump sum social cost of Tk. 96,000 is estimated and hence no factor like the other inputs is provided.

included in BNI calculation for participants (Chapter 13).

Using the social cost factors for inputs (incurred in the production of basic needs goods and the generation of basic needs income) involved in the agroforestry and woodlot schemes in Rajshahi, the social costs of the schemes have been computed and are presented in Tables 16.3.

Table 16.3 Social costs of the project incurred in the production of basic needs goods and generation of basic needs income

Input components	Factors for social costing of inputs in the production of basic needs goods	Factors for social costing of inputs in the generation of basic needs income	Agroforestry			Woodlot		
			Financial cost of the scheme (Tk./ha)	Social cost in production of basic needs goods (Tk./ha)	Social cost in generation of basic needs income (Tk/ha)	Financial cost of the scheme (Tk./ha)	Social cost in production of basic needs goods (Tk./ha)	Social cost in generation of basic needs income (Tk/ha)
A. Direct inputs								
i. Land *	0.00	0.00	0.00	96000.00	96000.00	0.00	96000.00	96000.00
ii. Labour	0.33	0.33	10773.71	3555.32	3555.32	16568.87	5467.73	5467.73
iii. Seed	0.33	0.33	161.00	53.13	53.13	173.17	57.15	57.15
iv. Polythene bags	0.06	0.06	1153.11	69.19	69.19	1401.99	84.12	84.12
v. Fertiliser	0.05	0.05	1682.68	84.13	84.13	1853.80	92.69	92.69
vi. Insecticide	0.00	0.00	34.55	0.00	0.00	33.06	0.00	0.00
vii. Tools and implement	0.73	0.73	2303.64	1681.66	1681.66	3298.31	2407.77	2407.77
B. Indirect inputs								
a) Establishment								
i. Salary and allowances	0.33	0.33	4433.44	1463.04	1463.04	4744.71	1565.75	1565.75
ii. Office expenses	0.11	0.11	1267.93	139.47	139.47	1356.94	149.26	149.26
iii. Vehicles	0.01	0.01	400.96	4.01	4.01	429.12	4.29	4.29
iv. Buildings	0.10	0.10	320.89	32.09	32.09	343.42	34.34	34.34
b) Overhead								
i. Training	0.20	0.20	625.44	125.09	125.09	669.36	133.87	133.87
ii. Protection	0.26	0.26	1111.50	288.99	288.99	1111.50	288.99	288.99
C. Government funds	1.485	1.485	24268.85	36039.24	36039.24	31984.25	47496.61	47496.61
Total			**24268.85**	**139535.36**	**139535.36**	**31984.25**	**153782.57**	**153782.57**

Note: * factor for estimating the social cost of land was not possible, so a lump sum amount (Tk. 96,000, see para 16.1.1) is estimated as the social cost of land.

Chapter Seventeen

Conclusions

This chapter attempts to draw a conclusion to the different analyses carried out under the financial appraisal and basic needs appraisal of the TANDP in Rajshahi. Table 17.1 gathers together results from chapters 13 – 16. It aggregates values for all inputs and outputs of the project, and sums the goods and income accounts by weighting each as 0.5.

Table 17.1 Basic needs outcomes of the analysis

(Tk. per ha per year, but Tk. per ha for financial analysis)

AEZ	Agroforestry			Woodlot		
	BBS-BNs	WHO-BNs	Financial	BBS-BNs	WHO-BNs	Financial
OHPP	5,564	5,111	80,598	10,871	11,412	135,711
NEBT	11,437	13,022	116,274	12,399	12,240	159,825
TMF	15,614	27,128	127,131	21,564	21,725	176,617
LBT	22,703	27,587	122,070	29,033	32,742	190,813
HBT	19,119	22,219	123,314	32,615	33,840	203,716
All	16,066	20,732	113,877	21,778	22,703	173,336

Source: Compiled using data from tables 12.6, 14.3, 15.6, 15.7 and 16.2.

Note: BBS means figures based on Bangladesh Bureau of Statistics' estimate of basic calorie intake (2122 Kcal/capita/day),

WHO means figures based on World Health Organisation's estimate of basic calorie intake (2780 Kcal/capita/day).

The table (17.1) shows that, in terms of basic needs satisfaction, the woodlot scheme is doing better than the agroforestry scheme for Rajshahi Division on a whole, under both the BBS and the WHO estimates. This matches with the result of the financial analysis, where the NPV per ha is higher for the woodlot scheme compared to agroforestry. The probable reasons for woodlot's better financial performance have been elaborated in Chapter 12. Similar reasons can be incorporated here for the woodlot's better ability in the fulfilment of basic needs of the participants. Greater survivability of trees and expected share of benefit from higher number of trees per unit area are the most influential causes of woodlot's better performance. Nevertheless, it should be stated here that the basic needs figures for the two schemes in different agro-ecological zones in Table 17.1 are much less than the respective financial figures, primarily owing to taking into account the cost of land in basic needs calculations. Cost of land has been considered as nil in the financial analysis, since there was no financial transaction between the two stakeholders (i.e., the FD and the participating farmers) of the project.

When the basic needs outcomes of the agroforestry scheme are compared within agro-ecological zones, it was found that the LBT zone provides the highest benefit (Tk. 22,703) per ha per year, while the OHPP zone performs poorest in this respect. Highest number of trees per ha was observed in the LBT zone (1700 trees per ha on an average). This has led to the highest total value of intermediate products in LBT zone and the second highest stipulated final returns from the agroforestry plots of the same zone (see Chapter 12 for further details). Thus, the tree component is the main contributing factor for LBT's superior basic needs performance. On the other hand, the OHPP zone could support only about 1100 trees per ha, leading possibly to its poorest basic needs performance. Financial performance of agroforestry plots in the OHPP zone has been found lowest as well.

However, in the woodlot sector, HBT zone is found to be providing the highest basic needs outcomes (Tk. 32,615 per ha per year), followed closely by the LBT zone. OHPP zone here has performed poorest as well. HBT zone supports the highest number of trees to survive (2700 trees per ha on average), while in OHPP, only about 2200 trees have survived. This high number of trees has supplied the greatest amount of financial return in terms of the intermediate products over the life of the woodlot scheme and is also anticipated to provide the highest return in terms of final forest products (Chapter 12).

Therefore, the basic needs performance of the social forestry project has been found closely related to the condition of trees in different schemes and in different locations.

It is noteworthy that the figures based on WHO estimate are usually slightly higher than those based on the BBS estimate, but not always, perhaps because of cases included where the project brought a decrease in income. Mostly there is not much difference between the figures based on these two estimates, so the basic needs calorie level is not so critical a determining factor after all. However, for agroforestry, the AEZs are ranked differently by BBS and WHO estimates.

The woodlot figures are ranked the same by the three criteria, but this is not true for agroforestry. One possible reason may be that agroforestry is less orientated towards the commercial product. This can be supported by the estimated wood production of the two schemes. Woodlot produces about 90 m^3 of total wood per ha with approximately 53 m^3 of pole and 6.5 m^3 of timber, while the agroforestry plots are expected to produce about 68 m^3 of wood with 40 m^3 of pole and 5 m^3 of timber. These two are the wood components which are likely to fetch commercial value prices from local markets.

Encouraging enough is the fact that the basic needs values have been found positive for both the schemes, across all the sampled agro-ecological zones and for the whole of Rajshahi Division. Thus, it can be concluded that the social forestry project has been successful in meeting basic needs of the participating farmers.

The BNI approach used here has taken depth of poverty (i.e., poverty gap ratio) into account because the deeper the without-project poverty, the greater the proportion of project income constitutes basic income. However, it has not taken severity of poverty (i.e., squared poverty gap ratio) into account. SCBA is needed to incorporate severity of poverty into basic needs analysis. The data requirement of SCBA is very demanding, but even for basic needs analysis, it is quite demanding as well.

The overall contribution of this study has been to assess basic needs satisfaction of participants in a social forestry project and identify factors attributing that satisfaction. The methodology coined by Nair (1981) and developed by Singh (1995) has further been sharpened here. In this reworked version of basic needs analysis, the costs of both food and non-food basic needs goods and services have been taken into consideration. Those costs have further been applied to the WHO and BBS recommended minimum calorie requirements to come up with basic needs values for the two schemes under the project and also for the different agro-ecological zones under this study. This type of work fits well with the recent poverty concerns. The 'cost-of-basic-needs' method of measuring poverty, described primarily in 1994 by Ravallion and Bidani (1994) of the World Bank, has thence been widely used by the World Bank poverty studies worldwide (e.g. those by Ravallion and Sen (1996), Wodon (1997), World Bank (1998) and Gibson (2000), among others). The current BNA can well be integrated into poverty studies by using the analogous 'cost-of-basic-needs' method. The broad methodology behind this analysis can be used for evaluation of land use projects in particular, and more so in the developing countries. A possible short cut for this broad methodology of BNA can be thought of by assuming the equivalent of a standard conversion factor, such as those used in conventional CBA. For example, if it could be held that 80% of labour input represent basic needs income, then it would greatly reduce the effort required for BNA. However, such figures would best be realistic within one sector.

This study has been constrained by a few shortcomings. If the two groups of actors could be considered separately in the FCBA, it may well have given more refined results. If the costs of land, labour and inputs and collection cost of intermediate products by the farmers were obtainable, the FCBA could come up with a different inference. One should not automatically assume land opportunity cost as zero, like what has been taken in the financial analysis here. The social cost of labour in the basic needs analysis has been taken as 0.33 of daily wage. It would have been interesting to look at the sensitivity of the results by using a different value for the wage rate of labour. The inconsistency, or, the large variation of basic needs figures and financial figures need additional considerations as well. If all these shortcomings could be addressed properly, this study would have reached a more sophisticated overall outcome.

Although efforts were made by BFD to induce only the landless, poor farmers into the project in 1991-92 (as discussed in Chapter 4), there were discrepancies in the selection process. This in turn, has led to possible poor poverty targeting by the project. Thus, all the participants were not poor in the true sense. However, the poverty analyses (Chapter 11), done on the basis of data collected in 1998-99, have shown the participants to live above the current national poverty threshold for Bangladesh. So, the really poor sections of participants from 1991-92 may have managed to uplift themselves out of the vicious circle of poverty by the year 1998-99 with participation in the social forestry project as one of the contributing factors for their current better well-being status.

It has been attempted in this study to achieve the best balance between accuracy and time required for assessment. Further accuracy could be achieved if some more time could be arranged. However, if the author were to take the research steps further, he would try to use SCBA to take into account the issue of severity of poverty and also, would try to gather disaggregated cost data for each plot or observation unit, which was not possible in this study. This would enhance the accuracy of the results.

REFERENCES

ADB 1992a. *Forestry Master Plan: Participatory Forestry*. FMP Project 372001/22. Asian Development Bank, Manila.

ADB 1992b. *Thana Afforestation and Nursery Development Project: Interim Assessment Report*. Asian Development Bank, Dhaka.

ADB 1993. *Forestry Master Plan. Main Plan – 1993/2012*. Volume 1. Ministry of Environment and Forests, Govt. of Bangladesh and Asian Development Bank, Dhaka.

ADB/UNDP 1995. *Development Perspective of the Forestry Sector Master Plan: Bangladesh*. Asian Development Bank/United Nations Development Program, Dhaka.

Adhikari, J. 1990. Is community forestry a new concept? An analysis of past and present policies affecting forest management in Nepal. *Society and Natural Resources*. **3**: 257-265.

Adlard, P. G. 1990. *Procedures for Monitoring Tree Growth and Site Change: A Field Manual*. Tropical Forestry Paper No. 23. Oxford Forestry Institute, Oxford.

Ahluwalia, M. S. and Chenery, H. 1974. The economic framework. In Bowen, I. and Svikhart, B. J. (eds.) *Redistribution With Growth*. Oxford University Press, London.

Ahmad, A. 1995. *Rural Landuse in Bangladesh*. Bangladesh Academy for Rural Development, Comilla.

Ahmad, M. 1987. Bangladesh: how forest exploitation is leading to disaster. *The Ecologist*. **17** (4/5): 168-169.

Ahmad, Q. K. and Hossain, M. 1985. An evaluation of selected policies and programmes for the alleviation of rural poverty in Bangladesh. In Islam, R. (ed.) *Strategies for Alleviating Poverty in Rural Asia*. Bangladesh Institute of Development Studies, Dhaka and ILO/ARTEP, Bangkok.

Ahmed, A. U. 1993. *Patterns of Food Consumption and Nutrition in Rural Bangladesh*. International Food Policy Research Institute, Washington DC and Bangladesh Food Policy Project, Dhaka.

Ahmed, A. U., Khan, H. A. and Sampath, R. K. 1991. Poverty in Bangladesh: measurement, decomposition and intertemporal comparison. *Journal of Development Studies*. **27** (4): 48-63.

Ahmed, I and Freedman D. H. 1982. Access to rural factor markets, technological change and basic needs: evidence from Bangladesh. *International Labour Review*. **121** (4): 433-441.

Ahmed, I. 1981. Farm size and labour use: some alternative explanations. *Oxford Bulletin of Economics and Statistics*. **43** (1): 73-88.

Ahmed, J. U. 1999. Personal communication on social forestry projects in Bangladesh. DFO-Rangpur Forest Division, Bangladesh Forest Department, Rangpur.

Ahmed, K. J. 1957. Tidal forests of East Pakistan - their growth and regeneration. *Pakistan Journal of Forestry*. **3** (1): 17-24.

Ahmed, M. U., Alam, A. H. M. M., and Khan, H. 1991. Poverty in rural Bangladesh: trend and magnitude. *Bangladesh Journal of Political Economy*. **11**(2B): 523-532.

Akhter, S. and Sarker, A. H. M. R. 1998. "Patronage, tenure, inclusiveness and local markets: ingredients of a successful strategy for social forestry at Betagi". *Forest, Tree and People Newsletter*, March 1998, No. **35**: 36-41.

Alam, S. and Abedin, M. J. 1996. Changing cropping pattern in Bangladesh from 1971-75 through 1991-93: implications on crop sector growth. *Bangladesh Journal of Agricultural Economics*. **19** (1/2): 31-44.

Alam, S. E. 1999. Personal communication on social forestry projects in Bangladesh. DFO-Dinajpur Forest Division, Bangladesh Forest Department, Dinajpur.

Alamgir, J. 1993. Rural-urban migration in Bangladesh: theoretical approaches to understanding the internal and external dynamics. *Journal of Social Studies*. **59**: 26-49.

Alamgir, M. 1974. Some analysis of distribution of income, consumption, savings and poverty in Bangladesh. *Bangladesh Development Studies*. **11** (4): 737-818.

Alamgir, M. and Ahmed, S. 1988. Poverty and income distribution in Bangladesh. In Srinivasan, T. N. and Bardhan, P. K. (eds.) *Rural Poverty in South Asia*. Columbia University Press, New York.

Alauddin, M. and Tisdell, C. 1995. Labour absorption and agricultural development: Bangladesh's experience and predicament. *World Development*. **23** (2): 281-297.

Ali, A. M. S. 1993. Unemployment in agriculture and opportunities for and contributions of off-farm employment to rural economy: A case study from southwestern Bangladesh. *Human Ecology*. **21** (4): 431-445.

Amin, M. R. 1999. Personal communication on social forestry projects in Bangladesh. RO-Mithapukur Forest Range. Rangpur Forest Division, Bangladesh Forest Department, Rangpur.

Amin, S. 1997. The poverty-purdah trap in rural Bangladesh: implications for women's roles in the family. *Development and Change*. **28** (2): 213-233.

Anand, S. and Morduch, J. 1996. *Poverty and Population Problem: Evidence from Bangladesh*. Development Discussion Paper No. 559. Harvard Institute for International Development, Harvard University, MA.

Ara, I. and Yahya, N. S. M. 1990. Profitability of *Eucalyptus camaldulensis* plantation in Bangladesh. *Bangladesh Journal of Forest Science*. **19** (1/2): 45-55.

Arnold, J. E. M. 1983. Replenishing the world's forests: community forestry and meeting fuelwood needs. *Commonwealth Forestry Review*. **63** (2): 183-189.

Arnold, J. E. M. 1984. Forestation for local community development. In Wiersum, K. F. (ed.) *Strategies and Designs for Afforestation, Reforestation and Tree Planting*. Centre for Agricultural Publishing and Documentation (Pudoc), Wageningen.

Arnold, J. E. M. 1987. Community forestry. *Ambio*. **16**: 122-128.

Arnold, J. E. M. 1992. *Community Forestry: Ten Years in Review*. Community Forestry Note 7, Rev. 1. Food and Agriculture Organisation of the United Nations, Rome.

ASNIC. 1999. *Bangladesh: The Roots*. Asian Studies Network and Information Center. http://asnic.utexas.edu/asnic/countries/bangla/bangladeshm.html

Atkinson, A. B. 1983. *The Economics of Inequality*. 2nd Edition. Clarendon Press, Oxford.

Atkinson, A. B. 1989. *Poverty and Social Security*. Harvester Wheatsheaf, Hemel Hempstead.

Banik, R. L. 1994. Distribution and ecological status of bamboo forests of Bangladesh. *Bangladesh Journal of Forest Science*. **23** (2): 12-19.

Bannock, G., Baxter R. E. and Rees, R. 1984. 3rd Edition. *The Penguin Dictionary of Economics*. Penguin Books Ltd., Harmondsworth.

Barker, A. 1994. *Bangladesh*. Heinemann, Oxford.

Barraclough, S. L. and Ghimire, K. B. 1995. *Forests and Livelihoods: The Social Dynamics of Deforestation in Developing Countries*. Macmillan, London.

