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Analysis of resource base and exogenous factors relevant to sustainable development in a dry land-heel ecosystem in Puthia, Rajshahi.

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University of Rajshahi

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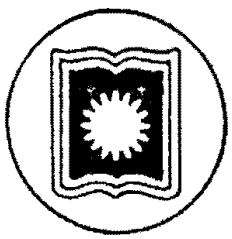

A Thesis Submitted to the University of Rajshahi for the Degree of Master of Philosophy in Botany

By

Md. Abdul Latif Sarker

Registration No. 2549

Session: 2007-2008

Genetics, Plant Breeding and Biodiversity Lab.
Department of Botany
Rajshahi University
Rajshahi-6205, Bangladesh

February, 2010

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Dedicated

to

My parents

DECLARATION

I hereby declare that the whole work submitted as a thesis entitled **"Analysis of resource base and exogenous factors relevant to sustainable development in a dry land-beel ecosystem in Puthia, Rajshahi."** in the Department of Botany, Rajshahi University, Rajshahi, for the degree of **Master of Philosophy** is the result of my won investigation and was carried out under the supervision of Dr. M. Iqbal Zuberi, Professor, Department of Botany, Rjashahi University, Rajshahi. The thesis has not already been submitted in the substance for any degree and has not been concurrently submitted in the candidature for any other degree.

February, 2010 **(Md. Abdul Latif Sarker)**

CERTIFICATE

It is my pleasure to certify the thesis entitled **"Analysis of resource base and exogenous factors relevant to sustainable development in a dry land-beel ecosystem in Puthia, Rajshahi."** By Md. Abdul Latif Sarker. Department of Botany, Rajshahi University, Rajshahi, Bangladesh for the degree of **Master of Philosophy**.

I hereby certify that (i) the candidate has fulfilled the residential requirements, (ii) the works embodied in the thesis were carried out by the candidate and (iii) the data, to the best of my knowledge are genuine and original. No part of the work has been submitted in the substance for any other degree.

(Dr. M. Iqbal Zuberi)
Professor and supervisor
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The Author
February 2010

ABSTRACT

The main factors of the natural resource system of the study area have been identified and the trends of natural resource utilization of the inhabitants and impacts over 1970-2007 have been presented. The complicated process of identification and measurement has been explained.

The findings clearly indicate an intense pressure on the natural resource base due to over-exploitation and lack of conservation; the various components are now failing to regenerate. The sad aspect is, even after intense use, the need of the local community remained unsatisfied-thus the over-exploitation continued to intense. Also, the degree of frustration of the under-satisfied resource users leads to decreased care of the resource base thus increases the degradation and instability. This situation was found to exist and gradually intensify over the period of 1970-2007 and the ecosystem has been under continuous stress through the entire period. The symptoms of breakdown of sustainable production capabilities became evident during the study.

Impact of external factors such as global climate change, inflow of new technologies, and pressure of the external markets added to the environmental degradation of the resource base.

The documentation of the components of natural resource base and identification of the trends is expected to enable comparing the state of these at any future time and thus will enable to take proper remediation steps for sustainable management. These remediation steps can help in climate change adaptations, sustainability attaining, ecological restoration, biodiversity conservation, planning for renewable energy resource and for developing innovative approaches for solving complex environmental problems.

The main remediation step would be to repair and rehabilitate the natural resource system and to increase the capacity of the agricultural production system of the study area. The first step to do this, an integrated approach should be adopted to use and manage the components of the resource base. A system approach be adopted where the interrelationship among the components should be considered to achieve a sustainable utilization system.

For this, monoculture should be replaced by integrated and organic agriculture; the resource utilization should be diversified; to attain sustainability as well as enhanced productivity.

Emphasis on crop-based system should be reduced and non-crop, natural resource based production system be expanded, open water fishery, animal production, fruit and vegetable sector can shift pressure from the sick resource base.

Another important step is to restore and conserve the habitats of wild plants and animals to bring back the ecosystem health so that sustainable supply of ecosystem goods and services can resume. Most important here is the restoration of the local stock of biodiversity. The local community should be involved here.

Biodiversity conservation is rarely viewed as a local priority, rather often remains dependent on centralized concept and donor support. Even local people are considered as problem in conservation. This study indicated that conservation should not be limited to large protected areas like the Sundarbans and confined solely to professional conservationists. It is possible to maintain considerable biodiversity in areas used for other purposes, like a village ecosystem. This can be possible by gaining the cooperation and participation of the local people, farmers and land managers. This study integrated survey inventory with information on how people view and value their natural environment which helps in conservation also addressing needs of the local people. One key constraints of the study area is the supply of energy resources.

Energy is the life of modern civilization. The people of the study area also need energy for their survival. Though most of the global primary energy use (87%) is from fossil fuel eg. (natural gas, oil and coal) these are not available to the people of the study area except diesel for irrigation pumps and kerosene for domestic use for light. Most of the energy used by the villagers is for cooking, parboiling rice and other foods processing. Regeneration of sources of biomass fuel is to be supplemented with provision of coal, natural gas or electricity for the local community. The energy resource can be put under control and management of local community. Community based management has been recognized as an appropriate approach to conserve natural resources. It is considered that local communities have higher stakes, better knowledge and increased interest in the resource base.

Though implemenntation of community based management has problems to overcome, these are recent examples of success in attaining sustainable management of natural resources.

Chapter 1

Introduction

Many human - driven changes of our environment including global warming are raising concern about the future of Earth's environment and its role as our life support system. The environmental and social challenges that face the world as a whole, are very complex and diversified. The diversity of ecosystems, people and use of natural resources makes it impossible to reach clear conclusions about the threats posed by impacts of natural resource use and the exogenous factors relevant to sustainable development. These factors are diverse and the composite impact of these is threatening the ecosystems and the life support system.

1.1 Flood plain resource base of Bangladesh

Bangladesh trying hard to improve its socio-economic condition has to depend on a sustainable utilization and management of its natural resource base. To a large extent, this depends on how Bangladesh promotes local development in its floodplains to reduce poverty and hunger (WB, 2006). This study attempts to contribute to the understanding of the complex interrelationships between natural and socio-economic factors in the flood plain areas. The extensive flooding during the rainy season and following dry period provide a diverse and complex system on which the natural resource base depends for its role in the livelihood of its rural people.

A systems approach has been adopted to carry out a comprehensive analysis of the natural resource base to identify the exogenous and local factors in a flood prone and a comparatively flood free ecosystem to carry out the analysis. An extensive rural appraisal survey of the selected villages and adjacent crop land areas was made over a period of two years.

1.2 Resource base and sustainable development

The natural resource base is the important base of sustainable development. The interpretation of sustainable development (SD) was often given in terms of WCED (1987). The WCED defined sustainable development as: development that "meets the needs of the present without compromising the ability of future generations to meet their own needs"

(WCED 1987, P 43). The theoretical and analytical frame work associated with SD is complex but SD can be elaborated in the equation (Markandya, 2001).

$$SD = \int (R, Ex, En, Po, PE)$$

Where,

SD = Sustainable development,

R = Resource base,

Ex = Exogenous factors,

En = Endogenous factors,

Po = Population factor,

PE = Political Economic factors.

Any Sustainable development strategy should examine all of the above variables. Which is a formidable task indeed. However, the first two, the resource base (both biophysical and socio-economic) and the exogenous factors (external influences on resource management, technologies and development ideologies) are very important and must be understood for SD.

1.3 The resource base utilization

The floodplains of Bangladesh have been considered as a valuable resource base for economic development. The country's 80% land area and the entire study area are under this floodplain ecosystem, considered as one of the most productive ecosystems in the world (Brammer 1990). The natural resources include rich biodiversity, fertile land and aquatic wealth like richest inland fisheries on earth.

At the same time, the regularly changing character of this flood plain, seasonal shifts of flood and drought, sedimentation and erosion, climatic instability and land degradation, create serious challenges for agricultural production and life support system.

Of special significance are the technological changes in the following system, introduction of a number of exogenous factors changing flooding regimes and cropping environment (Lopez, 1992). The present thesis is primarily an investigation into the resource base and the exogenous factors in the dry land (Danga) and wet land (Beel) ecosystem, which already have contributed to the economic development. It is intended the study will provide insight in the planning for sustainable development of the village ecosystem in future.

Though the new technologies had an immediate positive effect on crop production, a very high population growth and uneven socio-economic stratification, quickly slowed down the progress. All these generated an immerse pressure on the natural resource base, the main problem posed by the large and increasing population and continued poverty and under-development. Introduction and adaptation of new technologies and the influence of market also have impact on natural resource base and environment (Janvry and Garcia, 1998).

Thus, any appraisal of a natural resource base of a particular area and in a particular society must consider the socio-cultural and technological-economic factors as constraints and possibilities. The natural resource utilization system is a complex one, as developed and modified by various factors as given in Figure1.1.