Bawa, K. S. and Dayanandan, S. 1998. Causes of tropical deforestation and institutional constraints to conservation. In Goldsmith, F. B. (ed.) *Tropical Rain Forest: A Wider Perspective*. Chapman & Hall, London.

BBS 1993. *Statistical Pocketbook of Bangladesh 1993*. Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS 1996. *Report on Labour Force Survey in Bangladesh 1995-96*. Bangladesh Bureau of Statistics. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS 1997a. *Statistical Yearbook of Bangladesh 1996*. Bangladesh Bureau of Statistics. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS 1997b. *Summary Report of The Household Expenditure Survey 1995-96*. Bangladesh Bureau of Statistics. Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS 1997c. *Analysis of Basic Needs Dimension of Poverty*. Volume II. Bangladesh Bureau of Statistics. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS 1998a. *Household Expenditure Survey 1995-96*. Bangladesh Bureau of Statistics. Statistics Division, Ministry of Planning, Government of The People's Republic of Bangladesh, Dhaka.

BBS 1998b. *Yearbook of Agricultural Statistics of Bangladesh 1997*. Bangladesh Bureau of Statistics. Statistics Division, Ministry of Planning, Government of The People's Republic of Bangladesh, Dhaka.

BBS 1998c. *Rural Poverty Monitoring Survey: April 1996*. Bangladesh Bureau of Statistics. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS 1998d. *Analysis of Basic Needs Dimension of Poverty*. Volume III. Bangladesh Bureau of Statistics. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS 1999a. *Statistical Yearbook of Bangladesh 1998*. Bangladesh Bureau of Statistics. Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BBS 1999b. *Census of Agriculture 1996: Structure of Agricultural Holdings and Livestock Population*. Vol. I. Bangladesh Bureau of Statistics. Statistics Division, Ministry of Planning, Government of The People's Republic of Bangladesh, Dhaka.

BBS 1999c. *Statistical Pocketbook of Bangladesh 1998*. Bangladesh Bureau of Statistics. Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

BCIC 1997. *BCIC Annual Report 1995-96*. MIS and PR Division, Bangladesh Chemical Industries Corporation, Dhaka.

Behrman, J. R. and Deolalikar, A. B. 1987. Will developing country nutrition improve with income? A case study for rural South India. *Journal of Political Economy*. **95** (3): 492-507.

Behrman, J. R. and Deolalikar, A. B. 1989. Is variety the spice of life? Implications for calorie intake. *Review of Economics and Statistics*. **71** (4): 666-672.

Belson, W. A. 1981. *The Design and Understanding of Survey Questions.* Gower Publishing, Aldershot.

Bene, J. G.; Beall, H. W. and Cote, A. 1977. *Trees, Food and People: Land Management in the Tropics.* International Development Research Centre, Ottawa.

Bequele, A. and Freedman, D. H. 1979. Employment and basic needs: An overview. *International Labour Review.* **118** (3): 315-329.

Berg, A. 1980. A strategy to reduce malnutrition. *Finance and Development.* **17** (1): 23-26.

Berry, R. A. and Cline, W. R. 1979. *Agrarian Structures and Productivity in Developing Countries.* Johns Hopkins University Press, Baltimore.

BFD 1992. Plantation Journals – various Forest Divisions, Bogra Circle. Bangladesh Forest Department.

BFD 1993. Plantation Journals – various Forest Divisions, Bogra Circle. Bangladesh Forest Department.

BFD 1999. Forestry Records – Bangladesh Forest Department, Head Office, Dhaka.

Bhatt, B. P., Negi, A. K. and Todaria, N. P. 1994. Fuelwood consumption pattern at different altitudes in Garwal Himalaya. *Energy.* **19** (4): 465-468.

Bhuiyan, A. A. 1993. Social forestry in Bangladesh: prospects and problems. In Mahat, T. B. S and Amin, S. M. R. (eds.). *Participatory Forestry Perspectives.* Bangladesh Agricultural Research Council, Dhaka.

Bhuiyan, A. A. 1994. *Forest Land Agroforestry: The North Bengal Experience.* BARC - Winrock International. Agroforestry and Participatory Forestry Research and Training Support Program, Dhaka.

Bhuiyan, A. A. 1997. Agroforestry in forest land. In Alam, M. K., Ahmed, F. U. and Amin. S. M. R. (eds.). *Agroforestry: Bangladesh Perspective.* Bangladesh Agricultural Research Council, Dhaka.

Biswas, W. K. and Lucas, N. J. D. 1997. Energy consumption in the domestic sector in a Bangladesh village. *Energy.* **22** (8): 771-776.

Blackwood, D. L. and Lynch, R. G. 1994. The measurement of inequality and poverty: A policy maker's guide to the literature. *World Development.* **22** (4): 567-578.

Boius, H. E. 1994. The effects of income on demand for food in poor countries: Are our food consumption databases giving us reliable estimates? *Journal of Development Economics.* **44** (1): 199-226.

Bose, S. K. 1998. Woodfuel production programmes and strategies of the forest department. Paper presented at the national training course on "*Woodfuel in*

Bangladesh-Production and Marketing". Rural Development Academy, Bogra. 7-11 December 1996. RWEDP Report No. 38. Food and Agriculture Organization of the United Nations, Bangkok.

Boyce, J. K. and Hartmann, B. 1981. Hunger in a fertile land. *Ceres*. **14** (2): 32-35.

Brammer, H. 1990. Floods in Bangladesh: I. Geographical background to the 1987 and 1988 floods. *The Geographical Journal*. **156** (1): 12-22.

Brandis, D. 1906. *Indian Trees: An Account of Trees, Shrubs, Woody Climbers, Bamboos and Palms Indigenous or Commonly Cultivated in the British Indian Empire*. A. Constable & Co. Ltd., London.

Brent, R. J. 1990. *Project Appraisal for Developing Countries*. Harvester Wheatsheaf, London.

Brent, R. J. 1998. *Cost-Benefit Analysis for Developing Countries*. Edward Elgar, Cheltenham.

Briones, N. D. 1995. The integrated social forestry program: experiences in community forest management in the Philippines. In: Sandbukt, Ø (ed.) *Management of Tropical Forests: Towards an Integrated Perspective*. Centre for Development and the Environment, University of Oslo.

Briscoe, J. 1979. Energy use and social structure in a Bangladesh village. *Population and Development Review*. **5** (4): 615-641.

Bruce, C. 1976: Social cost–benefit analysis. *World Bank Staff Working Paper* 239.

Burgess, R. G. 1982. Elements of sampling in field research. In Burgess, R. G (ed.) *Field Research: A Sourcebook and Field Manual*. Routledge, London.

Burki, S. J. 1980. Sectoral priorities for meeting basic needs. *Finance and Development*, **17** (1): 18-22.

Burki, S. J. and Haq, M. U. 1981. Meeting basic needs: an overview. *World Development*. **9** (2): 167-182.

Cabarle, B. J. 1991. Community forestry and the social ecology of development. *Grassroots Development*. **15** (3): 3-9.

Carney, D. 1998. *Sustainable Rural Livelihoods: What Contributions Can We Make?* Department For International Development, London.

Casley, D. J. and Kumar, K. 1982. *The Collection, Analysis and Use of Monitoring and Evaluation Data*. Johns Hopkins University Press, Baltimore.

Casley, D. J. and Lury, D. A. 1981. *Data Collection in Developing Countries*. Clarendon Press, Oxford.

Cernea. M. 1988. Alternative social forestry development strategies. In Ives, J. and Pitt, D. C. (eds.) *Deforestation: Social Dynamics in Watersheds and Mountain Ecosystems*. Routledge, London.

Chambers, R. 1988. Sustainable Rural Livelihoods: A Strategy for People, Environment and Development. Institute of Development Studies, University of Sussex.

Chambers, R. and Leach, M. 1990. Trees as savings and security for the rural poor. *World Development*. **17** (3): 329-342.

Chambers, R., Saxena. N. C. and Shah, T. 1989. *To The Hands of The Poor: Water and Trees*. Intermediate Technology Publications, London.

Champion, H. G. 1936. *A Preliminary Survey of the Forest Types of India and Burma*. Indian Forest Records, New Series: Silviculture, Vol. 1, No. 1. Manager of Publications, Delhi.

Chatterjee, N. 1985. Economic aspects of social forestry. In *Community Forestry – Socio-Economic Aspects*. Edited by Rao, Y.S. *et al.*. FAO, Bangkok.

Chein, I. 1976. An introduction to sampling. In Selltiz, C. L., Wrightsman, S. and Cook, S. W. (eds.) *Research Methods in Social Relations*. 3rd Edition. Holt, Rinehart & Winston, New York.

Chen, L. C. 1975. An analysis of per capita food grain availability, consumption and requirements in Bangladesh: A systematic approach to food planning. *Bangladesh Journal of Development Studies*. **3** (2): 93-126.

Chowdhury, A. J. M. N. 1992. The impact of smuggling on the economic development of Bangladesh. *Bangladesh Journal of Political Economy*. **12** (1): 303-314.

CIDA 1989. *The environment and development in Bangladesh: an overview and strategy for the future*. Asia Branch, Canadian International Development Agency.

Clements, P. 1995. A poverty-oriented cost-benefit approach to the analysis of development projects. *World Development*. **23** (4): 577-92.

Cline, W. R. 1992. *The Economics of Global Warming*. Institute for International Economics, Washington.

Cochran, W. G. 1963. *Sampling Techniques*. 2nd Edition. John Wiley & Sons, New York.

Cochran, W. G. 1977. *Sampling Techniques*. 3rd Edition. John Wiley & Sons, New York.

Colchester, M. 1984. The crisis of ownership: the plight of the tribal population of northern Bangladesh. *Survival International Review*. **43**: 29-35.

Colchester, M. and Ghai. D. 1994. Sustaining the forests: the community based approach in South and South-East Asia. *Development and Change*. **25** (1): 69-100.

Colclough, C. 1978. The satisfaction of basic educational needs. *IDS Bulletin*. **9** (4): 27-30.

Collier, P. 1975. Labour mobility and labour utilisation in developing countries. *Oxford Bulletin of Economics and Statistics*. **37** (3): 169-189.

Comte, M. C. 1980. Making social forestry work. *Ceres*. March-April: 41-44.

Conway, F. 1967. *Sampling: An Introduction for Social Scientists*. George Allen & Unwin Ltd., London.

Cowell, F. A. 1977. *Measuring Inequality*. Philip Allan Publishers, Oxfrod.

Curry, S. and Weiss, J. 1993. *Project Analysis in Developing Countries*. Macmillan, London.

Das, D. K. 1990. *Forest Types of Bangladesh*. Bulletin-Plant Taxonomy Series, No. 6. Bangladesh Forest Research Institute, Chittagong.

Dasgupta, A. K. and Pearce, D. W. 1972. *Cost-benefit Analysis: Theory and Practice*. Macmillan, London.

Davidson, J., Das, S., Khan, S. A., Latif, M. A. and Zashimuddin, M. 1985. *Tree Volume Tables for Small Eucalypt Roundwood in Bangladesh*. Silvicultural Research Division Bulletin No. 4. Bangladesh Forest Research Institute, Chittagong.

Davis, K. P. 1976. *Land Use*. McGraw-Hill Book Company, New York.

de Vaus, D. A. 1996. *Surveys in Social Research*. 4th Edition. UCL Press, London.

Deaton, A. S. and Muellbauer, N. J. 1980. *Economics and Consumer Behavior*. Cambridge University Press, MA.

Deb, N. C. 1986. Consumption pattern in rural Bangladesh. *Bangladesh Development Studies*. **14** (1): 1-28.

Devereux, S. and Hoddinott, J. 1992. *Fieldwork in Developing Countries*. Harvester Wheatsheaf, London.

DFID. 1998. *Bangladesh: Country Strategy Paper 1998*. Department for International Development.
http://www.dfid.gov.uk/public/what/strategy_paper/bangladesh_csp_text.html

Dickenson, J., Gould, B., Clarke, C., Mather, S., Prothero, M., Siddle, D., Smith, C. and Thomas-Hope, E. 1996. *A Geography of the Third World*. Routledge, London.

Dinwiddy, C. and Teal, F. 1996. *Principles of Cost-Benefit Analysis for Developing Countries*. Cambridge University Press, Cambridge.

Douglas, J. J. 1981. Traditional fuel usage and the rural poor in Bangladesh. *World Development*. **10** (8): 669-676.

Douglas, J. J. 1982. *Consumption and Supply of Wood and Bamboo in Bangladesh*. Field Document No. 2. UNDP/FAO Project BGD/78/010. Bangladesh Planning Commission, Dhaka.

Douglas, J. J. 1983. *A Reappraisal of Forestry Development in Developing Countries*. Martinus Nijhoff, The Hague.

Doyal, L. And Gough, I. 1991. *Theory of Human Need*. Macmillan, London.

Duinker, P. N.; Matakala, P. W. and Zhang, D. 1991. Community forestry and its implications for Northern Ontario. *Forestry Chronicle*. **67**: 131-135.

FAO 1971. *Soil Resources of Bangladesh*. FAO/UNDP Soil Survey Project, Pakistan. Technical Report No. 3. Food and Agriculture Organization of the United Nations, Rome.

FAO 1978. *Forestry for Local Community Development*. FAO Forestry Paper 7. Food and Agriculture Organisation of the United Nations, Rome.

FAO 1979. *Economic Analysis of Forestry Projects*. FAO Forestry Paper No. 17. Food and Agriculture Organization of the United Nations, Rome.

FAO 1986. *Tree Growing by Rural People*. FAO Forestry Paper 64. Food and Agriculture Organisation of the United Nations, Rome.

FAO 1988. *Land Resources Appraisal of Bangladesh for Agricultural Development*. Food and Agriculture Organization of the United Nations, Rome.

FAO 1993a. *Forest Resources Assessment 1990 - Tropical Countries*. FAO Forestry Paper 112. Food and Agriculture Organization of the United Nations, Rome.

FAO 1993b. *Forestry Policies of Selected Countries in Asia and the Pacific*. FAO Forestry Paper 115. Food and Agriculture Organization of the United Nations, Rome.

FAO 1995. *Forest Resources Assessment 1990 - Global Synthesis*. FAO Forestry Paper 124. Food and Agriculture Organization of the United Nations, Rome.

FAO 1999. *FAO Forestry Profile - Bangladesh*. http://www.fao.org/infosylva/VR/is_country.jsp?country_code=16&lang=en.

FAO/UNEP. 1981. *Forest Resources of Tropical Asia*. Tropical Forest Resources Assessment Project (in the framework of GEMS). Food and Agriculture Organization of the United Nations/United Nations Environment Programme, Rome.

Feldstein, M. S. and Flemming, J. S. 1964. The problem of time stream evaluation: present value versus internal rate of return rules. *Bulletin of the Oxford University Institute of Statistics.* **26**: 79-85.

Fisher, F. M. 1987. Household equivalence scales and interpersonal comparisons. *Review of Economic Studies.* **54**: 519-524.

Ford Foundation. 1998. *Forestry for Sustainable Rural Development.* A Review of Ford Foundation Supported Community Forestry Programs in Asia. Ford Foundation, New York.

Foster, B. B. and Brooks, G. N. 1983. Rates of return: internal or composite. *Journal of Forestry.* **81**: 669-670.

Foster, J., Greer, J. and Thorbecke, E. 1984. A class of decomposable poverty measures. *Econometrica.* **52** (3): 761-766.

Frankenberger, T. R. and McCaston, M. K. 1998. The household livelihood security concept. *Food, Nutrition and Agriculture.* **22**: 30-35.

Furer-Haimendorf, C. V. 1985. *Tribal Populations and Cultures of The Indian Subcontinent.* E. J. Brill, Leiden.

Ganguly, B. N. 1995. *Breakthroughs in Forestry Development – Experience of the Asian Development Bank.* Asian Development Bank, Manila.

Garrity, D. P *et al.* 1997. The Imperata grasslands of tropical Asia: area, distribution and typology. *Agroforestry Systems.* **36** (1-3): 3-29.

Ghai, D. 1978. Basic needs and its critics. *IDS Bulletin.* **9** (4): 16-18.

Ghai, D. 1980. Basic needs: from words to action with illustrations from Kenya. *International Labour Review.* **119** (3): 367-379.

Ghai, D. P., Khan, A. R., Lee, E. L. H. and Alfthan, T 1977. *The basic needs approach to development – some issues regarding concepts and methodology.* International Labour Office, Geneva.

Gibson, J. 2000. The impact of growth and distribution on poverty in Papua New Guinea. *Applied Economics Letters.* **7** (9): 605-607.

Gittinger, J. P. 1982. *Economic Analysis of Agricultural Projects.* The Johns Hopkins University Press, Baltimore.

Glewwe, P. and van der Gaag, J. 1990. Identifying the poor in developing countries: Do different definitions matter? *Word Development.* **18** (6): 803-814.

Gordon, D. and Spicker, P. (eds.) 1999. *The International Glossary on Poverty.* Comparative Research Programme on Poverty (CROP). University Press Ltd., Dhaka.

Gordon, J. C.; Berry, J. K and Schmidt, R. 1999. Forests, poverty and this book. In: *Forests to Fight Poverty: Creating National Strategies*. Yale University Press, New Haven.

Gowen, M. M., Bentley, W. R. and Stijfhoorn, E. 1994. Tropical forest management and wood-based biomass energy as development assets. *In*: Bentley, W. R. and Gowen, M. M. (eds.) *Forest Resources and Wood-Based Biomass Energy as Rural Development Assets*. Winrock International, USA.

GPRB 1980. *The Second Five Year Plan 1980 – 85*. Planning Commission, Ministry of Planning, Government of the Peoples' Republic of Bangladesh, Dacca

GPRB 1985a. *Bangladesh Energy Planning Project-Draft Final Report*. Volume IV. Rural Energy and Biomass Supply. Planning Commission, Government of the Peoples' Republic of Bangladesh, Dhaka.

GPRB 1985b. *The Third Five Year Plan 1985 – 90*. Planning Commission, Ministry of Planning, Government of the Peoples' Republic of Bangladesh, Dhaka.

GPRB 1987. *Participatory Forestry in Bangladesh: Concepts, Experiences and Recommendations*. A Task Force Report to the Ministry of Agriculture. Government of The People's Republic of Bangladesh, Dhaka.

GPRB 1990. *The Fourth Five Year Plan 1990 – 95*. Planning Commission, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

GPRB 1993. *Thana Afforestation and Nursery Development Project: Project Proforma* (Revised). Government of The People's Republic of Bangladesh, Dhaka.

GPRB 1994. Project Proposal (Revised): Thana Afforestation and Nursery Development Project. Government of the People's Republic of Bangladesh, Dhaka.

GPRB 1996. *National Based Female Student Stipend Programme – Stipend Activity Manual*. Secondary and Higher Education Department. Ministry of Education, Government of the People's Republic of Bangladesh, Dhaka.

GPRB 1997. *Bangladesh Economic Review 1997*. Finance Division, Ministry of Finance, Government of the People's Republic of Bangladesh, Dhaka.

GPRB 1998. *The Fifth Five Year Plan 1997-2002*. Planning Commission, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

GPRB/ADB 1997. *Bangladesh Northwest Region Development and Investment Study*. Final Report, Executive Summary. Planning Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka and Asian Development Bank, Manila.

Grainger, A. 1993. *Controlling Tropical Deforestation*. Earthscan Publications, London.

Grainger, A. 1998. Modelling tropical land use change and deforestation. In Goldsmith, F. B. (ed.) *Tropical Rain Forest: A Wider Perspective*. Chapman & Hall, London.

Gree, D. 2000. Structural Adjustment Programmes. Catholic Agency for Overseas Development, London. http://www.cafod.org.uk/saps.htm.

Greeley, M. 1994. Measurement of poverty and poverty of measurement. *IDS Bulletin*. **25** (2): 50-58.

Green, R. H. 1978. Basic human needs: concept or slogan, synthesis or smokescreen? *IDS Bulletin*, **9** (4): 7-11.

Gregersen, H.; Draper, S. and Elz, D. 1989. *People and Trees: The Role of Social Forestry in Sustainable Development*. The World Bank. Washington, DC.

Grubler, A. 1994. Technology. In Meyer, W. B. and Turner II, B. L (eds.) *Changes in Land Use and Land Cover: A Global Perspective*. University Press, Cambridge.

Gulati, A. K. 1990. Community forestry or social forestry for rural development – a critical review. *Indian Forester*. **116** (9): 687-693.

Hamid, M. A. 1990. Satisfaction of basic food needs: Bangladesh perspective. *Bangladesh Journal of Political Economy*. **10** (3): 234-241.

Hanson, A.H. 1986. *Guidelines to Practical Project Appraisal: Social CBA in Developing Countries*. UNIDO, Vienna.

Haq, A. H. M. S. 1997. Review of primary education in Bangladesh. In Jalaluddin, A. K. and Chowdhury, A. M. R. (eds.) *Getting Started – Universalising Quality Primary Education in Bangladesh*. University Press Limited, Dhaka.

Haq, M. U. 1980. An international perspective on basic needs. *Finance and Development*, **17** (3): 11-14.

Haque, C. E. 1992. Effects of natural hazard-induced displacement upon household income in rural Bangladesh. *Asian Profile*. **20** (5): 427-439.

Haque, C. E. and Blair, D. 1992. Vulnerability to tropical cyclones: evidence from the April 1991 cyclone in coastal Bangladesh. *Disasters*. **16** (3): 217-229.

Haque, S. A. 1998. Nutrient management for sustainable food production in Bangladesh. In Johnston, A. E and Syers, J. K (eds.) *Nutrient Management for Sustainable Crop Production in Asia*. CAB International, Wallingford.

Haque, S. M. S. and Osman, K. T. 1993. Performance of gurjan (*Dipterocarpus turbinatus*) and teak (*Tectona grandis*) in pure and mixed plantations at Kaptai, Bangladesh. *Indian Forester*. **119** (9): 738-743.

Harberger, A. C. 1978. On the use of distributional weights in social cost-benefit analysis. *Journal of Political Economy*. **86** (2): 87-120.

Harberger, A. C. 1984. Basic needs versus distributional weights in social cost-benefit analysis. *Economic Development and Cultural Change.* **32** (3): 455-474.

Harou, P.A. 1985. On a social discount rate for forestry. *Canadian Journal of Forest Research.* **15**: 927-34.

Harrigan, J. and Mosley, P. 1991. Evaluating the impact of World Bank structural adjustment lending: 1980-87. *Journal of Development Studies.* **27** (3): 63-94.

Hasan, S. and Mulamoottil, G. 1993. Land use policy for Bangladesh. *Asian Profile.* **21** (5): 417-426.

Hasan, S. and Mulamoottil, G. 1994. Natural resource management in Bangladesh. *Ambio.* **23** (2): 141-145.

Hasina, S. 1997. Quality primary education for all. In Jalaluddin, A. K. and Chowdhury, A. M. R. (eds.) *Getting Started – Universalising Quality Primary Education in Bangladesh.* University Press Limited, Dhaka.

Hawladar, M. 1999. Personal communication on production of polythene bags in Bangladesh. Hawladar Polybag Factory, Dhaka.

Hediger, W. 2000. Sustainable development and social welfare. *Ecological Economics.* **32** (3): 481-492.

Hekstra, G. P. 1985. Development policies ignore ecological constraints. *The Ecologist.* **15**: 240-245.

Hicks, N and Streeten, P. 1979. Indicators of development: the search for a basic needs yardstick. *World Development,* **7** (5): 567-580.

Hobley, M. 1996. *Participatory Forestry: The Process of Change in India and Nepal.* Rural Development Forestry Study Guide 3. Rural Development Forestry Network, Overseas Development Institute, London.

Hocking, D. 1998. Trees in wetland rice fields – an exciting project in Bangladesh. *Agroforestry Today.* **10** (3): 4-6.

Horn, R. V. 1993. *Statistical Indicators for the Economic and Social Sciences.* Cambridge University Press, Cambridge.

Hossain, M. 1988. Nature and Impact of the Green Revolution in Bangladesh. International Food Policy Research Institute, Washington, D. C.

Hossain, M. and Sen, B. 1992. Rural poverty in Bangladesh: trends and determinants. *Asian Development Review.* **10** (1): 1-34.

Hossain, M., Quasem, M. A., Jabbar, M. A. and Akash, M. M. 1994. Production environments, modern variety adoption and income distribution in Bangladesh. In David, C. C and Otsuka, K (eds.) *Modern Rice Technology and Income Distribution in Asia.* Lynne Rienner, Colorado.

Houghton, R. A. 1994. The worldwide extent of land-use change. *Bioscience*. **44** (5): 305-313.

Howes, M. 1987. Domestic fuel shortages in Bangladesh: causes, consequences and possible solutions. *IDS Bulletin*. **18** (1): 5-10.

Howes, S. and Lanjouw, J. O. 1997. *Poverty Comparisons and Household Survey Design*. LSMS Working Paper No. 129. The World Bank. Washington, D.C.

Huda, S. and Rahman, P. M. M. 1997. On measuring land holding mobility in rural Bangladesh. *Indian Journal of Agricultural Economics*. **52** (2): 271-278.

Huq, A. S. M. A., Dham, S. C. and Hussain, M. S. 1992. Tenancy system and its impact on crop production in a selected area of Bangladesh. *Economic Affairs*-Calcutta. **37** (3): 169-178.

Huq, E. 1984. *Planning for Core Needs in Bangladesh*. University Press Ltd., Dhaka.

Husain, A. T. M. A. 1985. *Share-cropping system in four villages of Bogra district.* Rural Development Academy, Bogra.

Hussain, M. and Hossain, S. M. A. 1998. Sustainable agricultural development in Bangladesh: an eco-regional approach. In Dhaliwal, G. S., Arora, R., Randhawa, N. S and Dhawan, A. K. (eds.) *Ecological Agriculture and Sustainable Development*. Vol. II. Centre for Research in Rural and Industrial Development, Chandigarh.

Hussain, T. 1995. *Land Rights in Bangladesh Problems of Management*. University Press Limited, Dhaka.

Hyde, W. F. 1992. Social Forestry: a working definition and 21 testable hypotheses. In Nemetz, P. N. (ed.) *Emerging Issues in Forest Policy*. UBC Press, Vancouver.

Hyde, W. F. and Newman, D. 1991. *Forest Economics and Policy Analysis: an Overview. World Bank Discussion Paper* 134.

Hye, H. A. 1996. *Below the Line: Rural Poverty in Bangladesh*. University Press Ltd., Dhaka.

ILO 1964. *Employment and Economic Growth*. International Labour Organization, Geneva.

ILO 1976. *Employment, Growth and Basic Needs: A One World Problem.* International Labour Office, Geneva.

ILO/ARTEP 1993. *Bangladesh: Towards an Integrated Approach to Employment Promotion and Poverty Alleviation*. International Labour Organization/Asian Regional Team for Employment Promotion, New Delhi.

ILO/ROAP 1999. *Towards Full Employment.* International Labour Organization /Regional Office for Asia and the Pacific, Bangkok. http://www.ilo.org/public/english/270asie/feature/f-emp26.htm.

IMF 2000. *Bangladesh: Recent Economic Developments.* IMF Staff Country Report No. 00/25. International Monetary Fund. Washington. D. C.

INFS 1992. *Deshiyo Khaddodrobber Pushtiman* (in Bengali) [Nutritive Values of Local Food Items]. Institute of Nutrition and Food Sciences, University of Dhaka.

Ipe, C. V. 1995. Issues in the management of the environment and natural resources in Bangladesh. *Journal of Environmental Management.* **45**: 319-332.

Irvin, G. W. 1978. *Modern Cost-Benefit Methods.* Macmillan, London.

Islam, I. and Khan, H. 1986. Income inequality, poverty and socioeconomic development in Bangladesh: an empirical investigation. *Bangladesh Development Studies.* **14** (2): 75-92.

Islam, K. R.; Kamaluddin, M.; Bhuiyan, M. K. and Badruddin, A. 1999. Comparative performance of exotic and indigenous forest species for tropical semievergreen degraded forest land reforestation in Chittagong, Bangladesh. *Land Degradation and Development.* **10** (3): 241-249.

Islam, M. N and Iftekharuzzaman, M. 1996. Export-growth nexus in a small open economy: the case of Bangladesh. In: Wahid, A. N. M and Weis, C. E (eds.) *The Economy of Bangladesh: Problems and Prospects.* Praeger, Westport.

Januzzi, F. T. and Peach, J. T. 1980. *The Agrarian Structure of Bangladesh: An Impediment to Development.* Westview Press, Boulder, Colorado.

JASPA 1977a. *Narrowing the Gaps-Planning for Basic Needs and Productive Employment in Zambia.* Jobs and Skills Programme for Africa. International Labour Office, Addis Ababa.

JASPA 1977b. *Economic Transformation in a Socialist Framework - An Employment and Basic Needs Oriented Development Strategy for Somalia.* Jobs and Skills Programme for Africa. International Labour Office, Addis Ababa.

Jenkins, S. P. 1991. Income inequality and living standards: changes in the 1970s and 1980s. *Fiscal Studies.* **12** (1): 01-28.

Jenkins, T. 1998. Personal communication on sampling of tree plots. School of Agricultural and Forest Sciences. University of Wales, Bangor.

Johnson, B. L. C. 1982. *Bangladesh.* 2nd Edition. Heinemann, London and Barnes & Noble, New Jersey.

Johnson, J. K. and Whitlam, G. B. 1988. Estimation and interpretation problems in the ex-post economic analysis of projects. *Project Analysis.* **3** (4): 219-228.

Jolliffe, F. R. *Survey Design and Analysis.* Ellis Horwood Ltd., Chichester.

Kahn, J. R. and McDonald, J. A. 1995. Third-world debt and tropical deforestation. *Ecological Economics.* **12**: 107-123.

Kakwani, N. C. 1980. Income Inequality and Poverty: Methods of Estimation and Policy Applications. Oxford University Press, New York.

Kalton, G. 1983. *Introduction to Survey Sampling.* Sage University Paper series on Quantitative Applications in the Social Sciences, 7-35. Sage Publications, California.

Kamaluddin, M. 1979. Pyinkado-an exotic hard wood species in the sal forests of Bangladesh. *Bano Bigyan Patrika.* **8** (1/2): 9-12.

Kamaluddin, M. 1984. *Forest Ecology.* Hoshnara Begum, Chittagong.

Kamaluddin, M. and Bhuiyan, M. K. 1985. Growth and fuelwood yield of Petford provenance of *Eucalyptus camaldulensis* Dehn. grown in rural marginal land. *Pakistan Journal of Forestry.* **35** (1): 15-19.

Kanshahu, A. I. 1996. *Planning and Implementing Sustainable Projects in Developing Countries: Theory, Practice and Economics.* AgBe Publishing, Brussels.

Kapp, G. 1998. Financial evaluation tools for smallholder forestry: a methodological comparison of two forms of cost–benefit analysis and optimisation. *International Tree Crops Journal.* **9**: 233-46.

Karch, G. E. 1992. Comparison of agroforestry practices in Senegal using financial analysis. In Sullivan, G. M., Huke, S. M. and Fox, J. M. (eds.) *Financial and Economic Analyses of Agroforestry Systems.* Proceedings of a workshop held in Honolulu, Hawaii, USA, July 1991. Nitrogen Fixing Tree Association, Paia, HI.

Kennes, W., Parikh, J. K. and Stolwijk, H. 1984. Energy from biomass by socio-economic groups – a case study of Bangladesh. *Biomass.* **4** (3): 209-234.

Khan, A. R. 1977. Poverty and inequality in rural Bangladesh. In *Poverty and Landlessness in Rural Asia.* International Labour Organisation, Geneva.

Khan, A. R. 1990. Poverty in Bangladesh: a consequence of and a constraint on growth. *Bangladesh Development Studies.* **18** (3): 19-34.

Khan, A. R. 1995. A quarter century of economic development in Bangladesh: successes and failures. *Bangladesh Development Studies.* **23** (3/4): 1-19.

Khan, J. A. 1993. *Ex-post Cost-benefit Analysis of Village Woodlots of Gujarat, India.* Unpublished PhD thesis, UCNW, Bangor.

Khan, M. M. 1985. Labour absorption and unemployment in rural Bangladesh. *Bangladesh Development Studies.* **13** (3/4): 67-88.

Khan, M. S. and Alam, M. K. 1996. *Homestead Flora of Bangladesh*. Bangladesh Agricultural Research Council, Dhaka.

Khan, N. A. 1998. *A Political Economy of Forest Resource Use - Case Studies of Social Forestry in Bangladesh*. Ashgate Publishing, Aldershot.

Kihiyo, V. B. M. S. 1996. Economic evaluation of rural woodlots in a developing country: Tanzania. *Journal of Environmental Management*. **46** (3): 271-279.

King, J. A.; Morris, L. L. and Fitz-Gibbon, C. T. 1987. *How to Assess Program Implementation*. Sage Publications Inc., California.

Kirkpatrick, C. and Weiss, J. 1996. Cost benefit analysis for developing countries. In Kirkpatrick, C. and Weiss, J. (eds.) *Cost-Benefit Analysis and Project Appraisal in Developing Countries*. Edward Elgar, Cheltenham.

Klemperer, W. D. 1996. *Forest Resource Economics and Finance*. McGraw Hill Book Co., Singapore.

Knudsen, O. K. and Scandizzo, P. L. 1982. The demand for calories in developing countries. *American Journal of Agricultural Economics*. **64** (1): 80-86.

Kula, E. 1981. Future generations and discounting rules in public sector investment appraisal. *Environment and Planning* A. **13**: 899-910.

Kula, E. 1986. The developing framework for the economic evaluation of forestry in the United Kingdom. *Journal of Agricultural Economics*. **37** (3): 365-376.

Kula, E. 1996. Social project appraisal and historical development of ideas on discounting – a legacy for the 1990s and beyond. In Kirkpatrick, C. and Weiss, J. (eds.) *Cost-Benefit Analysis and Project Appraisal in Developing Countries*. Edward Elgar, Cheltenham.

Kumar, P. J. D. 1988. *Cost Benefit Analysis and Sustained Yield Forestry in India*. Unpublished PhD Thesis. SAFS, University of Wales, Bangor.

Kuzmin, S. A. 1977. An integrated approach to development and employment. *International Labour Review*. **115** (3): 327-341.

Kvale, S. 1996. *Interviews: An Introduction to Qualitative Research Interviewing*. Sage Publications, California.

L'esperance, W. L. 1971. *Modern Statistics for Business and Economics*. Macmillan, New York.

Laarman, J. G. and Sedjo, R. A. 1992. *Global Forests: Issues for Six Billion People*. McGraw-Hill, Inc., New York.

Lal, D. 1980. *Prices for Planning: towards Reform of Indian Planning*. Heinemann, London.

Lancaster, G., Ray, R. and Valenzeula, M. R. 1999. A cross-country study of household poverty and inequality on unit record household budget data. *Economic Development and Cultural Change*. 1999. **48** (1): 177-208.

Lanjouw, J.O.1999. *Demistifying Poverty Lines*. http://www.undp.org/poverty/publications/pov_red/Demistifying_Poverty_Lines.pdf.

Lanjouw, P. and Stern, N. 1991. Poverty in Palanpur. *World Bank Economic Review*: **5** (1): 23-55.