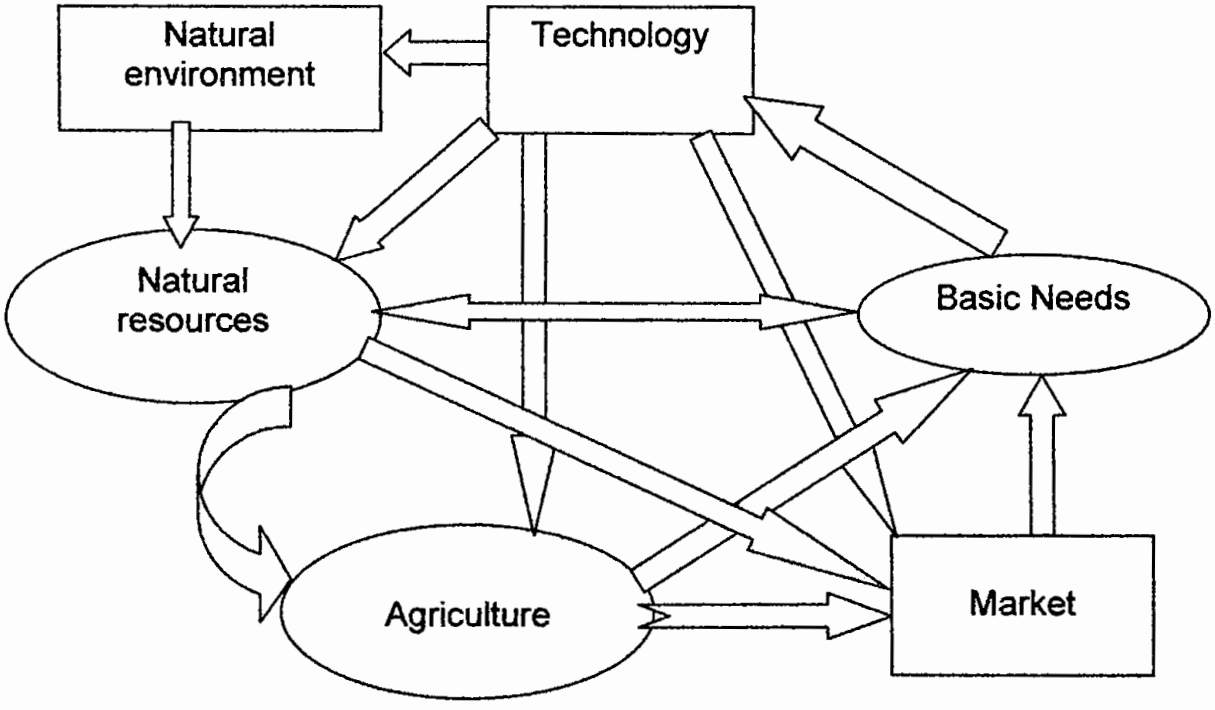

Fig. 1.1 Natural resources utilization system of a region: system concept

Thus here, need is the driving force for resource utilization, the natural resource base is the source, from where goods and energy demand are satisfied.

The proposed study intends to consider the changes in the production system over the past three decade (1970-2007) by the development interventions and resource utilization activities in the natural resource base. This is will enable the determination of impacts and consequences, and the future planning for sustainable development.

1.4 Study objectives

The overall objective of this research has been to identify the impacts of natural resource utilization and economic development in Puthia Upazila of Rajshahi District, a flood plain of Bangladesh. The aim is to contribute to the typical understanding of the factors, both exogenous and local, that impact on the resource base, resulting in constraints for sustainable development.

The following are the main objectives of the study of the natural resource base, its utilization and impacts.

a. Identification of the factors of the natural resource base in the study area
b. Identify and measure the changes of the individual factors over the period 1970-2007
c. Determination of the local and exogenous factors
d. Analysis of the trend of local resource base over the period 1970-2007.
e. Identify the major elements of constraints in the resource base to sustainable development
f. To assess future development potential and suggest the best possible remedy.

1.5 The study area

Fig. 1.2 shows the map of Bangladesh and the location of Puthia Upazila in Northern Bangladesh. Fig.1.3 shows the map of Puthia Upazila and the location of the study area. The Upazila has area about 192.64 square km. and is bounded by the river Baranoi and beel of the Moropara, Khamar beel, Zader beel, Kumor gara, Gudabara beel, Jashopara beel, Baluchar,Gara beel, Pampara beel and Udanpara beel (Fig. 1.4).

Fig. 1.2 Map of Bangladesh Including Puthia Upozilla, (Indicate by green colour)

Fig. 1.3 Map of Puthia Upozilla,(Including study area)

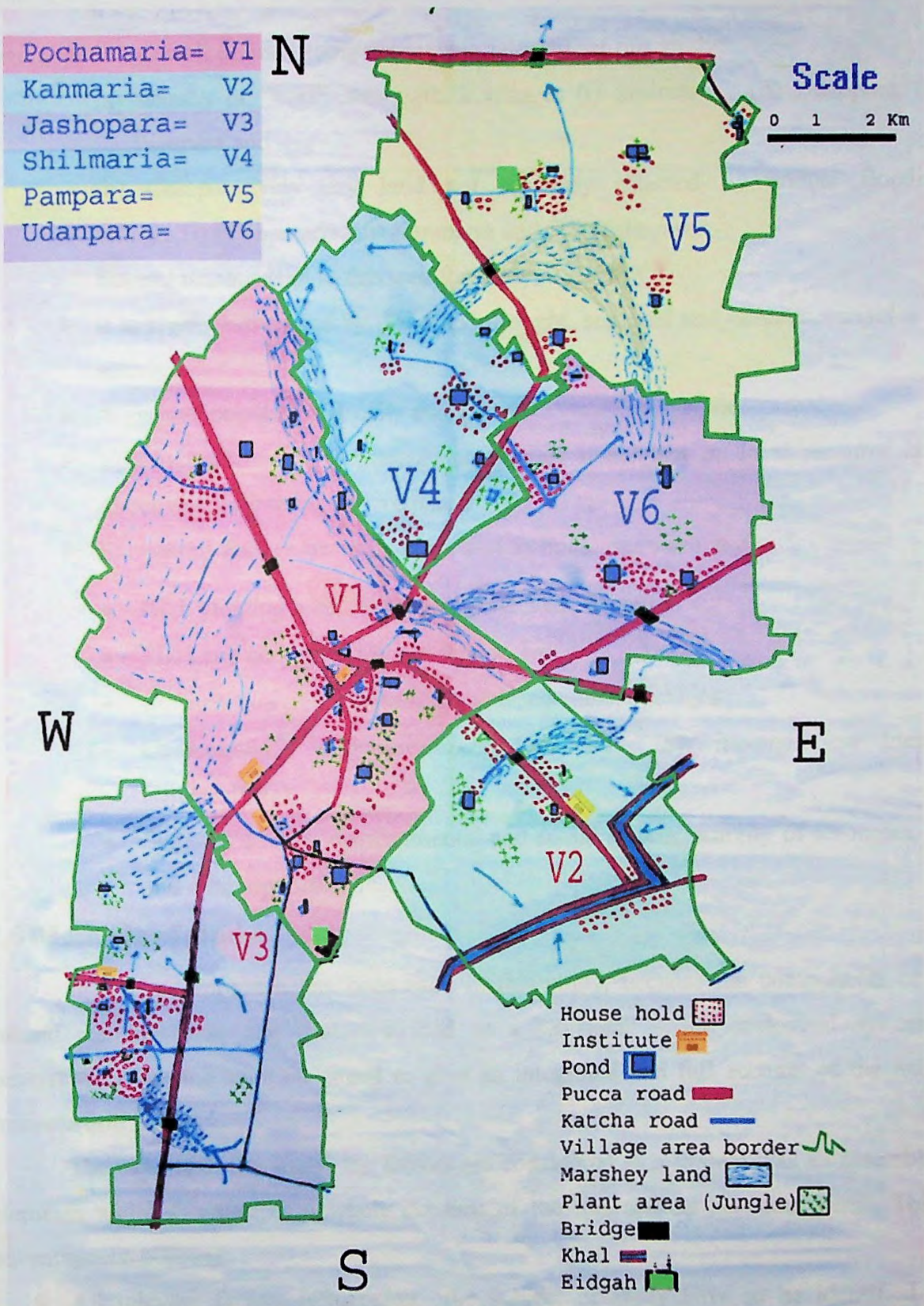

Fig. 1.4 Map of the study area

Two more or less well defined ecosystems were selected for this study:

(a) Marshy or "beel" area with 3 villages (i) Shilmaria , (ii) Udanpara, (iii) Pampara and

(b) Comparatively dry land not regularly affected by annual flooding, villages (i) Pochamaria, (ii) Kanmaria and (iii) Jashopara.

Several reasons lead to this area for study:

- It is highly influenced by flood and drought, seasonal and climatic variables are active
- With high population density and growth
- Non-industrialized , the people completely dependent on local resource base, directly or indirectly, for livelihood
- Exogenous factors such as adoption of technologies were high
  - High yielding seed , fertilizer , pesticides, irrigation
  - Road and communication development
  - Construction of embankment and flood control devices
  - Comparatively underdeveloped, low GDP, low income, low literacy (UNDP,1998)
  - Signs of adverse environmental and social effects, scarcity of resources, job and other opportunities.

1.6 Methods of study

A systems approach has been used in this study, because the components of the natural resource base can best described as a "System" – the ecological system or ecosystem. Also, the analysis aimed to give an integrated and full account of the natural resource utilization.

The objects of the study, the factors are considered as a system- "as an assembly of elements which function as a whole because of the interactions between them". This is advantageous because:

- All relevant factors influencing the subject or study have to be identified and accounted for
- The holistic approach enables to see the complete picture including the interdependencies and relations.