Lanly, J. P. (ed.) 1981. *Tropical Forest Resources Assessment Project (GEMS): Tropical Africa, Tropical Asia, Tropical America*. UN Food and Agriculture Organisation/UN Environment Programme, Rome.

Lappe, F. M. and Collin, J. 1976. Food first. *New Internationalist*. **42**: 5-9.

Latif, M. A, Rahman, M. F. and Das, S. 1995. Volume tables for *Acacia auriculiformis, Cassia siamea* and *Pinus caribaea* in Bangladesh. *Bangladesh Journal of Forest Science*. **24** (2): 22-30.

Latif, M. A.; Chowdhury, J. A.; Das, S. and Rahman, M. F. 1997. Growth and yield of *Paraserianthes falcat*aria in the forests of Bangladesh. *Bangladesh Journal of Forest Science*. **26** (2): 23-30.

Latif, M. A.; Khan, S. A. and Bhuiyan, M. K. 1985. Prospects of *Acacia mangium* for afforestation in Bangladesh. *Pakistan Journal of Forestry*. **35** (1): 7-12.

Lefroy, R. D. B and Craswell, E. T. 1998. Sustainable agriculture and natural resource management. In Johnston, A. E and Syers, J. K (eds.) *Nutrient Management for Sustainable Crop Production in Asia*. CAB International, Wallingford.

Leipziger, D. M. 1981. Policy issues and the basic human needs approach. In Leipziger, D. M. (ed.) Basic Needs and Development. Oelgeschlager, Gunn & Hain Publishers, Cambridge.

Levine, G., Bentley, W. R., Brockbank, B. and Ghildyal, B. P. 1986. *Problems and Solutions: Lessons from Rural Development Projects*. Ford Foundation Discussion Paper No. 20, New Delhi.

Lewbel, A. 1989. Household equivalence scales and welfare comparisons. *Journal of Public Economics*. **39** (3): 377-391.

Lewis, D.J. 1994. Catalysts for change? NGOs, agricultural technology and the state in Bangladesh. *Journal of Social Studies*. **65**: 63-100.

Libby, L. W. 1974. Land use policy: implications for commercial agriculture. *American Journal of Agricultural Economics*. **56**: 1143-1152.

Library of Congress. 1988. *Bangladesh – A Country Study*. http://lcweb2.loc.gov/frd/cs/bdtoc.html

Lisk, F. 1977. Conventional development strategies and basic-needs fulfilment: A reassessment of objectives and policies. *International Labour Review*, **115** (2): 175-191.

Lisk, F. and Werneke, D. 1976. *Alternative Development Strategies and Basic Needs.* World Employment Programme Research Working Paper. International Labour Office, Geneva.

Little, I. M. D. and Mirrlees, J. A. 1974. *Project Appraisal and Planning for Developing Countries.* Heinemann, London.

Little, I. M. D. and Mirrlees, J. A. 1991. Project Appraisal and Planning Twenty Years On. Proceedings of the World Bank Annual Conference on Development Economics. The World Bank, Washington, D. C.

Little, I. M. D. and Scott, M. FG. 1976. *Using Shadow Prices.* Heinemann, London.

Livingstone, I. and Tribe, M. 1995. Projects with long time horizons: their economic appraisal and the discount rate. *Project Appraisal.* **10**: 66-76.

Lohmann, L. 1990. Commercial tree plantations in Thailand: deforestation by any other name. *The Ecologist.* **15**: 69-72.

Lok-Dessallien, R. 1999. *Review of Poverty Concepts and Indicators.* http://www.undp.org/poverty/publications/pov_red/Review_of_Poverty_Concepts.pdf

Lumby, S. 1985. *Investment Appraisal: A Students Workbook.* Van Nostrand Reinhold, Wokingham.

Mahar, D. and Schneider, R. 1994. Incentives for tropical deforestation: some examples from Latin America. In Brown, K. and Pearce, D. W. (eds.) *The Causes of Tropical Deforestation.* UCL Press, London.

Mahmud, W. 1989. Estimation of employment and unemployment in Bangladesh: a review. In: Jahangir, B. K. (ed) *Perspectives in Social Sciences II.* Centre for Advanced Research in Social Science, Dhaka University, Dhaka.

Mallik, A. U. and Rahman, H. 1994. Community forestry in developed and developing countries: a comparative study. *Forestry Chronicle.* **70** (6): 731-735.

Mallik, A. U., Rahman, H. and Park, Y. G. 1995. Community forestry: revitalizing an age-old practice of sustainable development. *Journal of Korean Forestry Society.* **84** (4): 525-535.

Mandal, M. A. S. 1981. Farm size, tenure and productivity in an area of Bangladesh. *Bangladesh Journal of Agricultural Economics.* **3** (2): 21-42.

Marglin, S. A. 1979. *Value and Price in Labour Surplus Economy.* Clarendon Press, Oxford.

Marquette, C. M. 1997. Current poverty, structural adjustment, and drought in Zimbabwe. *World Development,* **25** (7): 1141-1149.

Mather, A. S. 1986. *Land Use.* Longman Inc., New York.

Mcneill, J *et al.* 1994. Toward a typology and regionalisation of land-cover and land-use change: report of working group B. In Meyer, W. B. and Turner II, B. L (eds.) *Changes in Land Use and Land Cover: A Global Perspective.* University Press, Cambridge.

Mgeni, A. S. M and Nsolomo, V. R. 1995. Financial evaluation of social forestry in Tanzania as an aid to forest extension: The Magadu village case study. *International Tree Crops Journal.* **8** (4): 235-252.

Mirza, M. M. Q. 1998. Diversions of the Ganges water at Farakka and its effects on salinity in Bangladesh. *Environmental Management.* **22** (5): 711-722.

Mishan, E.J. 1975. *Cost–benefit Analysis.* Allen and Unwin, London.

Momin, M. A. 1991. Impact of agrarian structure on agricultural growth of Bangladesh. *Journal of Rural Development*-Hyderabad. **10** (3): 253-263.

Moser, C. and Kalton, G. 1971. *Survey Methods in Social Investigations.* 2nd Edition. Gower Publishing, Aldershot.

Mujahid, G. B. S. 1977. Measurement of poverty in Bangladesh: a note on methodology. *Bangladesh Development Studies.* **5** (4): 262-269.

Mujeri, M. K.; Alauddin, M. and Tisdell, C. 1993. Consumption, savings and investment by social class in Bangladesh: Does the rural sector support the urban sector? *Journal of Development Studies.* **30** (1): 226-245.

Musgrave, R. A. 1969. Cost–benefit analysis and the theory of public finance. *Journal of Economic Literature.* **7** (3): 101-16.

Myers, N. 1994. Tropical deforestation: rates and patterns. In Brown, K. and Pearce, D. W. (eds.) *The Causes of Tropical Deforestation.* UCL Press, London.

Naher, F. 1997. Green revolution in Bangladesh: production stability and food self-sufficiency. *Economic and Political Weekly.* **32** (26): A84-A89.

Nair, C. T. S. 1981. *Basic Needs Fulfilment and Evaluation of Land Use Alternatives with Special Reference to Forestry in Kerala State, India.* Unpublished PhD thesis. University College of North Wales, Bangor.

Nautiyal, J. C. 1988. *Forest Economics, Principles and Applications.* Canadian Scholars' Press, Inc. Toronto.

Nicholas, P. 1989. *Social Survey Methods: A Field Guide for Development Workers.* Oxfam, Oxford.

Oakley, P. and Marsden, D. 1984. *Approaches to Participation in Rural Development.* International Labour Office, Geneva.

ODA. 1988. *Appraisal of Projects in Developing Countries: A Guide for Economists.* 3rd Edition. HMSO, London.

Ojima, D. S, Galvin, K. A. and Turner II, B. L. 1994. The global impact of land-use change. *Bioscience.* **44** (5): 300-304.

Oneworld 2000. http://www.oneworld.org/guides/sap/front.shtml.

Openshaw, K. and Morris, J. 1979. The socio-economics of agroforestry. In Chandler, T. and Spurgeon, D. (eds.) *International Cooperation in Agroforestry.* International Council for Research in Agroforestry, Nairobi.

Oppenheim, A. N. 1966. *Questionnaire Design and Attitude Measurement.* Heinemann, London.

Osgood, D. 1994. Government failure and deforestation in Indonesia. In Brown, K. and Pearce, D. W. (eds.) *The Causes of Tropical Deforestation.* UCL Press, London.

Osman, K. T., Haque, S. M. S. and Rehman, M. M. 1993. Performance of *Acacia mangium* in Chittagong, Bangladesh. *Annals of Forestry.* **1** (2): 193-195.

Osmani, S. R. 1980. Poverty, inequality and the problem of nutrition in Bangladesh. *Bangladesh Development Studies.* **8** (1-2): 121-142.

Otsamo, R. 2000. Secondary forest regeneration under fast-growing forest plantations on degraded *Imperata cylindrica* grasslands. *New Forests.* **19** (1): 69-93.

Oxfam 1995. *A Case for Reform: Fifty Years of the IMF and World Bank.* Oxfam (UK and Ireland), Oxford.

Palo, M. and Lehto, E. 1996. Tropical Asian deforestation and sustainability prospects. In Palo, M. and Mery, G (eds.) *Sustainable Forestry Challenges for Developing Countries.* Kluwer Academic Publishers, Dordrecht.

Pant, M. M. 1975. Benefit-cost analysis: a possibly over-emphasised criteria in forestation evaluation. *Indian Forester.* **101**: 367-84.

Pant, M. M. 1979. Social forestry in India. *Unasylva.* **31**: 19-24.

Pardo, R. D. 1985. Forestry for the people: can it work? *Journal of Forestry.* **83** (12): 732-741.

Pearce, D. and Brown, K. 1994. Saving the world's tropical forests. In Brown, K. and Pearce, D. W. (eds.) *The Causes of Tropical Deforestation.* UCL Press, London.

Pearson, R. S. and Brown, H. P. 1932. *Commercial Timbers of India: Their Distribution, Supplies, Anatomical Structure, Physical and Mechanical*

Properties and Uses. Vol. 1. Government of India, Central Publications Branch, Calcutta.

Pinstrup-Andersen, P. and Caicedo, E. 1978. The potential impact of changes in income distribution and food demand and human nutrition. *American Journal of Agricultural Economics*. **60** (3): 402-415.

Pitt, M. M. 1983. Food preferences and nutrition in rural Bangladesh. *Review of Economics and Statistics*. **65** (1): 105-114.

Pitt, M. M., Rosenzweig, M. R. and Hassan, M. N. 1990. Productivity, health and inequality in the intrahousehold distribution of food in low-income countries. *American Economic Review*. **80** (5): 1139-1156.

Potter, L. M. 1997. The dynamics of *Imperata*: historical overview and current farmer perspectives, with special reference to South Kalimantan, Indonesia. *Agroforestry Systems*. **36** (1-3): 31-51.

Pratima, J. S. S. 1999. Participatory forest management to meet basic needs of forest dependent communities. *Indian Forester*. **125** (9): 895-902.

Price, C. 1989. *The Theory and Application of Forest Economics*. Basil Blackwell, Oxford.

Price, C. 1990. Deforestation and economic criteria. *Project Appraisal*. **5**: 159-66.

Price, C. 1991: Do high discount rates destroy tropical forests? *Journal of Agricultural Economics*. **42**: 77-85.

Price, C. 1996. Long time horizons, low discount rates and moderate investment criteria. *Project Appraisal*. **11**: 157-68

Price, C. and Nair, C. T. S. 1984. Cost-benefit analysis and the consideration of forestry alternatives. *Journal of World Forest Resource Management*. **1** (1): 81-104.

Quazi, A. 1978. Village overspill. *Mazingira*. **6**: 27-33.

Quddus, A. H. G., Ali, S. M. I., Bhuiyan, A. M. A and Hossain, M. 1992. *Greening the Hills: the Betagi-Pomora Agroforestry Experience*. Bangladesh Agricultural Research Council, Dhaka.

Radwan, S. and Alfthan, T. 1978. Household surveys for basic needs: some issues. *International Labour Review*. **117** (2): 197-210.

Raghavan, U. S. 1991. Social forestry in integrated rural development: an overview. In: *Social Forestry in IRD*. Report of the Regional Expert Consultation. CIRDAP Action Research Series No. 13. Centre on Integrated Rural Development for Asia and the Pacific, Dhaka.

Rahman, A and Islam, R. 1988. Labour use in rural Bangladesh - an empirical study. *Bangladesh Development Studies*. **16** (4): 1-40.

Rahman, A. and Islam, S. S. 1997. Financial viability of agroforestry under participatory approach in Bangladesh: the case of Forest Department's first logged over plots of Dinajpur. *Bangladesh Journal of Forest Science*. **26** (1): 47-55.

Rahman, A. K. M. F. 1998. Personal communication on social forestry activities in Bogra circle. CF-Bogra Circle. Bangladesh Forest Department, Bogra.

Rahman, F. 1998. Personal communication on social forestry projects in Bangladesh. CF-Bogra Forest Circle, Bangladesh Forest Department, Bogra.

Rahman, M. S. 1999. Personal communication on different aspects of social forestry in Rajshahi region. Charkai Forest Range, Bangladesh Forest Department.

Rahman, P. M. M. and Ali, M. M. 1984. Distribution of land holding and its inequality in Bangladesh. *Indian Journal of Agricultural Economics*. **39** (1): 40-52.

Rahman, S. 1996. The fine art of silk production – spin-offs for rural women. *Agroforestry Today*. **8** (3): 9-11.

Ramaswamy, S. R. 1988. Social costs of social forestry. *Economic and Political Weekly*. **23** (26): 1314-1316.

Rao, Y. S. 1985. Community forestry: building success through people's participation. *Unasylva*. **37**: 29-35.

Rasheed, S.K.B. 1995. Participatory forestry as a strategy for reforestation in Bangladesh. *Geojournal*. **37** (1): 39-44.

Rashid, H. E. 1991. *The Geography of Bangladesh*. Revised 2nd Edition. University Press Limited, Dhaka.

Rashid, M. R. 1970. Trial cultivation of Eucalyptus in East Pakistan. *Forest Dale News*. **2** (4): 39-44.

Ravallion, M. 1992. *Poverty Comparisons: A Guide to Concepts and Measures*. Living Standards Measurement Study Working Paper 88. World Bank, Washington, DC.

Ravallion, M. 1994. *Poverty Comparisons*. Harwood Academic Press, Chur.

Ravallion, M. 1998. *Poverty Lines in Theory and Practice*. Living Standards Measurement Study Working Paper 133. World Bank, Washington, DC.

Ravallion, M. and Bidani, B. 1994. How robust is a poverty profile? *World Bank Economic Review*. **8** (1): 75-102.

Ravallion, M. and Sen, B. 1996. When method matters: monitoring poverty in Bangladesh. *Economic Development and Cultural Change*. **44** (4): 761-792.

Ravallion, M. and Wodon, Q. 1997. *Poor Areas, or Only Poor People*? Policy Research Working Paper 1798. World Bank, Washington, DC.

Ravindran, D. S. 1998. *Risk, Store of Wealth and Land Use Choice: A Socio-economic Analysis of Farmer Adoption of Woodlots in Karnataka, India.* Unpublished Ph. D. thesis, University of Wales, Bangor.

Ray, A. 1984. *Cost–benefit Analysis: Issues and Methodology.* Johns Hopkins University Press, Baltimore.

Reutlinger, S. and Selowski, M. 1976. *Malnutrition, Poverty and Policy Options.* World Bank Staff Occasional Papers. World Bank, Washington, DC.

Rhind, D and Hudson, R. 1980. *Land Use.* Methuen & Co. Ltd, London.

Richards, P J. 1981. Target setting for basic-needs services: some possible approaches. *International Labour Review.* **120** (5): 645-657.

Richards, P J. 1982. The role of target setting. In Richards, P. J. and Leonor, M. D. (eds.) *Target Setting for Basic Needs.* International Labour Office, Geneva.

Roberts, R.W. 1990. Social forestry: definitions and research needs. In: Science in Forestry, IUFRO's second century. Congress Report XIX World Congress (Vol. B), International Union of Forest Research Organizations, Montreal.

Robinson, F. 1989. *The Cambridge Encyclopedia of India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan and the Maldives.* Cambridge University Press, Cambridge.

Rockwell, R. C. 1994. In Meyer, W. B. and Turner II, B. L (eds.) *Changes in Land Use and Land Cover: A Global Perspective.* University Press, Cambridge.

Romm, J. 1981. Assessing benefits and costs of social forestry projects. *Indian Forester.* **106**: 106-7.

Roy, I. and Siddique, A.R. 1997. Involving people in agroforestry: the experience of the village and farm forestry project in Bangladesh. *Asia Pacific Journal of Rural Development.* **7** (2): 134-146.

Roy, K. C. and Clark, C. 1994. Development versus growth: Basic human needs, appropriate technology and social connectedness. In Roy, K. C. and Clark, C. (eds.) *Technological Change and Rural Development in Poor Countries: Neglected Issues.* Oxford University Press, Calcutta.

Rudel, T. 1994. Population, development and tropical deforestation: a cross-national study. In Brown, K. and Pearce, D. W. (eds.) *The Causes of Tropical Deforestation.* UCL Press, London.

Ruttan, V. W. 1984. Integrated rural development programmes: a historical perspective. *World Development,* **12** (4): 393-401.

Sage, C. 1994. Population and income. In Meyer, W. B. and Turner II, B. L (eds.) *Changes in Land Use and Land Cover: A Global Perspective.* University Press, Cambridge.

Salam, M. A., Noguchi, T. and Koike, M. 1999. The causes of forest cover loss in the hill forests in Bangladesh. *GeoJournal.* **47**: 539-549

Sanderson, S. 1994. Political-economic institutions. In Meyer, W. B. and Turner II, B. L (eds.) *Changes in Land Use and Land Cover: A Global Perspective.* University Press, Cambridge.

Sarkar, S. K. 1998. Quantification of the stress to which West Bengal forests are subjected. *Indian Forester.* **124** (1): 37-42.

Sattar, M. A. 1998. Wood energy in Bangladesh. In *Woodfuel in Bangladesh: Production and Marketing.* Technical Papers from the National Training Course, held at RADA, Bogra (7-11 December, 1996). RWEDP Report No. 38. Food and Agriculture Organization of the United Nations, Bangkok.

Sawyer, J. 1993. *Plantations in the Tropics: Environmental Concerns.* IUCN, Gland, Switzerland and Cambridge, UK in collaboration with UNEP and WWF.

Scandizzo, P. L. and Knudsen, O. K. 1978. *Cost Benefit Analysis of Basic Needs Policies.* AGREP Working Paper No. 18. World Bank, Washington, DC.

Scandizzo, P. L. and Knudsen, O. K. 1980. The evaluation of the benefits of basic needs policies. *American Journal of Agricultural Economics.* **62**: 46-57.

Schaffer, B. 1978. Exclusive needs, inclusive services. *IDS Bulletin.* **9** (4): 19-23.

Schallau, C. H. and Wirth, M. E. 1980. Reinvestment rate and the analysis of forestry enterprises. *Journal of Forestry.* **78**: 740-742.

Scherr, S. J. and Yadav, S. 1996. *Land degradation in the developing world: implications for food, agriculture and environment to 2020. A 2020 Vision for Food, Agriculture and the Environment.* Discussion Paper No. 14. International Food Policy Research Institute, Washington, DC.

Scherr, S. J. 1997. Meeting household needs: farmer tree growing strategies in western Kenya. In: Arnold, J. E. M. and Dewees, P. A. (eds.) *Farms, Trees and Farmers: Responses to Agricultural Intensification.* Earthscan Publication Ltd., London.

Schuman, H. and Presser, S. 1981. *Questions and Answers in Attitude Surveys: Experiments on Question Form, Wording, and Context.* Academic Press, New York.

Scott, M. F. G., MacArthur, J. D. and Newbery, D. M. 1976. *Project Appraisal in Practice.* Heinemann, London.

Sedjo, R. A. 1983. *The Comparative Economics of Plantation Forestry: a Global Assessment.* Resources for the Future, Inc., Washington D.C.

Sekar, C. and Karunakaran, K. R. 1993. Economic analysis of cashew plantations under agroforestry conditions of central Tamil Nadu. *Journal of Tropical Forest Science*. **6** (4): 523-528.

Selvavinayagam, K. 1991. *Financial Analysis in Agricultural Project Preparation*. Food and Agriculture Organization of the United Nations, Rome.

Sen, A. K. 1984. *Resources, Values and Development*. Basil Blackwell, Oxford.

Sen, A. K. 1987. *The Standard of Living*. Cambridge University Press, New York.

Sen, D. and Das, P. K. 1987. The management of people's participation in community forestry: some issues. Social Forestry Network Paper 4d. Overseas Development Institute, London.

Shah, S. A. 1988. *Forestry for People*. Indian Council of Agricultural Research, New Delhi.

Shahjahan, A. 1995. Land reclamation in Bangladesh. In Appleton, H. (ed.) *Do It Herself: Women and Technical Innovation*. Intermediate Technology Publications, London.

Sharawi, H. 1987. *Acacia senegal in the Gum Belt of Western Sudan: a Cost Benefit Analysis*. Unpublished MSc thesis, University College of North Wales, Bangor.

Sharma, R. A.; Blyth, J. F. and McGregor, M. J. 1991. The social discount rates for land use projects in India. *Journal of Agricultural Economics*. **42** (1): 86-92.

Sharma, R. A. and McGregor, M. J. 1991. Economic discount and wage rates for social forestry projects in India: Estimates and problems. *Project Appraisal*. **6** (1): 47-52.

Sharma, R. A. 1994. On a discount rate for forestry in India. *Indian Forester*. **120** (11): 1019-1027.

Sharma, R. A. 1996. Analytical techniques for social forestry evaluation: a review. *Indian Forester*. **122** (4): 289-97.

Shepherd, A. 1998. *Sustainable Rural Development*. Macmillan Press, New York.

Shingi, P. M. and Seetharaman, S. P. 1990. Social forestry as peoples' programme: organisational strengths and limitations. In Shingi, P. M. (ed.) *Studies on Social Forestry in India: Management Perspectives*. RAPA Publication 1990/1. FAO Regional Office for Asia and the Pacific, Bangkok and Indian Institute of Management, Ahmedabad.

Shiva, V. 1987. Forestry myths and the World Bank. *The Ecologist*. **17** : 142-149.

Shukla, D. K. 1996. *Project Appraisal Under Risk, Threat and Uncertainty: A Case Study of the Afforestation Project of Bihar, India*. Unpublished PhD thesis, University of Wales, Bangor.

Siddiqui, K. 1981. Land reform legislation in the 50s. In Alamgir, M. K (ed.) *Land Reform in Bangladesh*. Centre for Social Studies, Dhaka.

Siddiqui, K. 1994. Land resources of Bangladesh. In Rahman, A. A., Haider, R., Huq, S. and Jansen, E. G. (eds.) *Environment and Development in Bangladesh*. Vol. II. University Press Limited, Dhaka.

Singh, A. K., Singh, M. K. and Mascarenhas, O. A. J. 1985. Community forestry for revitalising rural ecosystems: a case study. *Forest Ecology and Management*. **10**: 209-232.

Singh, G., Singh, N. T., Dagar, J. C., Singh, H. and Sharma, V. P. 1997. An evaluation of agriculture, forestry and agroforestry practices in a moderately alkali soil in northwestern India. *Agroforestry Systems*. **37** (3): 279-295.

Singh, J. P. 1995. *An Economic Evaluation of Agroforestry, Forestry and Agriculture Projects in Orissa, India; With Particular Reference to Financial Profitability and Basic Needs Fulfilment*. Unpublished PhD thesis, University of Wales, Bangor.

Skerman, P. J. and Riveros, F. 1990. *Tropical Grasses*. Food and Agriculture Organisation of the United Nations, Rome.

Skole, D. L. 1994. Data on global land-cover change: acquisition, assessment and analysis. In Meyer, W. B. and Turner II, B. L (eds.) *Changes in Land Use and Land Cover: A Global Perspective*. University Press, Cambridge.

Smith, D. M. 1986. *The Practice of Silviculture*. 8th Edition. John Wiley & Sons, New York.

Som, R. K. *A Manual of Sampling Techniques*. Heinemann, London.

Squire, L. and van der Tak, H. G. 1975. *Economic Analysis of Projects*. The Johns Hopkins University Press, Baltimore.

Srinivasan, T. N. 1984. Development, poverty and basic human needs: Some issues. In Ghosh, P. K. (ed.) *Third World Development: A Basic Needs Approach*. Greenwood Press, Westport, CT.

Stewart, F. 1985. *Planning to Meet Basic Needs*. Macmillan, London.

Stewart, F. 1991. The many faces of adjustment. *World Development*, **19** (12): 1847-1864.

Stomph, T. J; Fresco, L. O and van Keulen, H. 1994. Land use system evaluation: concepts and methodology. *Agricultural Systems*. **44** (3): 243-255.

Streeten, P. 1979. From growth to basic needs. *Finance and Development*, **16** (3): 28-31.

Streeten, P. 1990. Poverty concepts and measurements. *Bangladesh Development Studies*. **18** (3): 1-18.

Streeten, P. 1994. *Poverty Monitoring: An International Concern*. UNICEF, Geneva.

Streeten, P. and Burki, S. J. 1978. Basic needs: some issues. *World Development*, **6** (3): 411-421.

Streeten, P., Burki, S. J., Haq, M. U., Hicks, N. and Stewart, F. 1981. *First Things First: Meeting Basic Human Needs in the Developing Countries*. Oxford University Press, New York.

Sudman, S. 1976. *Applied Sampling*. Academic Press, New York.

Sudman, S. and Bradburn, N. M. 1982. *Asking Questions*. Jossey-Bass, San Francisco.

Svedin, U. E. 1979. Technology, development and environmental impact. *Ambio*. **8**: 48-51.

Talukder, R. K. 1993. Patterns of income induced consumption of selected food items in Bangladesh. *Bangladesh Development Studies*. **21** (1): 41-53.

Teekens, R. (ed.). 1988. *Theory and Policy Design for Basic Needs Planning: A Case Study of Equador*. Avebury, Aldershot.

Temu, A. B. 1990. *Forest Mensuration*. UNDP/FAO BGD/85/011 Field Document No. 3. Institute of Forestry, Chittagong University, Chittagong and Food and Agriculture Organization of the United Nations, Rome.

Timms, R. W. 1991. *The Adivasis of Bangladesh*. Minority Rights Group Report 92/1. Minority Rights Group, London.

Todaro, M. P. 1977. *Economic Development in the Third World*. Longman, New York.

Tole, L. 1998. Sources of deforestation in tropical developing countries. *Environmental Management*. **22** (1): 19-33.

Trivedi, S. N. 1987. *Utility Based Social Shadow Pricing and Its Comparison with Other Evaluation Techniques: A Cost Benefit Study of Fuelwood Plantations in Bihar, India*. Unpublished PhD Thesis, University College of North Wales, Bangor.

Troup, R. S. 1921. *The Silviculture of Indian Trees*. Vol. 1: Dilleniaceae to Leguminosae (Papililionaceae). Clarendon Press, London.

Turner II, B. L and Meyer, W. B. 1994. Global land-use and land-cover change: An overview. In Meyer, W. B. and Turner II, B. L (eds.) *Changes in Land Use and Land Cover: A Global Perspective*. University Press, Cambridge.

Turvey, N. D. 1994. *Afforestation and Rehabilitation of* Imperata *Grasslands in Southeast Asia: Identification of Priorities for Research, Education, Training and Extension*. ACIAR Technical Report No. 28. ACIAR, Canberra.

UCC 2000. The Universal Currency Converter. http://www.xe.net/ucc/convert.cgi

Umar, B. 1985. Bangladesh-employment crisis and its consequences. *Economic and Political Weekly*. **20** (40): 1686.

UNDP 1997. *Human Development Report 1997*. United Nations Development Programme. Oxford University Press, New York.

UNDP 1998. *Bangladesh Human Development Report-Monitoring Human Development*. United Nations Development Programme. Dhaka.

UNESCO 1977. *Soil Map of the World*. Volume VII South Asia. United Nations Educational, Scientific and Cultural Organization, Paris.

UNICEF 1995. *The State of the World's Children 1995*. United Nations Children's Fund. Oxford, New York.

UNIDO,1972. *Guidelines for Project Evaluation*. United Nations, New York.

UNIDO 1978. *Guide to Practical Project Appraisal Social Benefit-Cost Analysis in Developing Countries*. United Nations, New York.

United Nations. 1995. The Copenhagen Declaration and Programme of Action: World Summit for Social Development 6-12 March 1995. United Nations, New York and http://www.un.org/esa/socdev/geneva2000/docs/summit.pdf.

Vaclav, E. and Skoupy, J. 1972. Growing of teak (*Tectona grandis* L. F.) in Bangla Desh. *Silvaecultura Tropica et Subtropica*. **2**: 11-28.

Veitch. M. 1978. Cost-benefit analysis and basic needs. *IDS Bulletin*. **10** (1): 19-23.

Vergara, N. T. 1985. Agroforestry: A primer. *Unasylva*. **37**: 22-28.

Vittachi, V. T, 1976. A necessary utopia. *New Internationalist*, September: 2-5.

Wax, R. H. 1971. *Doing Fieldwork: Warnings and Advice*. University of Chicago Press, Chicago.

Weis, R. S. 1968. *Statistics in Social Research: An Introduction*. John Wiley & Sons, Inc.; New York.

Westoby, J. 1987. *The Purpose of Forests Follies of Development*. Basil Blackwell, Oxford.

Westoby, J. 1989. *Introduction to World Forestry*. BaOsil Blackwell, Oxford.

Whitby, M. and Adger, N. 1993. UL land use and the global commons. In: *The Greening of Rural Policy: International Perspectives*. Edited by Harper, S. Belhaven Press, London.

White, L. P. and Plaskett, L. G. 1981. *Biomass as Fuels*. Academic Press, London.

WHO 1985. *Energy and Protein Requirements*. Report of a Joint FAO/WHO/UNU Expert Consultation. Technical Report Series 724. World Health Organization, Geneva.

WHO 1992. *Our Planet, Our Health: Report of the WHO Commission on Health and Environment*. World Health Organization, Geneva.

WHO/HD 1994. *Upazila Health Management Manual*. World Health Organization, Dhaka and Health Directorate, Dhaka.

Wodon, Q. T. 1997. Food energy intake and cost of basic needs: measuring poverty in Bangladesh. *The Journal of Development Studies*, **34** (2): 66-101.

World Bank 1978. *Forestry Sector Policy Paper*. The World Bank, Washington, D.C.

World Bank 1990. *Poverty: World Development Report 1990*. Oxford University Press, New York.

World Bank 1994. *Assessing Development Effectiveness: Evaluation in the World Bank and the International Finance Corporation*. World Bank, Washington, D.C.

World Bank 1996. *World Development Report 1996*. Oxford University Press, New York.

World Bank 1998. *Bangladesh: From Counting the Poor to Making the Poor Count*. World Bank, Washington, DC.

World Bank 1999. *Entering the 21st Century World Development Report 1999/2000*. Oxford University Press, New York.

World Bank 2000. http://www.worldbank.org/research/sapri/zimbab.htm [page 5/19].

WRI 1994. *World Resources 1994-95*. World Resources Institute. Oxford University Press, New York.

Yadav, I. P. S. and Rajpali, S. K. 1993. Resource use productivity of dryland farming system in Jhansi district. *Haryana Journal of Agronomy*. **9** (2): 96-100.

Zaman, M. A. U. 1998. Barind: predicted a failure, proved a success. In Rushton, K., Wheater, H and Kirby, C. (eds.) *Hydrology in A Changing Environment*. Vol. II. John Wiley and Sons Ltd., Chichester.

Zaman, M. R. 1973. Sharecropping and economic efficiency in Bangladesh. *Bangladesh Economic Review*. **1** (2): 149-172.

Appendix 2.1 Share of Employed Labour Force by Industry Sector 1995/96 (%)

Sector	% share in 1995/96
Agriculture, Forestry and Fisheries	63.2
Mining and Quarrying	...
Manufacturing	7.5
Electricity, Gas and Water	0.2
Construction	1.8
Trade, Hotel and Restaurants	11.2
Transport, Storage and Communication	4.2
Finance, Business and Services	0.4
Community and Personal Services	9.3
Others	2.2
Total	100

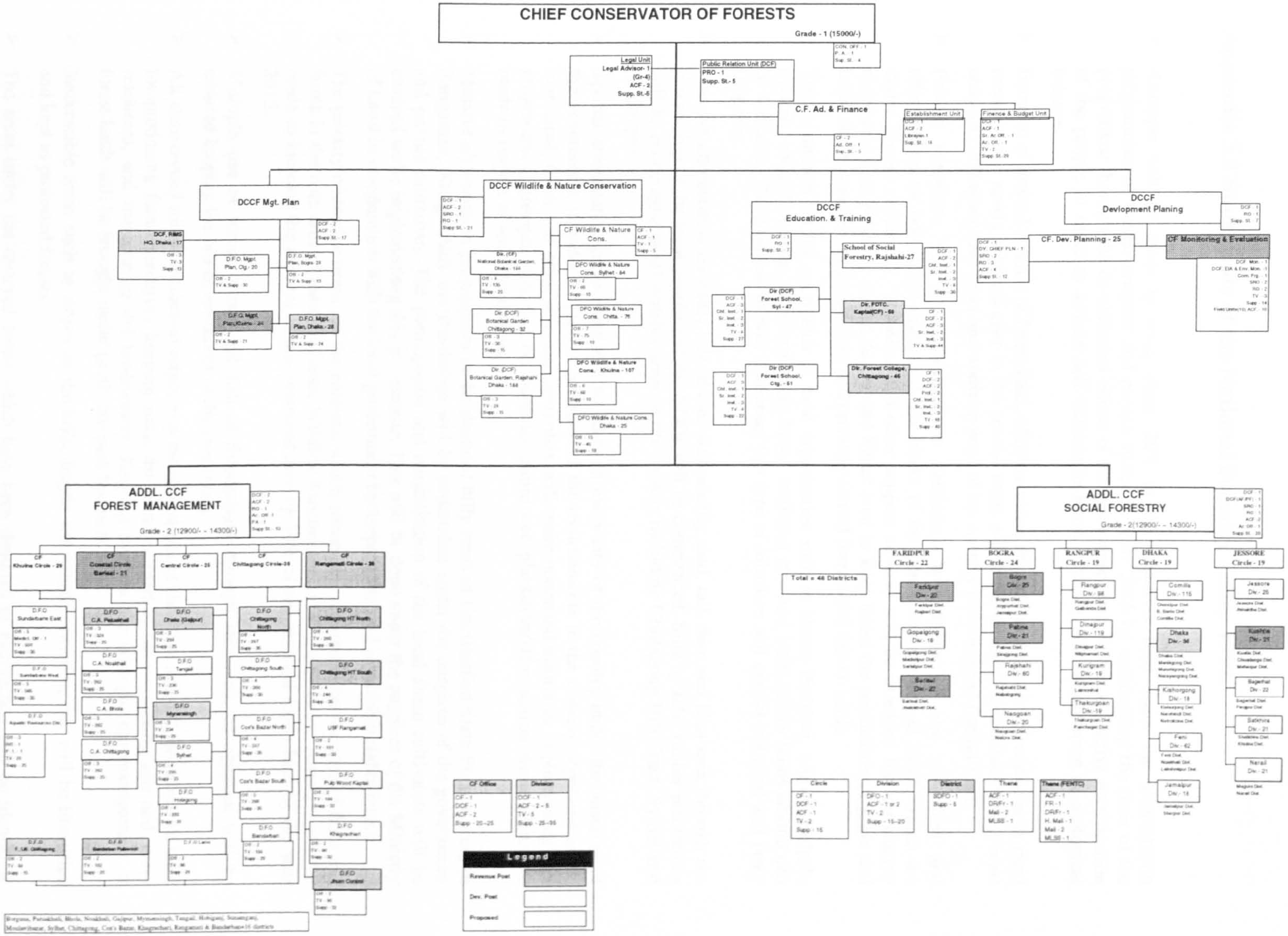
Appendix 2.2 Sectoral shares of GDP at constant (1984-85) prices

	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98
1. Agriculture	37.6	36.9	35.9	34.6	32.8	32.2	32.4	31.6
2. Industry	9.8	10.1	10.5	10.9	11.3	11.3	11.1	11.5
3. Construction	6.0	6.1	6.2	6.4	6.3	6.2	6.2	6.3
4. Power, Gas, Water and Sanitary	1.3	1.5	1.6	1.8	1.8	1.9	1.9	1.8
5. Transport, Storage and Communication	11.8	11.8	11.9	12.0	12.1	12.1	12.2	12.3
6. Trade services	9.1	9.0	9.0	9.1	9.7	10.0	10.1	10.2
7. Housing services	7.6	7.5	7.5	7.5	7.5	7.3	7.2	7.1
8. Public Admin. and Defence	4.3	4.7	4.7	4.9	5.1	5.2	5.4	5.5
9. Banking and Insurance	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.7
10. Professional and Misc. Services	10.7	10.9	10.9	11.2	11.5	11.7	11.8	12.0
GDP at Market Prices	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Source: GPRB 1997, BBS 1999a)

[mining/quarrying excluded due to very negligible figures]

Appendix 3.1 Organogram of Bangladesh Forest Department [as of 1999]



Appendix 3.2 Statements of the National Forestry Policy 1994.