The study area including the two different types: the marshy (Beel) and the high land (Danga) have been further divided into several sub-areas or villages as they were maintained there along with crop fields, ponds etc. associated with each village.

The elements or factors of the natural resource base system were

(a) identified and structured, then

(b) the state and behavior of the elements or factors were described and measured , the changes over the period 1970 to 2007 were traced and noted and

(c) the changes were interpreted and related to other elements e.g., the system as a whole.

The rural appraisal survey were made, the results of survey were checked by triangulation of other data from other sources e.g., secondary data, memory recall data and national/ regional data. The impacts of resource use and exogenous factors can only be assessed through a holistic approach. This will enable one to determine the interrelations among ecological, economic and socio-cultural factors affecting sustainable development (Chambers and Conway, 1991, DFID, 2001). Thus, the analysis of the livelihood pattern for detecting changes has the following focus:

- Changes in the house hold income / production
- Changes in the house holds ability to continued livelihood activities
- Changes in the resource base.

Here, the number of variables involved in such a analysis and the complexity of their interrelationships make it extremely difficult to document all of these changes and impacts. Conventional evaluation method often used is the time-series (before / after) analysis.

1.7 The general structure of this thesis

This thesis is planned according to the steps of the system approach and the objectives of the research:

Chapter 2 Background of the research, theoretical approach and methodology.

Chapter 3 Results of the system identification.

Chapter 4 Results of the system measurements.

Chapter 5 Resource base changes, implications and impacts.

Chapter 6 Prospect in terms of sustainable development.

To elaborate the contents of the chapters, the Chapter 2 will provide background information on the theme of the research. Emphasis will be on the factor of the resource base in terms of utilization and exogenous influences. Chapter 3 will thoroughly describe the study area and the different elements or factors of the resource system emphasizing resource utilization values. Chapter 4 will provide detailed account of the changes in the elements of the resource system over the period 1970-2007. These changes will be the basis of system analysis in Chapter 5, which will describe the trends of natural resource utilization in the period of 1970-2007. Chapter 6 will describe the prospects associated.

Agricultural household modeling in the Bangladesh farming system characterized by the fact that small-scale farmers produce mainly for the household consumption (food and other needs) and only partly for sale. So, they plan and manage accordingly. So, the analysis of farmer's perceptions on the consumption and production attributes of the agricultural production system is relevant. Also, important is an evaluation of household responses to changes in commodity and input prices (market), the suitability of the production environment and access to off farm income opportunities

Thus, results from farm household modeling item, can be used for assessment of the change in the production system and resource base in terms of economic impact. The environmental effects of the factors also include impacts on ecosystem components like soil, water, biodiversity etc. The impacts of resource use and exogenous factors have to be assessed following science-based methods and conducted in a case to case basis, taking into account the specific conditions of the relevant agro-ecosystem. Most of these impacts are expressed directly or indirectly into economic impact.

Analysis of these requires long term, detailed studies with the resource system for sustainable development. Emphasis will be given on exogenous factors such as influence generated from outside the system in the form of technology introduction, environmental influence form outside like floods and climate change or outside market forces like globalization and free market.

1.8 Other similar study

Very few study like this has been found. One such research is the Land -Water Interface program (LWI) of the UK DFID, coordinated by the Universities of New Castle, Durhan and Sterling of UK. In the Natural Resources System Research of DFID, University

of Rajshahi and Bangladesh Agricultural University, Mymensingh took part. The research was focused on identification of constraints to development in floodplain villages using rural appraisal methodologies (Zuberi, 1996; Samina et al. 1996; Alam, 1996 and Naseem, 1996).

Another more relevant study is the Stave's (2005) study "Flood plain Resources Development in Bangladesh" a detailed analysis of the Beel in the Atrai Basin (Beel Hilna) for the University of Oslo.

Chapter 2

Background, theoretical approach and methodology

2.1 The Ganges flood plain

The Ganges floodplain is the major part of the Bengal Delta where Bangladesh is geographically located. The land has been formed by the huge sedimentation during annual flooding (Khan 1990). The climate of the flood plain is dominated by the monsoon wind system resulting in three major climatic seasons:

(i) The dry season (November – March) with little rain fall

(ii) The Pre-monsoon season (March - May) with high temperature

(iii) The rainy season (May – October) with rain and flood.

2.2 Socio-economic situation

Bangladesh is one of the most densely populated country's in the world; more than 900 people per square km. Around 50% of the population live below absolute poverty line (FAO, 1997). Despite the economic and social progress over the last 30 years, Bangladesh still remains one of the poorest countries in the world. Agriculture still is the largest economic sector, at present it is around 35% of the GDP.

2.3 The resource base of the study area

The resource base of the floodplains can be categorized following Dugan (1990):

(i) Forest resources,

(ii) Agricultural resources,

(iii) Wildlife resources,

(iv) Forage resources,

(v) Fisheries resources and

(vi) Water resources,

Directly or indirectly the local people depended on these resources for their livelihood.

The village and crop fields are converted Savanna forests. There is no national forest in the study area. Trees and vegetation are situated in household area, beside fields, road sides, pond banks and fallow land area. The villagers used to collect wood, fuel, timber, fruits, building materials from these trees and vegetation. During last few decades, these resources become very scarce.

Agricultural resource is the major products the village people. They obtain food, fuel, oil, spices, vegetables, pulses etc. from their crop fields, agriculture being the major livelihood activity of the people of the study area.

In the village ecosystems, wild resources were the main resource base to the villagers in the past. It includes a diverse and rich fish in the water bodies, the wild animals and wild birds (dear, wild boar, fishcats, snakes, lizards, fox etc.) which declined substantially over the last decades. Wildlife is the integral part of ecosystem. During last 3-4 decades, people have cleared forests, drained swamps and dammed rivers for cultivation crops and establishment of settlements. These activities have seriously harmed or destroyed large areas of wildlife habitats (Meijaard, 1999).

Fish and aquatic resources were the most important wild harvest utilized by the people of the region. The open –water fisheries in the beels and rivers have declined seriously over the last three decades.

The grazing land and pasture have been extremely reduced due to extension of crop land and destruction of aquatic habitats. Supply of fodder from natural sources seriously affected the cattle head and domestic animals.

Irrigation water, organic manure, food items, biomass fuel and reeds/sedges also constitute important components in the livelihood of the local people.

2.4 Theoretical approach of the study

The concept of sustainable development emerging from the report of World Commission on Environment and Development (WCED). Here it was felt necessary to provide focus on the relationships between human beings and his natural environment. The analysis of impacts of man's utilization of natural resources in well defined ecosystem can help to understand how sustainable development can be attained.

The concept of sustainable development, when applied to the floodplain resource base utilization, can be stated as, "Fulfillment of local needs satisfaction in the floodplain area based on utilization of the natural resources base without diminishing, the resource base's ability to satisfy the future needs".

The "needs", their magnitude and diversity, characterize the natural resource utilization, very complex. Thus, it becomes difficult to analyze in a predefined way. What can be done is to determine the change over time and find out the impact resulting in constraints to development. These constraints can be broken up into measurable aspects,

productivity, stability, sustainability and equitability following Conway, 1990; Conway and Barbier, 1990. These aspects of change in the natural resource base can be measured in terms of money or output or in terms of satisfying needs (Conway, 1990).

2.5 The approach of analysis

So the natural resource base has been viewed as a system in this study, the analysis of the natural resource base was done as a resource utilization system which includes:

-identification of the system, the factors or components their boundaries and relationships;

-measurement of the state of factors and changes used as indicators, both local and exogenous;

-analysis of the relationships among the factors and in respect to the system as a whole.

2.5.1 Identification of the system: factors

It is difficult to identify all the factors, their boundaries and potential relationships of the natural resource base of local system like that of the floodplain of the study area. So, only some of core factors of the system the natural resource base have been included in the studies which are relevant to satisfaction of the human needs of the local community.

2.5.2 Measurement of the system

To understand the systems behavior, it is essential to detect and measure the changes in the factors over a time period. The comparison of the changes can from the foundation for system analysis. The factors can be quantified and measured directly or indirectly, using some useful attributes of the factors which are affected by the change.

2.5.3 Analysis of the system

After the major factors of natural resource base system has been, classification of the local and exogenous factors relevant to the changes and the relationship between these factors as system behavior can be analyzed. The major impacts of resource use and the constraints to sustainable development were predicted. Obviously, a complete system analysis was not attempted because of time and technology constraints.

2.6 Methods: data collection

The complexity of the resource base requires a wide range of different data be collected from varied sources. So, many different methods are to be used to measure the factors considered. The study was planed to include two different types of ecological conditions: the upland of the floodplain with comparatively drier condition and the low lying "beel" (marshes) adjacent to the upland which is more floods prone. Though there is a high

degree of uniformity in resource use pattern, three villages from the upland and three villages from the "beel" area are included.

The primary data collected from these six villages were complemented with secondary data to facilitate conclusions. The farmer's household survey was done in the six villages over two years (2007-08). The socio-economic status of the households were determined first with participatory ranking method. The villagers were asked to rank the surrounding households in four categories: rich, medium, poor and very poor. Several such ranking were used. This classification was verified by landownership and income data. The households were visited and a questionnaire was completed by interviewing the head of the households (Table 2.1 and 2.2).

The village households were then sampled through the stratified random sampling to select households representative of each socio-economic strata for detailed data collection. For past information "memory recall" method was used. The 1970-71 data was easier to remember because of the War of Liberation period-people remembered because of the war and associated events. These data were cheeked by location visits and physical verification. Other villagers were asked the same questions to corroborate the information before inclusion.

Field visits and rural appraisal survey in the six villages provided with current (2007) data on the different factors of the system. The collected data have been used to identify the core factors of the natural resource base of the study area.

To measure the changes of these factors, the period between 1970 and 2007 was used. Methods of field visits and memory recall have been used to collect time series data.

All the data was used to measure the changes in the factors; supported by secondary data which has been checked; rechecked and triangulated to obtain reliable results.

2.7 Field survey: rural appraisal

All the primary data from the six villages have been collected by the field methodology: rural appraisal (RA) following IIED, 1998; Chambers, 1992. Group interviews, field walks, change diagram, memory recall and individual interviews were used to collect and check data.

It was realized during the study, the villagers, as a group, possess a large body of information and knowledge, which can be easily obtained for use with a little care and effort. Also, through mutual checking and cross-checking by individuals and groups, the collected information and data could be verified in the location or outside.

Table 2.1

Socio - economic study

Area	Village	Family status				Age			Education status		
		Rich	Medium	Poor	Very poor	Under 15	15+	50 +	Under S S C	S S C	Graduate
Upland (Danga)	V1	20	38	137	184	363	811	128	1165	97	40
	V2	5	36	38	39	159	228	47	362	50	22
	V3	10	30	70	90	185	204	36	314	94	17
	Total	35	104	245	313	707	1243	211	1841	241	79
Lowland (Beel)	V1	4	9	7	8	33	66	17	112	4	0
	V2	8	19	14	26	86	151	39	241	27	8
	V3	8	35	19	78	167	295	55	503	14	0
	Total	20	63	40	112	286	512	111	856	45	8

Table 2.2

Sample households for study (30%)

Status	Upland						Lowland					
	Total house hold			Counted house hold			Total house hold			Counted house hold		
	V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3
Rich	18	5	9	6	3	3	4	6	4	1	2	2
Medium	38	15	18	12	4	5	5	12	8	2	4	2
Poor	60	16	12	16	5	4	4	16	14	1	5	3
Very poor	25	4	10	5	4	5	7	14	9	2	4	3
Total	141	40	49	39	16	17	20	48	35	6	15	10

Chapter 3

System identification

3.1 Land type and land use

The study area is included under the Ganges Floodplains, and can be divided into several local land types, the major source of local natural resource. The general physiography, the high flood free ridges and the depressions or 'beels' provide facilities for agricultural production and other resources on which the local people depend for their livelihood (Table 3.1).

There are boundaries of the 'beels', high lands with settlements, roads and embankments, the low croplands and water bodies; the beels act as local rain water catchment area. The study area includes the following land categories.

Land type	Flood level	Approximate area (acre)
High land	Flood free	239
Medium high land	0-90 cm	600
Medium low land	90-180 cm	635
Low land	180-300 cm	60
Very low land	>300	23
Total		1567

Brammer et al.1988.

Land use depends mainly on land types, flooding is the major determinant here. Crops also have to be assigned according to land type and flooding. Low lands are used for Boro and Aman/local Aus rice, while medium high lands HYV Aus, Aman and HYV Aman while high lands are used for wheat, pulses, potato, vegetables and oilseeds.

3.1.1 High lands or 'Danga'

The village homes are located on the high lands; local institutions and road are also situated on these. All the tree resource, natural vegetation are around and in the homesteads and kitchen gardens. Apart from high land crops, the tree and vegetation provide fruits, wood, fuel, fodder and timber come from these. There are very little common property resources apart from roadside lands; the land owners usually are the users of these resources. Sometimes fodder and fuel (leaves, twig and agricultural wastes) and dropped fruits are obtainable to the local poor.

The ponds and wells (Table 3.2) are also situated on these flood free highlands. These ponds and wells are the major source of domestic and drinking water used by the community. Pond water though used as common property resource in the village and for rearing ducks, the fish belongs to the pond owner. Small scale irrigation is done from these water resources (Appendix 1).

The highlands are used for dry land crops, the Rabi crops and vegetables since these are flood free. These crops are used by the farmers for their own consumption, but some farmers also grow crops for markets exclusively. Recently banana, jujube and vegetables are often commercially grown for marketing.

Many homestead and kitchen garden grow fruits and vegetables, are both consumed and marketed depending on the needs. The dry lands and homesteads are also used for rearing domestic animals (cattle, goat, chicken, ducks and pigeons). These are source of food and income and are reared mostly on feed collected from the surrounding land used or water bodies.

3.1.2 The medium high land

These are seasonally flooded for 3 to 4 months, so are not suitable for use as high lands. They are usually very fertile, flooding has been attributed for this; during flood these lands can be used either for paddy or fish, depending on flood levels. The upper parts can be used for Rabi crops after flood water recedes or in flood free years.

3.1.3 The low land

The low lands, with flooding and clay soil, are mostly used for paddy cultivation in the dry season. During flooding higher edges may be used for paddy (Aman). Very low lands are not found in the study area except the edge of the beel Moropara, Khamar beel, Zader beel, Kumor gara, Gudabara beel, Baluchar,Gara beel, Pampara beel and Udanpara beel. When dry up, some of these may be used for paddy cultivation.

Much of the un used plants of the low lands become the source of grazing for cattle, sheeps, goats and ducks. Aquatic grasses and weeds become source of green fodder for domestic animals. The weeds and aquatic alga are very useful for fish and these low lands when submerged are used as common property fishing ground for the poor fishermen.

Table 3.1
Land use change (area in acre) in upland and lowland during 1970-2007

Land use	Danga		Change	Beel		Change
Topic name	1970	2007		1970	2007	
Crop land	573	820	+247	354	415	+61
Forage land	120	15	-105	42	6	-36
Home stead	40	70	+30	31	42	+11
Water bodies	45	21	-24	70	39	-31
Tree cover	201	29	-172	22	10	-12
Others	41	64	+23	25	34	+9
Total	1020	1019		544	546	

Table 3.2

Changes in water supply in the study area during 1970-2007

Tools name	Upland		Change	Lowland		Change
	1970	2007		1970	2007	
	No.	No.		No.	No.	
Ring well	17	0	-7	4	0	-4
Tube well	3	74	+71	0	49	+49
Deep well	2	5	+3	1	4	+3
Shallow well	0	63	+63	0	42	+42
Pond	28	32	+4	16	22	+6
Total	50	174	+134	21	117	+96

3.1.4 Ponds: Perennial water bodies

The study area's natural resource base does not include big beels or rivers; the shallow beels are not perennial, they are seasonally flooded by rain water. However, the study area includes a large number of small and large ponds. Most of these are used by the local community as common property for their domestic need.

3.2 The local community: natural resource users

The study area comprised of six villages Pochamaria, Kanmaria, Jashopara, Shilmaria, Pampara and Udanpara.The mouzas being the lowest administrative units for determining the population structure and socio- economic condition.

Mouza and population (according BBS, 2001)

Mouza No	Name	Area(acre)	Household	Population
111	Pochamaria	499.92	379	1302
112	Kanmaria	158.07	108	434
74	Jashopara	362.75	200	425
109	Shilmaria	95.63	28	116
105	Pamparia	316.00	140	517
108	Udanpara	135.59	67	276

Most of the household heads are farmers, crops are the main source of their livelihood. Some households depend on other profession like fishing, agricultural labour, trading and sale of home garden products. Many families often engage in several livelihood activities, particularly those who are landless.

Different resource use groups in the study area

Major class	Sub- class	Resource use	Land own(bigha)
Farmers	Medium/large small marginal	Crops, homestead gardens Crops, homestead, trade Crops, home garden, trade	> 5-6 2-5 <2
Labourers	Tenants/landless shore croppers	Labour, homestead Crop cultivation, homestead	<0.2 Rented land
Fishermen	Professional Fishing/Marginal farmer	Fishing, homestead Fishing, homestead	<0.2 landless
Non land users	Non-agriculture	Trading, labour, non- land	Landless

The households of the study area utilize the local resource base to meet their needs directly or indirectly. These are

Direct	Indirect
Drinking water	Irrigation water
Food	Fodder/grazing
Fuel	Manures
Building materials	Seeds
Capital	Labour
Employment	Animal power
	Fish

The households needs are satisfied from the natural resource base directly or used for growing crops in the process generating income and resource can be grouped into local factors from the outside (exogenous or external). This is important mainly for growing crops and sustainability of the production system.

Local	External/exogenous
Cultivable land	Chemical fertilizers
Vegetation	Pesticides
Fish stock	Improved seeds
Fertile soil	Fish fry
Organic residue	Rain water
Surface water	Flood water
Ground water	Capital
Biodiversity	Market (external)
	Technology

The demands or needs of the local households are very complex and are satisfied by direct consumption or sale of natural resources and produce from agriculture. Apart from the local and external input factors, accesses to capitals and micro-credit also have relationship in the production system. Also, factors like storage, preservation and market demand and prices have a potential impact on the stability of the system.