- Attempts will be made to bring about 20% of the country's land under the afforestation programmes of the government and private sector by year 2015 by accelerating the pace of the programme through the co-ordinated efforts of the government and NGOs and active participation of the people in order to achieve self reliance in forest products and maintenance of ecological balance.
- Because of limited amount of forest land, effective measures will be taken for afforestation in rural areas, in the newly accreted char in the coastal areas and in the denuded Unclassed State Forest areas of Chittagong Hill Tract and northern zone of the country including the Barind tract.
- Private initiatives will be encouraged to implement programmes of tree plantation and afforestation on fallow and hinterland, the banks of the ponds and homestead lands, which are under private ownership. Technical and other support services will be extended for introducing agroforestry on privately owned fallow and hinter land to keep intact the production of grass and herb which is grown on government and privately owned forests and fallow lands.
- Tree plantation on the courtyards of rural organization such as Union Parishad, school, Eidgah, mosque, moktob, temple, club, orphanage home, madrassa etc. And other fallow lands around can be initiated. The government will encourage this type of initiative and extend technical and other supports.
- Massive afforestation on either side of land surrounding road, rail, dam and khas tank through the partnership of the local people and the NGOs will be commenced. Side by side, rubber plantations will be encouraged in all suitable areas of the country including Chittagong Hill Tract, Sylhet and Modhupur.
- Special afforestation programme will be taken in every city of the country under the auspices of the government in order to prevent pollution of the environments in the densely populated areas, municipal, town and other relevant authorities will make concerted efforts in implementing this programme. Attempts will also be made to ensure tree plantation/afforestation while plans are made in respect of residential areas.
- Massive afforestation programmes in the denuded hilly areas of Unclassified State Forests areas of Rangamati, Khagrachari and Bandarban will be undertaken under the auspices of the government and private initiatives. The participation and rehabilitation of the local Jhum cultivators will be ensured while implementing this programme. This will be done under the auspices of the Ministry of Land in co-operation with the local government by keeping the land ownership rights intact.
- The priority protection areas are the habitats, which encompass representative samples of flora and fauna in the core area of national Parks, Wildlife Sanctuaries and Game reserves. Attempts will be made to increase the amount of this protected area by 10% of the reserved forest land by the year 2015.
- Multiple use of forest, water and fish of Sundarbans through sustained management will be ensured keeping the bio-environment of the area intact.
- All state owned forests of natural origin and the plantations of the Hills and Sal forest will be used for producing forest resources keeping aside the areas earmarked for conserving soil and water resources, and maintaining the biodiversity. Keeping in view the ecology, the management of forest lands will be brought under profit-oriented business.
- Inaccessible areas such as slopes of the hills, fragile watersheds, swamps, etc. will be identified and kept as protected forests.
- The areas under the reserved forest which have been denuded or encroached will be identified. Afforestation in these lands will be done through people's participation. In this regard, the use of agroforestry will be encouraged. NGOs will have opportunities to participate in this programme. Side by side, the lands in Chittagong and Sylhet which were allocated to different per sons and institutions for developing the tea gardens and still remain unutilized and uncultivated will be identified and used for tree plantation and afforestation.

- Initiatives will be taken to reduce wastage by using modern and appropriate technology at all stages of extraction and processing forest products.
- Emphasis will be imparted on modernisation of forest-based industries to ensure effective utilisation of the forest raw materials.
- Steps will be taken to bring state-owned forest based industries to competitive and profit-oriented management system under the free market economy.
- Forest resource based labour intensive small and cottage scale industries will be encouraged in the rural areas.
- Rules and procedures regarding transportation of forest produce in the country will be simplified and made up-to-date.
- Export of logs will remain banned given the scarcity of wood in the country. But processed forest products can be exported. Import policy on wood and wood-based products will be liberalised, but import tariffs, for the wood products which are abundant in the country, will be levied appropriately.
- Because of the scarcity of forest land, state owned reserve forests cannot be used for non-forest purposes without the permission of the Head of the Government.
- A large number of tribal people live around a few forest zones. Since the ownership of land under their disposal is not determined, they grab the forest land at will. They will be imparted ownership of certain amount of land through the forest settlement process. The rest of the forest land will be brought under permanent protection.
- Funds from different donors including International Aid Organisations will be used to promote private forestry and tree farming, and for such programmes like training, technical and financial support will be imparted at an increasing rate.
- Women will be encouraged to participate in homestead and farm forestry, and participatory afforestation programmes.
- Ecotourism, related to forest and wildlife, is recognised as forestry related activity, which will be promoted taking into consideration the carrying capacity of nature.
- There will massive campaign through the government and non-government media for raising consciousness among the people regarding afforestation and conservation, and use of forest resources.
- Encouragement will be extended to grow fruit trees for producing more fruits along with the production of timber, fuelwood and non-wood forest products under the afforestation programme.
- Initiatives will be taken to reduce wastage by increasing efficiency and modernising the technology for extracting forest resources.
- Forest department will be strengthened in order to achieve the goals and objectives of National Forest Policy. A new department called "Department of Social Forestry" will be established.
- The implementation of National Forestry Policy will be supported by strengthening educational, training and research organisations. This will contribute to forestry sector development.
- Laws, rules and regulations relating to forestry sector will be amended and if necessary, new laws and rules will be promulgated in consonance with goals and objectives of National Forestry Policy.

Appendix 4.1 Functions of trees in agricultural and livestock development

1. Providing tree products

   1.1 Intensification of subsistence production for farm and household purposes

   - 1.1.1 Human food (fruits, nuts, vegetables, sap)
   - 1.1.2 Fodder and forage for animals (foliage, fruits)
   - 1.1.3 Fuelwood and charcoal
   - 1.1.4 Wood for construction and farm implements
   - 1.1.5 Fibres and thatching materials
   - 1.1.6 Others, such as medicinal products

   1.2 Cash crop diversification resulting in increased productivity of land and labour

   - 1.2.1 Timber and other commercial wood products
   - 1.2.2 Cash crop commodities (coconut, coffee, tea, oil palm etc.)
   - 1.2.3 Exudates (latex, resins, gums)
   - 1.2.4 Others, e.g. cork, pharmaceuticals

2. Sustaining production capacity and other farm service functions

   2.1 Micro-climate improvement for crop and livestock

   - 2.1.1 Wind shelter
   - 2.1.2 Shade, and buffering temperatures

   2.2 Soil conservation

   - 2.2.1 Control of water erosion
   - 2.2.2 Control of wind erosion

   2.3 Soil improvement

   - 2.3.1 Efficient nutrient cycling, including nitrogen fixation
   - 2.3.2 Addition of organic matter and nutrients to topsoil
   - 2.3.3 Improved physical and hydrological conditions

   2.4 Live fences and hedges.

Appendix 4.2 The role of forests

Ecological effects	Catchment protection	Controlled runoff, water supplies, irrigation, soil fertility, oxygen
	Ecology and Wildlife	Recreation, tourism, national parks, protection of endangered species of flora and fauna
	Soil erosion control	Windbreaks, shelter belts, dune fixation. reclamation of eroded lands
Indigenous consumption	Fuelwood & charcoal	Cooking, heating and household uses
	Agricultural uses	Shifting cultivation, forest grazing, N fixation. mulches. fruits and nuts
	Building poles	Housing, building construction, fencing, furniture
	Pit sawing and sawmilling	Joinery, furniture, construction, farm buildings
	Weaving materials	Ropes & strings, baskets, furniture, furnishings
	Sericulture, apiculture, ericulture	Silk, honey, wax, lac
	Special woods & ashes	Carvings, incense, chemicals, glassmaking
Industrial uses	Gums, resins and oils	Naval stores, tannin, tarpentine, distillates. resin. essential oils
	Charcoal	Reduction agent for steel making, chemicals, PVC, dry cells
	Poles	Transmission poles, pitprops
	Sawlogs	Lumber, joinery, furniture, packing, shipbuilding, mining, construction, sleepers
	Veneer logs	Plywood, veneer furniture, containers, construction
	Pulpwood	Newsprint, paperboard, printing and writing paper, containers, packaging, distillates, textiles and clothing
	Residues	Particleboard, fibreboard, wastepaper

Source: World Bank 1978.

Appendix 4.3 Major items of investment cost of the TANDP

Item of works	Unit	Quantity of works	Financial (in million Tk.)		
			Local	FE	Total
1. Woodlot plantation	ha	21055	296.96		296.96
2. Agroforestry plantation	ha	4200	51.49		51.49
3. BWDB plantation	ha	1282	14.43		14.43
4. Strip plantation	km.	17272	161.64		161.64
5. Institute planting	m.seedl	7.2	103.38		103.38
6. Estab. & maint. of thana nursery	no.	345	52.45		52.45
7. Further development of FENTCs	no.	8	12.08		12.08
8. Improvement of FENTCs	no.	38	24.71		24.71
9. Maintenance of FENTCs	no.	94	13.25		13.25
10. Seedlings for distribution	m.seedl	106.18	201.31		201.31
11. Seedlings for planting	m.seedl	34.7	112.37		112.37
12. Private nursery	no.	100	2.75		2.75
13. Maintenance of seedlings	m.seedl	25.53	14.57		14.57
14. Maintenance of plantations					
a) Woodlot	ha	39558.88	94.61		94.61
b) Agroforestry	ha	3051.21	6.71		6.71
c) BWDB	ha	1898.27	5.25		5.25
d) Strip plantations	km.	19846.50	62.36		62.36
15. Residential buildings	sq.m no.	162592 313	66.36		66.36
16. Functional buildings	sq.m no.	1253 7	11.03		11.03
17. Land acquisition and dev.	ha	0.81	3.22		3.22
18. Electrification/gas/water			2.53		2.53
19. Boundary wall			2.70		2.70
20. Maintenance of buildings			14.20		14.20
21. Vehicles (jeep-10, car-1, bus-1, truck-1, Avvan-1, motorcycle-69, bicycle-667)	no.	750	28.41		28.41
22. Equipments			26.02		26.02
23. Experts and consultants					
a) Foreign	MM	84		26.94	26.94
b) Local	MM	18		1.81	1.81
24. Training and fellowships	persons	100000		46.22	46.22
25. Misc. TA				19.00	19.00
26. Publicity			11.03		11.03
27. Staff salaries			342.31		342.31
28. Contingencies			115.50		115.50
29. CD VAT			4.0		4.0
Total			1857.62	98.08	1955.7

Source: GPRB 1994

Appendix 4.4 Physical and financial schedule of works of TANDP for the year 1991-92

Item of Works	Physical schedule		Financial schedule
	Unit	Quantity	Total cost (m. Tk.)
Major Head 250 (Capital)			
A. Organisation			
1. Woodlot plantation in Government forest land	ha	2876.92	52.34
1. Agroforestry plantation in Government forest land	ha	446.56	7.55
2. Afforestation of vacant land outside BWDB embankments	ha	107.29	1.80
3. Strip plantations along:			
i. Roads and highways	km	99.76	1.32
ii. Railways	km	28.96	0.35
iii. Embankment	km	57.92	1.00
iv. Feeder road	km	251	2.02
4. Institutional plantings (religious, educational, social institutes and office premises)	m.sdlngs	.02	1.6
5. Maintenance of existing FENTCs	no.	24	1.45
6. Maintenance of Thana nurseries	no.	38	0.97
7. Raising seedlings for distribution			
i. FENTC	m.sdlngs	6.90	12.32
ii. Thana HQ nursery centres	m.sdlngs	0.82	1.5
8. Maintenance of plantations:			
a) One year old plantations			
i. Woodlot plantation	ha	2859	9.32
ii. Agroforestry plantation	ha	405.51	0.85
iii. BWDB plantation	ha	64.75	0.22
b) Two years old plantations			
i. Woodlot plantation	ha	2023.5	3.69
ii. BWDB plantation	ha	4.05	0.01
9. Maintenance of strip plantations			
a) One year old plantation			
i. Roads and highways plantation	km	228.48	0.87
ii. Railways plantation	km	93.32	0.35
iii. Embankment plantation	km	107.8	0.48
iv. Feeder road plantation	km	495.57	1.60
b) Two year old plantation			
i. Roads and highways plantation	km	154.46	0.45
ii. Railways plantation	km	5.06	0.14
iii. Embankment plantation	km	5.06	0.16
iv. Feeder road plantation	km	259.05	0.63
Total Organisation			103.01

Continued from over leaf...

Item of Works	Physical schedule		Financial schedule
	Unit	Quantity	Total cost (m. Tk.)
B. Communication and Building			
1. Residential building construction			
i) Forest guard and Malis quarter (500 sft. each)	no.	12	1.95
2. Maintenance of buildings			1.82
Total Communication and Building			3.77
C. Livestock, Store, Tools, Plants etc.			
1. Purchase of equipment			4.71
Total Livestock, Store, Tools, Plants etc.			4.71
TOTAL 250 (CAPITAL) A + B + C			111.49
Major Head 202 (Revenue)			
a) Staff salaries etc.			52.10
b) Contingency			14.90
TOTAL 202 (REVENUE)			67.00
TOTAL CAPITAL (250) and REVENUE (202)			178.49
TA Component			
1. Experts (International)			
a) Training (36 MM)	MM	12	
b) Agroforestry (24 MM)	MM	10	8.44
c) Communication (24 MM)	MM	12	
2. National Professional, Administrative Staff and mission cost			3.52
3. Training	Persons	19324	7.35
4. Equipments	LS		0.81
5. Miscellaneous TA			0.99
TOTAL TA COMPONENT			21.12
TOTAL for THE YEAR 1991-92			**199.61**

[note: MM – man month, TA – Technical Assistance, LS – lump sum]

Appendix 4.5 Letter of Agreement or Deed of Participation in Social Forestry Programme of Bangladesh Forest Department.

1. Agroforestry farmers

Letter of Agreement accomplished between the **agroforestry** farmer and Divisional Forest Officer, __________ Forest Division, on behalf of the Government of The People's Republic of Bangladesh

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This letter of agreement has been accomplished today (Eng.) _____ 19__ upon reaching a mutual understanding between Divisional Forest Officer, __________ Forest Division, on behalf of the Government of The People's Republic of Bangladesh (First party) and the farmer engaged in agroforestry Mr. _____ son of _____ (Second party).

Since the second party has expressed his willingness to protect the forest crop (planted forest trees) raised by FD grown in this agroforestry farm of _____ situated in reserved/protected/acquired forest land, so he is hereby permitted to grow agricultural crops in the vacant area in between rows of forest crops (as per design given by first party).

Schedule:

The agroforestry farm is situated in reserved/protected/acquired forest land in _____ mouza, _____ thana under _____ district. On its north is _____, south is _____, east is _____, west is _____. This title has been undertaken subject to the following conditions upon reaching consensus of both parties:

1. The second party would be allowed to grow agricultural crops without any revenue at the allocated space in the farm, as long as he properly protects the tree seedlings raised therein.

2. The second party will be allowed to grow agri-crops in the agroforestry farm on a yearly basis. If entrusted works are done satisfactorily then agri-crops can be grown every year by renewing the agreement. This document is absolutely untransferable. And if the second party violates any of the conditions of the agreement, then his work will be stopped and the deed will be considered as void.

3. The second party will be allowed to practice agriculture only at the place designated by the first party.

4. The second party, or any dependent, or anyone on behalf of him would be allowed to cut, collect or remove forest products along with agri-crops for own use, sale or exchange but such free-of-cost forest produce for instance, fuelwood, fodder or timber should not exceed 50% of the final harvest.