When considered as a system, the properties like productivity, stability, sustainability and equitability also have their effect on the natural resource base.

3.3 Forest resource (natural vegetation) utilization

Local people reported that in 1940-1960, maximum area was covered by natural vegetation in the study area. This vegetation was very important resource for the villagers. These provide them with food, fuel, building materials, feed and other needs.

3.3.1 Wild fruit plants

A number of wild fruit plants provided food to the villagers. They collected them from these vegetation even before 1970s. These were source of nutrient and income but these plants are endangered now.

3.3.2 Non cultivated wood trees

The villagers used to get their necessary fuel wood from these vegetation and were also source of timber used as building materials. But after the period 1980s people destroyed these trees for agricultural land and settlement and as a result, natural vegetation decreased. Recent, 1995-2007 people of the village began plantation of some selected wood trees.

3.3.3 Resource base of fuel

The local people reported that, twigs and bamboo were the main source of fuel of the villagers. They used to collect it easily from these vegetation before the period 1980s.But day by day these decreased and recent in (2000-2007) the villagers cannot get enough. Now, they use agricultural wastes, leaves and others residues.

3.3.4 Other needs

The local people traditionally used medicinal plants for common diseases. This was the minor resource of the villagers. Also most of the households of the villages used to be made of wood, bamboo and straw. The villagers for generations collected these valuable resources from the local ecosystems and make their house. These materials provide them significant economic support where many poor used to collect them to sell in the local market to earn their livelihood.

3.4 Cultivated land

RA and group discussion in the six villages has revealed that most of the cultivated lands are medium high land or low flooded land. Two or one crop per year were grown in these, respectively. Total cultivated land of this study area had increased during the period 1970-2007 with the clearing jungles for adoption of modern agricultural systems.

3.4.1 Fallow land

Very little area in the villages are kept fallow now a- days. Most of the fallow lands of the study area are for grazing land, road sides, banks of pond or garden sides. Much of the low lands had been changed into crop land or vegetable gardens by bunding and raising now.

3.4.2 Soil fertility

Old villagers reported that due to the utilization of chemical fertilizers, pesticides, irrigation by ground water and less use of organic manure had changed soil fertility and structure as also reported by the farmers. RA survey and local farmers reported that the decline of soil fertility has reached a serious level; more and more chemical fertilizer has to be used every year.

3.4.3 Organic manure and their availability

The number of domestic animals in the study area has been drastically reduced. During rural appraisals, farmers reported that local households use most of the crop residues, animal dung, leaves and twigs for every day cooking and parboiling of rice. Also aquatic and dry land weeds are used, thus contributing to less return of organic matter to the soil.

3.4.4 Open water fishery

Before 1980s, local people collected fish from open water area like beels or canals. But now the beels and canals were reported to provide very little fish catch during the wet season. At present (2007) in the study area, most of the fish supply comes from culture fishery in the ponds from exotic fish species introduced.

3.4.5 Surface water bodies

Due to siltation and filling up of water bodies most of the surface water bodies have been declined as reported by the local people. The RA and group interviews revealed that both the area and quality changed during recent years and water availability during the dry season decreased substantially.

3.4.6 Ground water

RA and interviews of the villagers reported that now-a-days main source of water in this study area is ground water. For drinking or for irrigation, the people use about 100% ground water.

3.4.7 Rain water

Rain is the main cause of local flood in the study area. RA with local people revealed that November - June are the rain less months. In recent years the amount and regularity of rain fall have changed.

3.4.8 Crop damages due to flood

Irregular and excess untimely rainfall during the period July – October cause flood in the lowlands. Flood damages many crops and the farmers face economic crisis.

Too early rain damages paddy and rabi crops while too late rain induces strong drought.

3.4.9 Shortage of water and droughts

Last two years (2005-2007) the villagers reported that duration of annual periods of drought in the study area has increased. A numbers of hand tube wells and shallow wells became dry. For this reason, farmers of this study area depend on irrigation from ground water.

3.4.10 Biodiversity: species of flora and fauna

Local people reported that before 1970 many kinds of wild flora and fauna were established in this study area. Local plants like- *Albizia procera, Acacia nylotica, Acacia catechu, Amoora rohituca, Azadiracta indica, Alstonia scholaris, Ficus benghalensis, Ficus rumphii* etc. were in abundance here. In this local vegetation, many kinds of wild animals, birds and reptiles lived together. But after 1980s, deforestation destroyed this biodiversity. Local people observed a rapid decrease in these wild flora and fauna.

3.4.11 Cultivated species

RA and group interviews of the local people indicated a serious reduction in the diversity of crop species during 1980s. Before 1970s, local people cultivated many local varieties of different crops which were adapted to local soil and environment. Now, modern technology had replaced traditional cropping system.

3.4.12 Incidence of pests and diseases

The villagers reported that they used no pesticides during 1970s, but since 1990s, the use of pesticides was started. Afterwards, more and more amounts of different pesticides have to be used. Local farmers of the area reported that the use of pesticides has increased rapidly to protect HYVs.

3.4.13 Crop loss due to pests

Local people mentioned that new generation of pests and disease attack crop every year. To control these new pesticides have been introduced.

3.4.14 Major crop resources

The local farmers mentioned that maximum crops grown in this area are HYVs. Especially the farmer of the study area grows BRRI rice, sugarcane and peas to get high production.

3.4.15 Production of other crops

RA and local farmer's interviews reported LV decreased and HYV increased during the period 1970-2007. Pulses, oilseeds, spices and others crop production also decreased.

3.4.16 Domestic animals and fishery

Information from the villagers revealed that some domestic animals like- cow, goat, duck and chicken increased and some decreased like- horse, buffalo, sheep and pigeon. They also reported that open water fisheries decreased and cultured fisheries increased.

3.5 Indicators for identifying changes of the factors

Certain indicators have been selected

To measure the changes in the factors of the natural resource system over a period of time mentioned in the objectives of this study (1970-2007), a set of indicators were used. These indicators have been selected on the basis of availability of information and data. These indicators related to local natural resource base are:

Factors	Indicators
Cultivable land ⟹	Total land under cultivation
	Different land types used
	Extent of cultivation
Natural vegetation ⟹	Natural vegetation and trees
	Biodiversity changes
Soil fertility ⟹	Use of organic manure
	Use of fertilizers
Open water fishery ⟹	Total fish catch
	Availability of different species of fish
Organic residue ⟹	Paddy straw in the fields
	Cattle dung availability
	Aquatic and dry land weeds
Surface water ⟹	Ponds in dry season
	Water availability in dry season
Ground water ⟹	Level of well water
	Dried tube wells
	Number of tube wells

Rain water	⇒	Rain fall per year Onset of rain fall
Flood damage	⇒	Crop damage due to flood
Water shortage	⇒	Rainless months and dry tube wells Crop loss due to drought Surface water shortage
Biodiversity	⇒	Habitat destruction and land use changes Species of plants Species of wild fauna Cultivated species

Others indicators used in the study are

Factors		Indicators
Agricultural productivity	⇒	Rice yield/ production
		Production of other crops
		Number of domestic animals
		Fish catch (culture)
		Crop diversity
Natural vegetation Biodiversity	⇒	Number of tree species: diversity
		Number of trees: abundance
		Abundance of wild animal species
		Abundance of open water fish species
		Abundance of cultivated tree species
Water resources	⇒	Number of tube wells
		Area irrigated by ground water
		Area irrigated by surface water
		Ground water discharge rates
		Area flooded during rainy season

Chapter 4

Changes in natural resource base: 1970-2007

The changes of the individual factors of the natural resource base during the period 1970-2007 are presented in this chapter. The results are presented following the sequence adopted in the previous chapter. The indicators were used to measure the changes.

4.1 Factors of the natural resource base

4.1.1 Cultivated land

Indicator: Land under cultivation

The information collected from the six villages through RA and interviews. The changes in the total cultivated land during the period 1970-2007 has mostly taken place during 1970-1980 with the adoption of modern agricultural technologies eg. High yielding varieties, chemical fertilizers, irrigation by ground water and pesticides.

Change in cultivated land area

Table 4.1 indicates that land under cultivation increased during the period 1970-2007 by 308 acres or 19.6 % of total land. In upland, cultivable land area has increased by about 50% but increase rate in lowland was less so during the period 1970-2007. So, individually total cultivable land increased both areas under study.

Number of ponds changes

The number of ponds has changed (Table 4.2) during the period 1970-2007. Total number of ponds increased both in the areas and the rate of increase in the ponds was more in lowland than upland during the period 1970-2007. The new ponds were excavated to meet the surface water needs and also to elevate lands for homestead.

Changes in low flooded land

Day by day, low flooded land has been decreased and changed into medium high land during the period 1970-2007. The low flooded land has decreased by about 50% both upland and lowland. Low flooded land declined in all villages during this period (Table 4.3). The low lands were filled up to expand area under crops (Fig. 4.1 and 4.2).

Table 4.1

Land under cultivation in upland and lowland during 1970-2007

Land use	Area	Village	1970	2007	Change
Cultivable land	Upland	V1	250	390	+140
		V2	90	120	+30
		V3	233	310	+77
		Total	573	820	+247
	Lowland	V1	74	80	+6
		V2	190	235	+45
		V3	90	100	+10
		Total	354	415	+61

Table 4.2

Number of Ponds: perennial water bodies in upland and lowland during 1970-2007

Land use	Area	Village	1970	2007	Change
Perennial water bodies	Upland	V1	12	14	+2
		V2	4	5	+1
		V3	12	13	+1
		Total	28	32	+4
	Lowland	V1	4	5	+1
		V2	6	10	+4
		V3	6	7	+1
		Total	16	22	+6

Table 4.3

Changes in low flooded land (area in acre) in upland and lowland during 1970-2007

Land use	Area	Village	1970	2007	Change
Low flooded land	Upland	V1	20	15	-5
		V2	15	5	-10
		V3	10	1	-9
		Total	45	21	-24
	Lowland	V1	5	4	-1
		V2	50	30	-20
		V3	15	5	-10
		Total	70	39	-31

Fig. 4.1 Low flooded land area in the village Udanpara

Fig. 4.2 Perennial water bodies in the study area (Udanpara beel)

Decline in fallow land

During the period 1970-2007, fallow land has decreased significantly and local farmers have converted into crop land or used for other purposes. About 70% of the fallow land has been converted into crop fields both the upland and lowland areas during this period (Table 4.4).

4.2 Natural vegetation

Non-cultivated plants and trees are important resource for the villagers. These provide food, building material, fuel, feed, and other needs often are source of common property (Fig. 4.3 and 4.4).

Indicator: Natural vegetation and trees in 1970 – 2007

There were large stretches of wild vegetation cover in the past (1970) providing different kinds of materials. Extensive areas of wetland, grassland and fallow land with natural trees were present (Table 4.5). Local People reported rapid depletion of these during 1980s. Group discussion and memory recall indicated that the process of deforestation and removal of trees was due to rapid population growth and increased demand as well as hard ship during that period. Table 4.5 also indicates that the number of fruit trees increased but multipurpose and wood trees decreased both in the upland and lowland. Seedling derived plants (naturally growing species) decreased but people planted more graft derived trees. Total number of plants in upland is more than the lowland areas. During the period 1970-2007, the changes in tree population was more notable. Also much of the tree population are asexually propagated (grafts) rather than sexually reproduced (Fig. 4.5 to 4.11).

In recent years (1995-2005), local forestation and tree plantation in and around homesteads was apparent (Table 4.6). The local villagers were reported to be motivated by tree plantation drives and also by high prices of timber, fruits, fuel and food during the last two decades (Appendix 2).

Indicator: Biodiversity changes

The Table 4.7 indicates that the tree population and local vegetation changed in character and quality too. It also indicates that fruit and multipurpose trees are increasing day by day in both areas. Wood yielding plant though are increasing in upland areas but decreased in lowland areas during 1971-1990 and recovering now. Much of the indigenous species have been replaced by multipurpose and fruit tree species. It has been reported that many wild species of the natural vegetation have become very rare or totally eliminated. For

Table 4.4

Changes in fallow land (area in acre) in upland and lowland during 1970-2007

Land use	Area	Village	1970	2007	Change
Fallow land	Upland	V1	50	10	-40
		V2	20	3	-17
		V3	50	2	-48
		Total	120	15	-105
	Lowland	V1	2	1	-1
		V2	30	20	-10
		V3	10	3	-7
		Total	42	6	-36

Fig. 4.3 Fallow land with sheep in the village Kanmaria

Fig. 4.4 Fallow land in the village Pochamaria

Table 4.5

Comparative study of tree population between upland and lowland in 1970-2007

Year	Village	Upland(Danga)					Lowland (Beel)				
		Fruit	Multi	Wood	Seedling	Graft	Fruit	Multi	Wood	Seedling	Graft
1970	V1	564	3832	4074	8387	83	46	373	349	395	24
	V2	182	1661	2052	3846	49	63	532	628	1188	35
	V3	214	783	1843	2821	19	47	578	247	859	13
	Total	960	6276	7969	15054	151	156	1483	1224	2442	72
2007	V1	2169	1988	2075	4236	1996	111	177	153	159	129
	V2	2248	2524	1765	4376	2161	202	478	274	701	253
	V3	1118	1205	2027	3551	799	119	486	223	656	172
	Total	5535	5717	5867	12163	4956	432	1141	650	1516	554

*** Multi= Multi purpose trees**

Table 4.6
Species of tree population between upland and lowland (1931-2007) from memory recall

Year	Village	Upland (Danga)						Lowland (Beel)					
		Fruit		Multi		Wood		Fruit		Multi		Wood	
		Sp.	No.	Sp.	No.	Sp.	No.	Sp.	No.	Sp.	No.	Sp.	No.
1931-1950	V1	8	109	9	1360	20	1493	5	14	9	146	15	171
	V2	6	9	9	468	16	443	7	9	8	124	11	81
	V3	3	16	9	204	15	569	6	14	9	210	13	231
	Total		134		2032		2505		37		480		483
1951-1970	V1	9	141	9	1113	20	1423	5	10	9	117	12	94
	V2	9	44	9	628	17	673	6	17	9	170	10	71
	V3	10	101	9	380	18	456	7	25	9	224	17	260
	Total		286		2121		2552		52		511		425
1971-1990	V1	11	285	9	1403	22	1158	9	22	9	110	12	66
	V2	10	121	9	565	19	936	6	21	9	284	13	95
	V3	9	107	9	199	17	818	9	24	9	98	16	137
	Total		513		2167		2912		67		492		298
1991-2007	V1	11	2169	9	1988	23	2075	10	111	9	177	12	153
	V2	11	1981	9	2524	19	1765	9	124	9	486	13	223
	V3	10	1118	9	1205	21	2027	11	202	9	478	15	274
	Total		5268		5717		5867		437		1141		650

Table 4.7

Some endangered fruit plants in the study area

Local name	Scientific name	Number of trees in six village	Use
Dhapar	*Flacourtia ramontchi*	30	Food, Fuel
Bagborai	*Zizyphus oenoplea*	11	Food, Partition
Jungle Jack Fruit	*Artocurpus lakucha*	4	Food, Fuel, Wood
Haihamla	*Trewia sp.*	2	Food, Fuel, Wood

Fig. 4.5 Agro forestry covered by exogenous tree population (*Swietenia mahogany)*

Fig. 4.6 Road side plantation covered by exogenous tree populations in the village Jashopara

Fig. 4.7 Mixed forestation in the study area (Pochamaria village)

Fig. 4.8 Bamboo clump *(Bambusa sp.)* with birds (Pochamaria village)

Fig. 4.9 A Dhapor (*Flacourtia ramontchi*) plant found in the village Shilmaria (Endangered)

Fig. 4.10 Banyan tree *(Ficus benghalensis)* in the village Jashopara(Endangered)

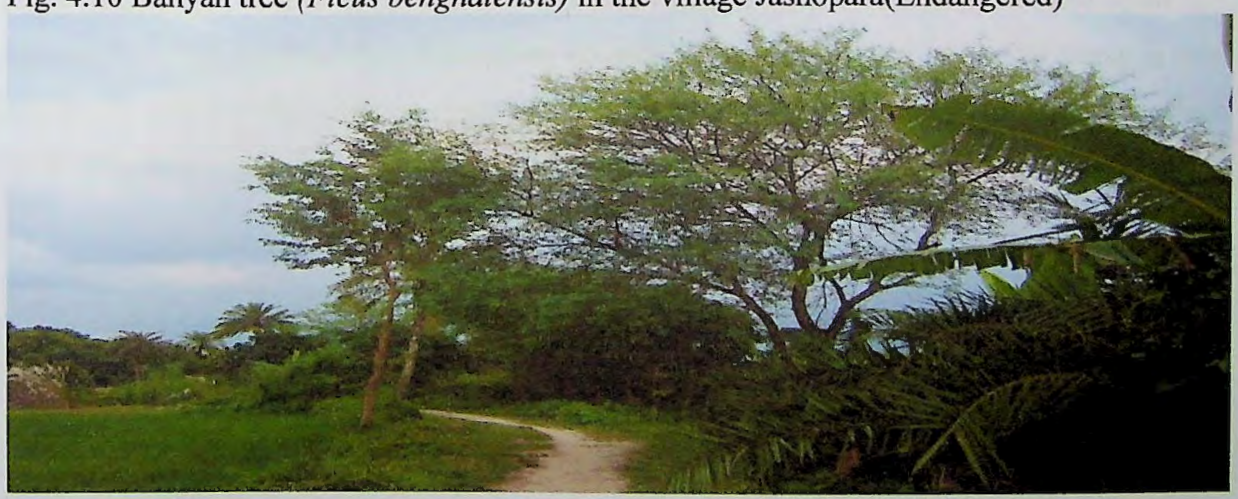

Fig. 4.11 A Babla tree (*Acacia nylotica) in the road side of village* Jashopara (Endangered)

example wild Jack fruit, Dhapar, Satim, Badar lathi, etc. are seldom seen now in the area, but were the common species in the past.

4.3 Fertility of the soil

Indicator: use of organic manure

Almost all farmers reported changes in soil fertility and soil structure during the period 1970-2007. They reported that use of chemical fertilizer and ground water irrigation has resulted in the decline of soil fertility. Trend in fertilizer use indicates less use of organic manure (Table 4.8). Low availability of aquatic weeds in the floodplains was also mentioned during RA. Table 4.8 also indicates, cow dung, compost and green manure use decreased during the period 1970-2007. Poultry waste and other inorganic fertilizer (Mn, Zn, S, Br, Ni etc.) use increased now (2007). Though cow dung use increased in the upland areas but declined in the lowland areas. Extensive rice cultivation and narrowing of crop diversity was reported to reduce natural soil fertility (Appendix 3).