5. The second party, or any dependent, or anyone of behalf of would not be allowed to do the following:
   - i) will not be allowed to cut/fell trees, leaf collection or any other activity damaging to the trees;
   - ii) will not be allowed to light a fire or carry fire to the AF farm;
   - iii) will not be allowed to graze cattle in any part of the AF farm.

6. If the first party evicts the second party or any dependent from the AF farm for contravening any condition of the deed and if he or any dependent of him erects a temporary shade on the farm and if he or any dependent does not remove it within 15 days from eviction, then the first party will arrange for its disposal and the evicted person/s would not be entitled to any compensation.

7. If there occurs a crime such as timber pilferage, then the second party must inform the first party and if there starts a fire in the farm or somewhere nearby, the second party must take measures for smothering the fire.

8. If the first party believes that the second party is unable to maintain all or part of the terms, then the first party can declare the title as void with a notification of one month and if there are some agri-crops maintained on the farm at the time of such declaration and the second party fails to remove such crop, then the first party preserves the right to sell such crop.

9. If there appears a dispute in the implementation of the terms of the title/deed between the two parties, then it should be brought into notice of the CCF, whose decision will be taken as final.

10. The first party will provide the second party with the following goods:
    i. Seed, seedling, fertiliser, insecticide and technical assistance for agri-crops for the first year, as per allocation in the budget.
    ii. All expenditure towards the establishment of forest plantations.
    iii. The second party would be allowed to enjoy the agri-crop but s/he will have to store seeds for the second year from the harvest of first year. No agricultural inputs would be supplied after the first year.
    iv. The second party would be allowed to raise poultry or practice apiculture, but inputs will have to be collected by the second party.

11. The second party will be further obliged that:
    i. S/he will produce only those agri-crops or forest trees that are acceptable to the first party.
    ii. The second party will not be able to or attempt to sale, transfer or bring into any kind of bond or settlement, the land received for agroforestry farming.
    iii. If the second party wishes to employ daily labour or incur any other expenditure on top of the grant, then s/he will have to inform this to the first party beforehand, and s/he will not be able to employ labour without permission of the first party.

iv. The second party will inform the first party about the agri-crop harvest in advance so that the first party can record the harvest correctly.

v. The second party will conduct in a timely manner the vacancy filling, weeding and tending operations. (the first party will bear only the first year's cost).

vi. The second party will allow forest officers/staff and other approved persons to visit the agroforestry farm.

vii. If the second party wishes to leave the farm, then s/he will have to bring this to the first party's notice three months in advance.

viii. No temporary or permanent house will be allowed to be built on the farmland.

ix. No new pond will be permitted to be excavated on the farmland.

12. The Government deserves the right to alter, amend or add to the terms and conditions of this title through mutual discussion or if necessary, on its own. No objection of the second party in this regard will be accepted and the Government decision will be considered irrevocable.

Signature of the Divisional Forest Officer on behalf of
The Government of The People's Republic of Bangladesh
______________ Division.
(First party)

Signature of first witness -
Signature of second witness -

Signature or thumb impression
of second party

2. Woodlot farmers

Letter of Agreement accomplished between the **woodlot** farmer and Divisional Forest Officer, __________ Forest Division, on behalf of the Government of The People's Republic of Bangladesh

Letter of agreement/title done between locally selected landless families who would participate in protecting the tree plantations and cultivate cash crops in the interim places, and the FD of the Government of the People's Republic of Bangladesh, aiming to create plantations of fuelwood and other tree species in national forest areas under the supervision of the FD.

As the FD has undertaken tree plantation activities on the land under this schedule on behalf of the Bangladesh Government, so today _____ year, _____ month, _____ day the title has been accomplished between the Divisional Forest Officer, __________ Forest Division on behalf of the Government of The People's Republic of Bangladesh (mentioned as first party henceforth) and Mr. __________, s/o Mr. _____ of village _____, PO _____, thana _____, district _____ (mentioned as second party henceforth) to protect forest plantations and cultivate cash crops in interim tree-less places.

According to this agreement, both parties are bound to observe its terms and conditions.

Terms and conditions

1. This contract will remain valid from _____ till _____. If the second party can comply with the terms up to the satisfaction of the first party, then the contract can be renewed for a certain period.

2. If the second party breaks any of the term of this contract within the stipulated time period, then the first party can nullify this contract. The second party will be obliged to vacate the place described on this schedule. S/he will not be able to claim any compensation or suit any appeal to the court of law for this act.

3. The first party will set up the place for raising cash crops like paddy, vegetables and forage crops in intermediate locations. The first party will not be allowed to plough the land after raising plantations, but will be able to grow crops by digging up soil using spades, without causing any damage to the planted trees.

4. The second party will not be allowed to build any sort of house or shade on the plantation site.

5. The second party will be able to consume or sell the cash crops grown in interim places as per model provided by the first party.

6. The second party will not be subject to any sort of revenue or levy for using the land in schedule.

7. The second party will be compelled to protect the planted forest trees from cattle grazing and from damage by crooks. S/he will be liable for any damage or loss of trees from the plantation. In addition, the second party will be obliged to inform the first party of any unlawful incidence in adjoining forest areas.

8. When the FD will sell part or full harvest of the forest crop during the period of the contract or any renewal thereof, the second party will get 40% share of that sale proceeds.

9. If the first party requires labourer for raising and tending of plantations on the scheduled land then the second party would provide with such labour on wage basis and will also be obliged to arrange labourers and extend other assistance.

"Schedule and Design of that Schedule"

Both parties are providing their signatures willingly and consciously to accomplish this agreement on the basis of above-mentioned terms and conditions in the presence of witnesses enlisted below:

<u>Witness</u>

1.

(representative of first party)

2.

(second party)

Appendix 10.1 Food values of food items commonly consumed in the study area

Food items	Energy content (Kcal per 100 gm)	Protein content (gm per 100 gm)
1. Rice	347.50	8.00
2. Pulse	345.50	24.80
3. Vegetable	31.08	2.18
4. Fruits	64.80	1.30
5. Fish	108.20	17.60
6. Meat	103.00	22.63
7. Egg	177.00	13.40
8. Milk	67.00	3.20
9. Sugar	398.00	0.00
10. Edible oil	900.00	0.00

Source: INFS 1992.

Annexure 8.1.1 Format for gathering annual physical input data from agroforestry plots

AE Zone______ District______ Village______ Participant______ Plot No.______ Area______										
		Annual physical use of inputs								
Input components	Units	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	Total
[A] Agricultural crops										
1. Land										
2. Labour										
i. Site preparation	Man days									
ii. Sowing/planting	Man days									
iii. Weeding	Man days									
iv. Fertiliser/insecticide application	Man days									
v. Harvesting	Man days									
vi. Processing	Man days									
Total labour										
3. Material										
i. Seed	Kgs.									
ii. manure and fertiliser	Kgs.									
iii. Insecticides	Kgs.									
iv. Tools and implements	Kgs.									
Total materials										
Total agricultural cost										
[B] Forestry crops										
1. Labour										
i. Site preparation	Man days									
ii. Seed/nursery raising	Man days									
iii. Planting	Man days									
iv. Weeding	Man days									
v. Fertiliser/insecticide application	Man days									
vi. Prunning/thinning	Man days									
Total labour										
2. Material										
i. Manure/fertiliser	Kgs.									
ii. Insecticides	Kgs.									
iii. Tools and implements	LS									
Total materials										
Total forestry cost										
Total agroforestry cost										

Annexure 8.2.1 Format for gathering annual physical output data from agroforestry plots

AE Zone__________ District __________ Village __________ Participant __________ Plot No. __________ Area ________

		Annual physical quantities of inputs								
Output components	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
[A] Agricultural crops 1. Paddy	Kgs.									
2. Wheat	Kgs.									
3. Potato	Kgs.									
4. Tarmaric	Kgs.									
5. Ginger	Kgs.									
6. Pulses	Kgs.									
7. Jute	Kgs.									
8. Others (pls. Specify)										
Total agricultural output	Kgs.									
[B] Forestry outputs										
1. Intermediate products										
i. Dry leaves	Kgs.									
ii. Grasses	Kgs.									
iii. Twigs/branches	Kgs.									
2. Final products										
i. Timber	cu. m									
ii. Firewood	cu. m									
Total forestry output										
Total agroforestry output										

Annexure 8.1.2 Format for gathering annual physical input data from woodlot plots

AE Zone__________ District__________ Village__________ Participant__________ Plot No.__________ Area__________

		Annual physical use of inputs								
Input components	Units	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	Total
1. Labour										
i. Site preparation	Man days									
ii. Seed/nursery raising	Man days									
iii. Planting	Man days									
iv. Weeding	Man days									
v. Fertiliser/insecticide application	Man days									
vi. Prunning/thinning	Man days									
Total labour										
2. Material										
i. Manure/fertiliser	Kgs.									
ii. Insecticides	Kgs.									
iii. Tools and implements	LS									
Total materials										
Total forestry cost										

Annexure 8.2.2 Format for gathering annual physical output data from woodlot plots

AE Zone________ District ________ Village ________ Participant ________ Plot No. ________ Area ______

		Annual physical quantities of inputs								
Output components	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Forestry outputs										
1. Intermediate products										
i. Dry leaves	Kgs.									
ii. Grasses	Kgs.									
iii. Twigs/branches	Kgs.									
iv. Poles/logs	Number									
2. Final products										
i. Timber	cu. m									
ii. Firewood	cu. m									
Total forestry output										

Annexure 8.3 Format for gathering growth data of trees from AF and WL plots.

AE Zone________ District__________ Village__________
Participant____________ Plot No.______ Area_______ Year_______

Tree No.	Agroforestry				Woodlot			
	TR	BR	TH	DBH	TR	BR	TH	DBH
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
--								
--								
--								
Survival %								

Note: TR- top reading, BR- bottom reading, TH- top height, DBH- diameter at breast height.

Annexure 8.4 The questionnaire for household survey

Serial no. _____ **QUESTIONNAIRE**

Name of respondent ______________________

Village ______________________

District ______________________

Agro-ecological zone ______________________

A. Socio-economic profile:

1. What is your family size?

Adult male	[ ]1	Adult female	[ ]2
Children	[ ]3	Total	[ ]4

2. Age structure:

Male				Female			
0 - 10	11 - 20	21 – 40	>40	0 - 10	11 - 20	21-40	>40

3. Are you:

Literate	[ ]1	Illiterate	[ ]2

4. If literate, then what level:

Primary	[ ]1	Secondary	[ ]2
H.Secondary	[ ]3	Graduate	[ ]4

5. What is your occupation?

Agriculture	[ ]1	Agri-labour	[ ]2
Nonagri-labour	[ ]3	Others (pls. Specify)	[ ]4

Landholding: ....

6. Are you a:

Full time worker	[ ]1	Part time worker	[ ]2
Seasonal worker	[ ]3	Others (pls. Specify)	[ ]4

7. Who are the earning members of your family?

Male _____ Female _____

8. What is the total monthly income of your family from all sources?

Source	Income [in CASH and in KIND] (Tk.)
a.	
b.	
Total	

9. Livestock details:

Cattle _____

Goat/sheep _____

Poultry _____

Others (pls. Specify) _____

10. Indication of wealth: [eg. bicycle, radio, TV, furniture etc.]

B. Participant's basic consumption needs

Food Items

11. How much do you consume and how much do you spend per day on the following goods for your family?

Foods	Consumption (gms.)	Expenditure (Tk.)
i. Food grains		
a. Rice		
b. Wheat		
c. Others (if any)		
ii. Pulses and alike		
iii. Edible oil		
iv. Vegetables		
v. Fruits		
vi. Milk and milk products		
vii. Non-veg. Items		

a. Fish

b. Meat

c. Egg

viii. Tea

ix. Sugar

x. Others (if any)

Total (food)

<u>Non-food Items</u>

12. How much do you spend per month on clothing items for your family?

Item(no.)	Expenditure (Tk.)
a. Lungi	
b. Genji	
c. Shirt	
d. Sari	
e. Shoes	
f. Baby clothes	
g. Others	

13. How much do you require and how much do you spend monthly on the following items for your family?

Items	Monthly consumption	Monthly expenses (Tk.)
i. **Fuel** (for cooking) a. Fuelwood b. Dung cake c. Others (pls. Specify)		
ii. **Light** a. Kerosene b. Electricity		
iii. **Housing** (for repair) a. Locally purchased b. Forest products c. Others (pls. specify)		

14. How do you cover medical treatment of your household?

Free treatment in govt. hospital	[ ]1
Private treatment on own expense	[ ]2
Partly free, partly private	[ ]3
No treatment	[ ]4
Others (if any)	[ ]5

Hospitals in last six months - how much? ....Tk.

Doctors in last two months - how much? ....Tk.

Medicines in last one month - how much? ....Tk.

15. How do you cover education of your children?

Free education in govt. school/madrasa	[ ]1
Private education on own cost	[ ]2
No education	[ ]3
Others (if any)	[ ]4

School fee - how much per month? .... Tk.

Books - how much per year? .... Tk.

Stationery - how much per month .... Tk.

Others (pls. Specify) .... Tk.

16. Do you require any transport facility?

Yes	[ ]1	No	[ ]2

17. If yes to Q. 16 then how do you meet it?

Own transport	[ ]1	Public transport at own cost	[ ]2
Use neighbour's facility	[ ]3	Others	[ ]4

If you use any paid transport then,

- how often you use it? ....

- how much you pay per visit? ....Tk.

C. Participant's involvement in the SFP

18. What is the survival % of trees in your plot?

Low (1 / 4)	[ ]1	Moderate (2 / 4)	[ ]2
High (3 / 4)	[ ]3	Nearly all (4 / 4)	[ ]4
DNK	[ ]5		

19. If low survival, can you please explain why?

Socio-economic reasons:

Agro-climatic reasons: Soil related:

20. If moderate survival, can you please tell why?

Socio-economic reasons:

Agro-climatic reasons: Soil related:

21. If high survival, then what are the possible factors?

D. Benefits from the SFP

22. Did you get agricultural produce from your SFP plot?

Yes [ ]1 No [ ]2

23. If yes to Q. 22, then what was the output per year?

Crops	1993 yr. 1	1994 yr. 2	1995 yr. 3	1996 yr. 4	1997 yr. 5	1998 yr. 6	1999 yr. 7
Paddy							
Wheat							
Spices							
Fruit/Veg.							
Others							

24. What were the inputs per year?

Inputs	1993 yr. 1	1994 yr. 2	1995 yr. 3	1996 yr. 4	1997 yr. 5	1998 yr. 6	1999 yr. 7
Labour*							
Seed							
Fertiliser							
Insecticide							
Others							

25. How did you use the harvested produce?

Own consumption	[ ]1	Sold	[ ]2
Partly consumed, partly sold	[ ]3	Others (pls. Specify)	[ ]4
DNK	[ ]5		

26. Did you get any other intermediate produce from the SFP?

Yes	[ ]1	No	[ ]2

27. What are the intermediate products that you got? [Lump sum]

Leaves___ Grasses___

Branches/twigs for fuel___ Poles___

Others___

28. If yes to Q26., could you please tell how did you use them?

Own consumption	[ ]1	Sold	[ ]2
Partly consumed, partly sold	[ ]3	Others	[ ]4
DNK	[ ]5		

29. Have you cut any tree from your SFP plot?

Yes	[ ]1	No	[ ]2

30. Could you please tell the reasons for cutting the tree/s?

i.

ii.

31. Do you think that the SFP has helped you in fulfilling the basic needs of your family?

Not at all	[ ] 1		
Little (25%)	[ ]2	Moderate (50%)	[ ]3
Fully (100%)	[ ]4	Others	[ ]5

32. Do you think that the SFP has helped in increasing your household income?

Yes	[ ]1	No	[ ]2

33. If yes to Q. 32, how has it increased your income **[per year]**?

Sale of forest produce	[ ]1	Tk.0-500[] Tk.500-1000[] Tk.1000-2000[]
Sale of agricultural produce	[ ]2	Tk.0-500[] Tk.500-1000[] Tk.1000-2000[]
Sale of both	[ ]3	Tk.0-500[] Tk.500-1000[] Tk.1000-2000[]
Others	[ ]4	Tk.0-500[] Tk.500-1000[] Tk.1000-2000[]

34. if no to Q. 32, then why and by how much?

35. How do you plan to utilise your share of revenue after the final harvest of the plot?

-

E. Participant's knowledge and awareness about the project

36. What in your opinion is the purpose of the SFP? [wait & then ↓]

To fulfil minimum needs of food, fuel, fodder and timber	[ ]1
To allow additional earnings	[ ]2
To let have some luxury goods/recreation	[ ]3
Others (pls. State)	[ ]4
DNK	[ ]5

37. Were you aware of the rights and obligations of the SFP when you joined it?

Yes [ ]1 No [ ]2

38. How the land now used in SFP were in use before (without) the project?

Fallow land without any use	[ ]1
Fallow land used for grazing	[ ]2
Agricultural land	[ ]3
Others	[ ]4
DNK	[ ]5

39. How would you value the per ha yield of this land w/out the project?

F. Participant's attitude toward and opinion about the SFP

40. What in your opinion is the quality of the land selected for SFP?

Suitable for forestry, not agriculture	[ ]1
More suitable for forestry than for agriculture	[ ]2
More suitable for agriculture than for forestry	[ ]3
Unsuitable for forestry	[ ]4
Unsuitable for agriculture	[ ]5
Unsuitable for forestry and agriculture both	[ ]6
Others (if any)	[ ]7

41. Do you think that the right species of tree been planted?

Yes	[ ]1	No	[ ]2

42. If no to Q. 41, then what species should have been planted?

Fruit species	[ ]1	Timber species	[ ]2
MPTS	[ ]3	Others	[ ]4

43. Why did you get involved in the SFP?

44. What were you doing before joining the project?

45. Is there any economic/social change since you have joined the project?

46. Have any of your non-participating neighbours changed their landuse practice since you have joined the SFP?

47. What sort of monthly income did you have before joining the SFP?

48. Are you willing to participate in SFP in the future?

Yes	[ ]1	No	[ ]2

49. If Yes to Q. 48, can you please give some reasons?

50. If No to Q. 48, can you please give some reasons?

Annexure 12.1 Market prices of major inputs and outputs involved in the agroforestry and woodlot schemes.

Year	Project year	Input Prices		Output Values													
		Labour	Chemical fertiliser	Prices of agricultural products (Tk/Kg)									Prices of forestry products (Tk/Kg)				
		(Tk/MD)	(Tk/Kg)	Paddy	Wheat	Potato	Maize	Black gram	Sesamum	Banana	Pineapple	Mixed vegetable	Leaf litter	Grasses	Twigs	Fuelwood (Tk/m^3)	Timber (Tk/m^3)
1991-92	1	30.00	6.50	6.00	4.20	3.70	7.00	10.00	14.00	1.50	3.00	4.00	0.40	0.30	0.50	180.00	900.00
1992-93	2	30.00	6.50	6.00	4.50	4.70	8.00	12.00	14.00	1.50	3.00	4.00	0.40	0.40	0.60	190.00	940.00
1993-94	3	30.00	6.50	6.50	4.50	4.80	8.00	12.00	15.00	2.00	3.50	5.00	0.50	0.50	0.60	220.00	1200.00
1994-95	4	35.00	7.00	7.00	5.00	4.40	8.50	15.00	16.00	2.25	3.50	5.00	0.50	0.60	0.70	250.00	1500.00
1995-96	5	35.00	7.00	7.00	5.00	4.70	9.00	16.00	16.50	2.50	4.50	7.00	0.75	0.60	0.80	260.00	2200.00
1996-97	6	40.00	8.50	8.00	5.00	5.00	9.00	18.00	17.00	3.00	6.00	8.00	0.80	0.80	1.20	300.00	3000.00
1997-98	7	50.00	8.50	8.50	6.00	5.20	10.00	20.00	20.00	3.00	8.00	8.00	1.00	0.80	1.50	350.00	3500.00
1998-99	8	50.00	9.00	9.30	6.25	5.50	10.50	22.00	20.00	3.50	10.00	9.00	1.00	0.80	1.50	450.00	4200.00

Annexure 12.2 Annual financial costs for various components of the agroforestry scheme starting in the year 1991-92.

(figures in Tk./ha at 1991-92 prices)

Project Year	Direct Cost							Total Direct Cost	Indirect Cost									Total Indirect Cost	Total Cost (Direct + Indirect)
									Establishment				Total Establishment	Overhead			Total Overhead		
	Labour	Seed	Polybag	Organic fertiliser	Chemical fertiliser	Insecticide	Tools & impls.		Salary & allowance	Office expenses	Vehicle	Building		Training	Publicity	Protection			
1	7626.24	161.00	1153.11	2230.40	1238.24	34.55	2208.48	14652.02	2660.08	760.75	400.96	320.89	4142.68	0.00	25.52	0.00	25.52	4168.20	18820.22
2	1351.85	0.00	0.00	0.00	444.44	0.00	0.00	1796.29	886.68	253.58	0.00	0.00	1140.26	312.72	0.00	741.00	1053.72	2193.98	3990.27
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	443.34	126.80	0.00	0.00	570.14	312.72	0.00	370.50	683.22	1253.36	1253.36
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	1795.62	0.00	0.00	0.00	0.00	0.00	95.16	1890.78	443.34	126.80	0.00	0.00	570.14	0.00	0.00	0.00	0.00	570.14	2460.92
Total -per ha	**10773.71**	**161.00**	**1153.11**	**2230.40**	**1682.68**	**34.55**	**2303.64**	**18339.09**	**4433.44**	**1267.93**	**400.96**	**320.89**	**6423.22**	**625.44**	**25.52**	**1111.50**	**1762.46**	**8185.68**	**26524.77**

Source: Official records of Bangladesh Forest Department (BFD 1992), TANDP Project Proforma-Revised (GPRB 1994) and Alam (1999).

Annexure 12.3 Annual financial costs for various components of the woodlot scheme starting in the year 1991-92.

(figures in Tk./ha at 1991-92 prices)

Project Year	Direct Cost							Total Direct Cost	Indirect Cost									Total Indirect Cost	Total Cost (Direct + Indirect)
									Establishment				Total	Overhead			Total		
	Labour	Seed	Polybag	Organic fertiliser	Chemical fertiliser	Insecticide	Tools & impls.		Salary & allowance	Office expenses	Vehicle	Building	Establishment	Training	Publicity	Protection	Overhead		
1	9843.44	173.17	1401.99	2746.13	1367.80	26.72	3163.64	18722.89	2846.83	814.16	429.12	343.42	4433.53	0.00	27.32	0.00	27.32	4460.85	23183.74
2	2240.00	0.00	0.00	85.00	270.00	6.34	0.00	2601.34	948.94	271.38	0.00	0.00	1220.32	334.68	0.00	741.00	1075.68	2296.00	4897.34
3	1792.00	0.00	0.00	0.00	216.00	0.00	0.00	2008.00	474.47	135.70	0.00	0.00	610.17	334.68	0.00	370.50	705.18	1315.35	3323.35
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	2693.43	0.00	0.00	0.00	0.00	0.00	134.67	2828.10	474.47	135.70	0.00	0.00	610.17	0.00	0.00	0.00	0.00	610.17	3438.27
Total -per ha	**16568.87**	**173.17**	**1401.99**	**2831.13**	**1853.80**	**33.06**	**3298.31**	**26160.33**	**4744.71**	**1356.94**	**429.12**	**343.42**	**6874.19**	**669.36**	**27.32**	**1111.50**	**1808.18**	**8682.37**	**34842.70**

Source: Official records of Bangladesh Forest Department (BFD 1992), TANDP Project Proforma-Revised (GPRB 1994) and Alam (1999).

Annexure 12.4 Yearwise approximate average yield of intermediate forestry products from agroforestry and woodlot plots.

Year	Project Year	Intermediate products (quintals/ha)					
		Leaf litter		Grasses		**Twigs and branches**	
		AF	WL	AF	WL	AF	WL
1991-92	1	0.00	0.00	10.00	4.00	0.00	0.00
1992-93	2	0.00	0.00	13.50	5.50	0.00	0.00
1993-94	3	0.00	0.00	6.50	2.50	0.00	0.00
1994-95	4	72.00	140.00	0.00	0.00	0.00	0.00
1995-96	5	108.00	200.00	0.00	0.00	32.00	60.00
1996-97	6	170.00	350.00	0.00	0.00	62.50	110.00
1997-98	7	195.00	420.00	0.00	0.00	93.00	150.00
1998-99	8	215.00	450.00	0.00	0.00	99.50	180.00
Total		**760.00**	**1560.00**	**30.00**	**12.00**	**287.00**	**500.00**

Annexure 12.5 Annual financial returns from various components of the agroforestry scheme for all agro-ecological zones (Tk/ha)

Year	Project Year	Annual returns from various components						Total Return (agriculture + forestry)
		Agricultural crops	Forestry Crops				Total forestry return	
			Intermediate products	Final products				
				Fuelwood	Pole	Timber		
1991-92	1	11174	300	0	0	0	300	11474
1992-93	2	8484	540	0	0	0	540	9024
1993-94	3	5516	325	0	0	0	325	5841
1994-95	4	3533	3600	0	0	0	3600	7133
1995-96	5	0	10660	0	0	0	10660	10660
1996-97	6	0	21100	0	0	0	21100	21100
1997-98	7	0	33450	0	0	0	33450	33450
1998-99	8	0	36425	10521	112700	20706	180352	180352
Total	**(per ha)**	**28707**	**106400**	**10521**	**112700**	**20706**	**250327**	**279034**

Annexure 12.6 Annual financial returns from various components of the agroforestry scheme by different agro-ecological zones (Tk/ha)

Year	Project Year	Annual returns from various components						Total Return (agriculture + forestry)
		Agricultural crops	Forestry Crops				Total forestry return	
			Intermediate products	Final products				
				Fuelwood	Pole	Timber		
OHPP								
1991-92	1	11886	360	0	0	0	360	12246
1992-93	2	9120	480	0	0	0	480	9600
1993-94	3	5786	410	0	0	0	410	6196
1994-95	4	3246	2300	0	0	0	2300	5546
1995-96	5	0	9560	0	0	0	9560	9560
1996-97	6	0	18210	0	0	0	18210	18210
1997-98	7	0	32200	0	0	0	32200	32200
1998-99	8	0	35800	7405	79956	14230	137391	137391
Total	**(per ha)**	**30038**	**99320**	**7405**	**79956**	**14230**	**200911**	**230949**
NEBT								
1991-92	1	13282	450	0	0	0	450	13732
1992-93	2	10144	520	0	0	0	520	10664
1993-94	3	6169	670	0	0	0	670	6839
1994-95	4	3846	3840	0	0	0	3840	7686
1995-96	5	0	10500	0	0	0	10500	10500
1996-97	6	0	19200	0	0	0	19200	19200
1997-98	7	0	32400	0	0	0	32400	32400
1998-99	8	0	36700	11230	121258	21580	190769	190769
Total	**(per ha)**	**33440**	**104280**	**11230**	**121258**	**21580**	**258349**	**291789**
TMF								
1991-92	1	11408	400	0	0	0	400	11808
1992-93	2	8884	620	0	0	0	620	9504
1993-94	3	5816	860	0	0	0	860	6676
1994-95	4	3377	3180	0	0	0	3180	6557
1995-96	5	0	12720	0	0	0	12720	12720
1996-97	6	0	20330	0	0	0	20330	20330
1997-98	7	0	34110	0	0	0	34110	34110
1998-99	8	0	36530	11344	122484	21798	192156	192156
Total	**(per ha)**	**29485**	**108750**	**11344**	**122484**	**21798**	**264376**	**293861**
LBT								
1991-92	1	7530	500	0	0	0	500	8030
1992-93	2	6340	620	0	0	0	620	6960
1993-94	3	3776	440	0	0	0	440	4216
1994-95	4	2201	2900	0	0	0	2900	5101
1995-96	5	0	10200	0	0	0	10200	10200
1996-97	6	0	24200	0	0	0	24200	24200
1997-98	7	0	33800	0	0	0	33800	33800
1998-99	8	0	39310	11244	121402	21605	193560	193560
Total	**(per ha)**	**19847**	**111970**	**11244**	**121402**	**21605**	**266220**	**286067**
HBT								
1991-92	1	10958	280	0	0	0	280	11238
1992-93	2	9572	560	0	0	0	560	10132
1993-94	3	7166	740	0	0	0	740	7906
1994-95	4	3027	4250	0	0	0	4250	7277
1995-96	5	0	11900	0	0	0	11900	11900
1996-97	6	0	21660	0	0	0	21660	21660
1997-98	7	0	32340	0	0	0	32340	32340
1998-99	8	0	35950	11233	121283	21584	190050	190050
Total	**(per ha)**	**30723**	**107680**	**11233**	**121283**	**21584**	**261780**	**292503**
Mean		**28707**	**106400**	**10491**	**113277**	**20159**	**250327**	**279034**

Note: Totals are zonal totals while means are the averages of five zonal totals.

Annexure 12.7 Annual financial *returns from various components of the woodlot* scheme for all agro-ecological zones (Tk/ha)

Year	Project Year	Annual returns from various components				
		Returns				Total Return (Intermediate + final products)
		Intermediate products	Final products			
			Fuelwood	Pole	Timber	
1991-92	1	120	0	0	0	120
1992-93	2	220	0	0	0	220
1993-94	3	125	0	0	0	125
1994-95	4	7000	0	0	0	7000
1995-96	5	19800	0	0	0	19800
1996-97	6	41200	0	0	0	41200
1997-98	7	64500	0	0	0	64500
1998-99	8	72000	13702.5	147448	27090	260240.5
Total	**(per ha)**	**204965**	**13702.5**	**147448**	**27090**	**393205.5**

Annexure 12.8 Annual financial returns from various components of the woodlot scheme by different agro-ecological zones (Tk/ha)

Year	Project Year	Annual returns from various components				
		Returns				Total Return (Intermediate + final products)
		Intermediate products	Final products			
			Fuelwood	Pole	Timber	
OHPP						
1991-92	1	90	0	0	0	90
1992-93	2	170	0	0	0	170
1993-94	3	140	0	0	0	140
1994-95	4	6580	0	0	0	6580
1995-96	5	15490	0	0	0	15490
1996-97	6	32240	0	0	0	32240
1997-98	7	50480	0	0	0	50480
1998-99	8	60350	11633	125607	22354	219944
Total	**(per ha)**	**165540**	**11633**	**125607**	**22354**	**325134**
NEBT						
1991-92	1	110	0	0	0	110
1992-93	2	210	0	0	0	210
1993-94	3	140	0	0	0	140
1994-95	4	7540	0	0	0	7540
1995-96	5	18510	0	0	0	18510
1996-97	6	39510	0	0	0	39510
1997-98	7	60290	0	0	0	60290
1998-99	8	67300	12688	136996	24381	241365
Total	**(per ha)**	**193610**	**12688**	**136996**	**24381**	**367675**
TMF						
1991-92	1	120	0	0	0	120
1992-93	2	220	0	0	0	220
1993-94	3	130	0	0	0	130
1994-95	4	6850	0	0	0	6850
1995-96	5	20370	0	0	0	20370
1996-97	6	40300	0	0	0	40300
1997-98	7	64110	0	0	0	64110
1998-99	8	70440	14435	155861	27738	268474
Total	**(per ha)**	**202540**	**14435**	**155861**	**27738**	**400574**
LBT						
1991-92	1	150	0	0	0	150
1992-93	2	240	0	0	0	240
1993-94	3	260	0	0	0	260
1994-95	4	8760	0	0	0	8760
1995-96	5	22950	0	0	0	22950
1996-97	6	45690	0	0	0	45690
1997-98	7	71510	0	0	0	71510
1998-99	8	79830	14138	152656	27168	273792
Total	**(per ha)**	**229390**	**14138**	**152656**	**27168**	**423352**
HBT						
1991-92	1	140	0	0	0	140
1992-93	2	250	0	0	0	250
1993-94	3	170	0	0	0	170
1994-95	4	7920	0	0	0	7920
1995-96	5	23380	0	0	0	23380
1996-97	6	47570	0	0	0	47570
1997-98	7	72915	0	0	0	72915
1998-99	8	81400	15712	169645	30191	296947
Total	**(per ha)**	**233745**	**15712**	**169645**	**30191**	**449292**
Mean		**204965**	**13721**	**148153**	**26366**	**393205.5**

Note: Totals are zonal totals while means are the averages of the five zonal totals.

Annexure 12.9 Sensivity Analysis of the agroforestry scheme at different discount rates and under varying cost and benefit situation.

AEZs	AGROFORESTRY														
	Discount Rates									Costs increased by 10%			Benefits decreased by 10%		
	0%		5%		10%		20%								
	NPV	BCR	NPV	BCR	**NPV**	**BCR**	NPV	BCR	**IRRs**	NPV	BCR	IRR	NPV	BCR	IRR
OHPP	175,468	3.47	118,914	2.80	**80,598**	**2.30**	35,681	1.65	**41%**	74,420	2.10	36%	66,360	2.07	36%
NEBT	240,969	4.54	166,636	3.63	**116,274**	**2.96**	57,137	2.08	**54%**	110,348	2.69	48%	98,720	2.67	47%
TMF	256,189	5.72	179,375	4.54	**127,131**	**3.67**	65,383	2.53	**63%**	122,375	3.34	56%	109,661	3.31	55%
LBT	251,587	6.21	174,447	4.87	**122,070**	**3.87**	60,358	2.57	**54%**	117,822	3.52	49%	105,615	3.49	49%
HBT	250,638	5.26	174,850	4.19	**123,314**	**3.40**	62,430	2.35	**59%**	118,171	3.09	52%	105,839	3.06	51%
All	237,835	5.16	165,398	4.10	**116,176**	**3.32**	58,110	2.29	**57%**	111,171	3.02	50%	99,553	2.99	50%

Annexure 12.10 Sensivity analysis of the woodlot scheme at different discount rates and under varying cost and benefit situation.

AEZs	WOODLOT														
	Discount Rates									Costs increased by 10%			Benefits decreased by 10%		
	0%		5%		10%		20%								
	NPV	BCR	NPV	BCR	NPV	BCR	NPV	BCR	IRRs	NPV	BCR	IRR	NPV	BCR	IRR
OHPP	291,350	7.48	198,685	5.70	**135,711**	**4.39**	61,515	2.68	**43%**	131,706	3.99	40%	118,135	3.95	40%
NEBT	336,131	8.47	231,256	6.47	**159,825**	**4.99**	75,370	3.06	**47%**	155,819	4.54	44%	139,837	4.49	44%
TMF	369,524	9.21	254,733	7.03	**176,617**	**5.41**	84,363	3.30	**48%**	172,611	4.92	46%	154,950	4.87	46%
LBT	394,285	9.76	273,323	7.47	**190,813**	**5.76**	93,024	3.54	**51%**	186,808	5.24	48%	167,727	5.19	48%
HBT	420,436	10.35	291,544	7.90	**203,716**	**6.09**	99,772	3.72	**52%**	199,711	5.53	49%	179,339	5.48	49%
All	362,249	9.05	249,730	6.91	**173,117**	**5.32**	82,571	3.25	**48%**	169,111	4.84	46%	151,800	4.79	45%