4.4 Organic manure and crop residues

The rice straw leftover, natural weeds and water plants and animal dung available for use has declined sharply during the period 1970-2007 (Table 4.9). People used these for their daily cooking or other purposes (Appendix 4).

Indicator: Paddy straw in fields after harvest

Though data (Table 4.9) and field survey indicated that the total paddy production has increased during 1970-2007, the increase in fuel demand resulted in the use of rice straw and stubbles from the fields after paddy harvest. In the rural appraisal farmers reported that local households use most of the crop residues, dung and rice straw for cooking and parboiling of rice. Table 4.9 also indicates that rice straws, wheat straws, maize and plant leaves are widely used as fuel. Maximum households in the lowland used cow dung in wet season as fuel (2007).bamboo, wood and others crop residues declined during the period 1970-2007 both upland and lowland (Case study 1).

Table 4.8

Change pattern of organic manure (%) in two study areas between 1970-2007 (Six sample households in each village)

Area	Village	1970					2007					Change				
		Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others
Upland	V1	72.5	1.6	2.8	2.1	4.1	55	6.6	0	0.8	4.1	-17.5	+5	-2.8	-1.3	0
	V2	76.6	0	0.8	0	5.8	45	0	0	1.6	3.3	-31.6	0	-0.8	+1.6	-2.5
	V3	92.5	0.8	0.3	1.1	5.1	92.5	0	0.8	2.5	4.1	0	-0.8	+0.5	+1.4	-1
Lowland	V1	95	0	0	1.6	3.3	61.6	0	0	15	6.6	-33.4	0	0	+13.4	+3.3
	V2	90	0	2.8	0.5	6.6	78.3	0	0	1.6	3.3	-11.7	0	-2.8	+1.1	-3.3
	V3	77.5	0	0	0.8	20.8	65	0	0	0.8	35.8	-12.5	0	0	0	+15

Table 4.9

Use of different sources of fuel (%) in the study areas in 1970 – 2007 (Six sample households in each village)

Area	Village	1970									2007								
		R	WH	S	M	C	B	WO	L	O	R	WH	S	M	C	B	WO	L	O
Upland	V1	1.6	0	4.5	0	16.6	40.8	25.8	3.6	6.8	2	0.5	2.8	4.1	15	14.1	2.1	52.5	5.8
	V2	5.8	0	9.1	0	21.6	26.6	20	5	11.6	5	0.6	5.5	7.1	18.3	8.6	5.5	25	8.3
	V3	5.8	0	7.5	0	19.1	30	25.8	5	6.6	16.3	2	9.1	7.5	15	6.3	11.1	25	7.5
Lowland	V1	12.5	0	0	0	22.5	29.1	21.6	5.5	8.6	9.1	0.8	0	3.3	28.3	10	5.8	35.8	7.5
	V2	11.6	0	0	0	22.5	25.8	21.6	6.6	11.6	9.1	0.3	0	4.6	25.8	6.6	1.6	42.5	9.1
	V3	5	0	0	0	11.6	38.3	27.5	6.6	10.8	9.6	1.5	0	3.5	20	10	5.3	43.3	6.6

↓

Change								
R	WH	S	M	C	B	WO	L	O
+0.4	+0.5	-1.7	+4.1	-1.6	-26.7	-23.7	+48.9	-1
-0.8	+0.6	-3.6	+7.1	-3.3	-18	-14.5	+20	-3.3
+10.5	+2	+1.6	+7.5	-4.1	-23.7	-14.7	+20	+0.9
-3.4	+0.8	0	+3.3	+5.8	-9.1	-15.8	+30.3	-1.1
-2.5	+0.3	0	+4.6	+3.3	-19.2	-20	+35.9	-2.5
+4.6	+1.5	0	+3.5	+8.4	-28.3	-22.2	+36.7	-4.2

Rice Straw =R , Wheat Straw=WH , Sugarcane=S , Maize Straw =M, Cow dung=C, Bamboo =B , Wood =WO, Leaf =L, Others (Jute stick , Weeds) =O

Case study 1

Case study of Mr. Furkan Ali and his wife

With only 12 decimals of homestead land, Mr. Furkan and his wife live in a hut in the village Pochamaria. He is a rickshaw van puller and earns enough to support his family of four.

Mrs. Furkan, aged 42, has to collect all her domestic fuel from the surrounding land. She also has to look after her two children, cook meals and do all the domestic duties alone. Starting from early in the morning, she could go to bed late, only after finishing all her work.

The most difficult of her duties, she considers, is the collecting enough fuel for cooking and to save a little daily for the rainy season when fuel becomes too scarce to find. As they do not have any crop land, she has to gather all her fuel from fallow lands and others crop fields. It became very difficult to collect dry rice straw and stubbles, wheat straw, cow dung, dry leaves, weeds, sugarcane leaves etc. from nearby areas.

In the past, she found very little difficulty to find these, people used to leave enough residues in their fields and finding dry weeds and leaves was easier. But now she had to walk long distances and spend 3-4 hours daily to collect just enough to boil her rice and cook one or two curry. She can not collect more to save some for the rainy season.

She says," it is becoming more and more difficult to get fuel every day".

Indicator: Availability cattle dung

The Table 4.10 shows that the number of cattle in the study area has been reduced during the period 1970-2007 (Appendix 5). Feed crisis and lack of grazing land were reported as the major factor responsible for this decline. Most of the animal dung is used as dry fuel for the wet season, thus its use as organic manure in crop field has been reduced (Case study 2).

Indicator: Aquatic and dry land weeds

The data from different sources indicated a decline in natural vegetation and aquatic weeds thus contributing to less return of organic matter to the soil. Aquatic and dry land weeds declined in recent years and its availability was not enough to provide organic matter to the soil. Some weeds species has been eliminated from both the land areas (Table 4.11).

4.5 Open water fishery

Indicator: Area under fish culture

Changes in the stock of non–culture self reproductive fish stock in the open water bodies has declined during 1970-2007 (Table 4.12). The beels and canals were reported to provide very little fish catch during the wet season now. Most of the supply of fish in the study area are form culture fishery in the ponds. Table 4.12 also indicates that indigenous fish areas decreased and pond fish culture increased during the period 1970-2007.

Indicator: Availability of different fish species

The local villagers reported a sharp reduction of local fish species and an increase in the introduced (exotic) fish species. Table 4.13 showed the common fish species during 1970s have been eliminated or are very rare now (2007) (Fig. 4.12 and 4.13).

Table 4.10

Changes in number of domestic animal in the study area during 1970-2007

(Six sample households in each village)

Area	Village	1970								2007								Change							
		C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P
Upland	V1	23	14	2	2	7	7	65	35	19	27	0	0	0	69	83	26	-4	+13	-2	-2	-7	+62	+18	-11
	V2	39	26	6	2	3	50	71	50	5	10	2	0	2	53	102	30	-34	-16	-4	-2	-1	+3	+31	-20
	V3	42	19	10	1	7	19	39	520	9	11	6	0	0	11	12	80	-33	-8	-4	-1	-7	-8	-27	-440
	Total	104	59	18	5	17	76	175	605	33	48	8	0	2	133	197	136	-71	-11	-10	-5	-15	+57	+22	-471
Lowland	V1	29	202	0	0	22	54	72	26	14	5	0	0	0	47	33	8	-15	-15	0	0	-22	-7	-39	-18
	V2	29	28	0	0	8	35	61	40	9	0	0	0	0	24	39	20	-23	-28	0	0	-8	-11	-22	-20
	V3	23	19	0	1	9	32	58	46	10	13	0	0	0	34	34	16	-13	-6	0	-1	-9	+2	-24	-30
	Total	81	67	0	1	39	121	191	112	33	18	0	0	0	105	106	44	-48	-49	0	-1	-39	-16	-85	-68

Cow =C, Goat =G, Buffalo=B, Horse =H, Ram =R, Duck =D, Hen =He, Pigeon =P

Case study 2

Case study: Abul Kasem Mollah

Mr. Abul Kasem Mollah is an old farmer of village Kanmaria. He is 77 and a local member of his community. A head of household with 16 members, he inherited about 10 acres of land from his father.

When young, he had 6 cows, 2 buffalos, 4 goats, more than a dozen chicken and 2/3 dozens ducks. He never had problem in the past to look after these domestic animals because there was plenty of fallow land around his home and the water bodies were rich in feed. The children of the house and women folk looked after these animals.

But now he has only 2 buffalos and 7 chickens in his home. When asked why, he replied that there is no fallow land around his house, so it became difficult to keep animals. The goats and chicken damage crops and vegetables in nearby fields and kitchen garden. The neighbors complain about such incidents so he had to sell off his goats. There is no water bodies for ducks so numbers were reduced. There is no land for cattle to graze; he had to feed his cows and buffalos buying hey and other animal food from the market. The expenses became too high to bear, so he had to reduce their number. He has a cart, so the buffalos are used to pull the cart, so he kept the buffalos only.

He felt sorry that he does not get pure milk to drink and is deprived from the income out for his domestic animals.

Table 4.11

Aquatic and dry land weeds in the study area during 1970-2007

Aquatic weeds		**Dry land weeds**	
Local name	Scientific name	Local name	Scientific name
Kuchuri pana	*Eichhorina sp.*	Kash	*Saccharum spontaneum*
kolmi	*Ipomoea sp.*	Ulu	*Imperata cylindrica*
Tarat	*Jussiaca repens*	Buthua	*Chnopodium album*
Nalkhagra	*Phragmits karka*	katakhure	*Amaranthes sp.*
Shapla	*Nymphea sp.*	Durba ghass	*Synodon dactylon*
koidum	*Ottelia sp.*	Choyla	*Sonneratia caseolaris*
Hellencha	*Alternanthera sp.*		

Table 4.12

Change pattern of area under fish (area in acre) during 1970-2007

Area	Village	Upland		Lowland	
		Indigenous	Culture	Indigenous	Culture
1970	V1	20	4	15	20
	V2	10	0	0	9
	V3	9	3	1	7
	Total	39	7	16	36
2007	V1	0	10	0	7
	V2	0	15	0	10
	V3	0	50	0	30
	Total	0	75	0	47

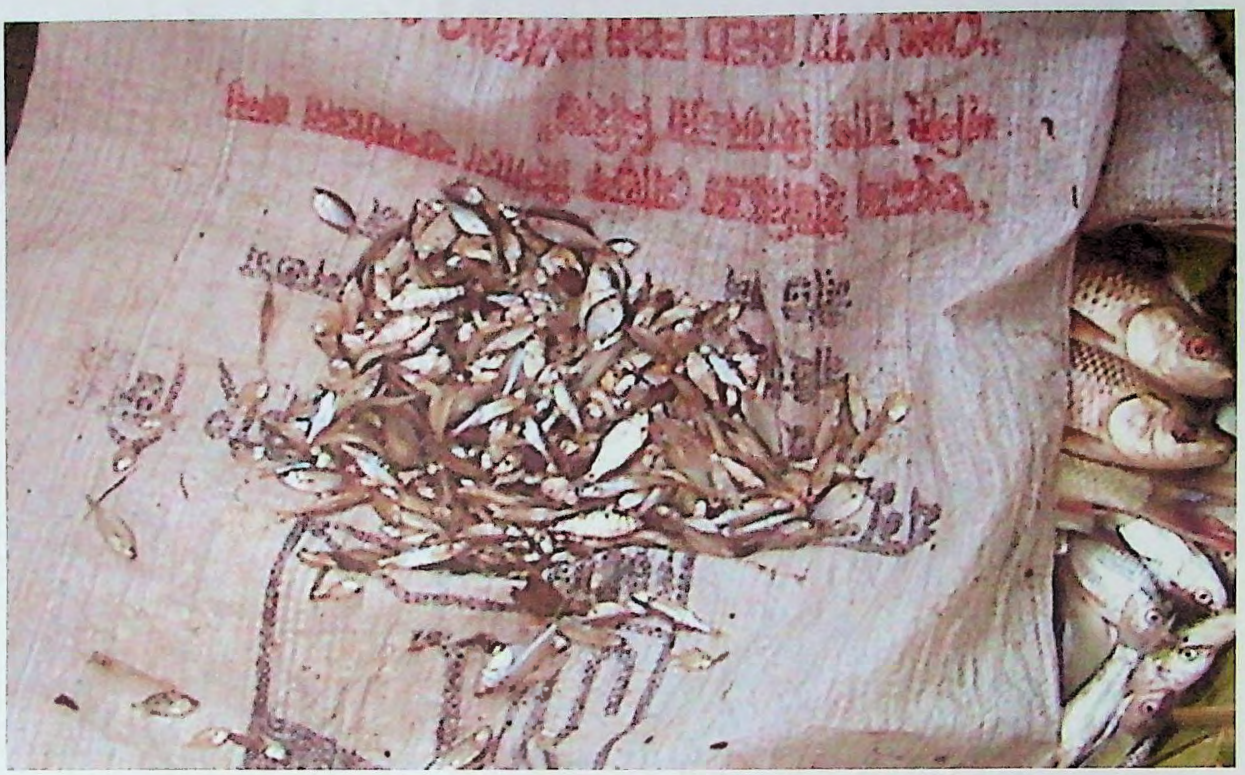

Fig.4.12 Some local fish species in the study area (Pochamaria bazaar)

Fig. 4.13 Some culture (Exogenous) fish species in the study area (Mollah bazaar)

Table 4.13

Fish stock change in study area during 1970-2007

1970				2007			
Very common	**Common**	**Rare**	**Very rare**	**Very common**	**Common**	**Rare**	**Very rare**
Anabas testudineus	*Labeo rohita*	*Pseudeutropius atherinoides*	*Notopterus chitala*	Silver carp	*Puntius sophore*	*Mystus tengara*	*Nandus nandus*
Heteropneustes fossilis	*Catla catla*	*Ompok pabda*	*Labeo calbasu*	Grass carp	*Channa striatus*	*Channa striatus*	*Mystus aor*
Clarius batrachus	*Cirrhinus mrigala*	*Mystus aor*		Telapia	*Macrobrachium rosenbergii*	*Mastacembelus armatus*	*Pseudeutropius atherinoides*
Mystus tengara	*Mastacembelus armatus*			Bighead	*Pangasius pangasius*	*Amblypharyngodon mola*	
Nandus nandus	*Glossogobius giuris*			Japani		*Glossogobius giuris*	
Channa striatus	Chela			Hungari		*Notopterus chitala*	
Puntius sophore	Gazar			Bata		*Colisa fasciatus*	
Colisa fasciatus	*Wallago attu*			*Labeo rohita*		*Wallago attu*	
Channa punctatus	*Xenentodon cancila*			*Catla catla*		*Xenentodon cancila*	
Amblypharyngodon mola				*Cirrhinus mrigala*		*Labeo calbasu*	
Chanda ranga							
Macrobrachium rosenbergii							

4.6 Surface water- bodies

Indicator: Availability of surface water during the dry season

Sources of above ground water, amount and quality, has been declined in the study area during 1970-2007. The ponds and canals, which are man-mode and the beel area, are important sources for storage and availability of surface water. The rural appraisal and group interviews reveals that both amount and quality changed during the period.

Though the number of ponds increased slightly (Table 4.2), but availability during the dry season decreased substantially. The increase in population and demand of water resource are emphasized by the local community.

Indicator: Surface water levels in the water bodies during dry season

Collected information show that there has been a substantial decrease in water levels of all surface water bodies in the study area form 1970-2007 (Table 4.2 and 4.3). The local people mentioned the following reasons:

- siltation and filling up of water bodies
- increased water use during the dry season
- reduced recharge and water storage.

4.7 Ground water resources

Indicator: Number of tube wells in the study area

The number of shallow, deep and hand- tube wells has increased in the study area during 1970-2007. The use of ring well and surface water for drinking and domestic use has declined. In recent years, only deep wells supply water during dry season.

Indicator: Level of ground water table

The rural appraisal information (Table 4.14) indicated that the minimum level has sunk and a number of wells become dry during the summer months. Many of the hand tube wells become dry and remain dry for longer periods during the summer months in the last decade. Also, the irrigation wells (shallow tube wells) fail to supply water, many of these have to be re sunk in deep pits for lifting water. The local people and well operator informed that level of ground water table sinks rapidly during the dry season. Hand tube wells draw water from 20-30 ft. in wet season but 80-90 ft. in dry season. Shallow wells supplies water from 20-25 ft. in wet season but maximum failed to supply water during the dry season. Now maximum of the crop area is covered under deep wells and supplies water from 180-200 ft. during 2007.

Indicator: Period of tube wells running dry per year

The number of days per year where tube wells in the study area failed to supply water due to low water table is given in Table 4.15. Increase in number of dry period for tube wells indicates prolonged unavailability of water.

4.8 Rain water

Indicator: Rainfall during the dry season (November – May)

The rainfall data in the Upazila is given in Table 4.16 during the dry season (November – May) over the period of 2004-2008. Though a definite trend can not be traced, the variability of rainfall during the dry season is remarkable.

Indicator: Total annual rainfall

The total rainfall in the study area during 2004-2008 is given in Table 4.16. Likewise, it is not possible to establish a trend in the rainfall, wide variation was the rule. Table 4.16 indicates December month was rainless and November; January; February and March months had little rainfall. May-October was the heavy rainfall months in the study area during 2004-2008.

Indicator: Fluctuation in rainfall

The timing of the first rainfall of the end of the dry season also reported to vary widely. This is important because too early rain fall damages Boro paddy and Rabi crops while too late rain fall induces strong drought (Table 4.16).

4.9 Inundation of rain water and flood

Indicator: crop damage and no cropping due to flood

Generally paddy cultivation in the area was not possible in low areas due to flooding during August to September. Because, heavy rainfall during this period cause to flood and the low land became flooded by rain water (Fig. 4.14 and 4.15).

Indicator: Crop damages due to flood and fluctuating rainfall

The people of the study area build their homesteads in elevated lands to escape flood and remain unaffected except extreme floods like the 1988 flood. But the low lying crop fields are much more damaged by annual floods. Table 4.17 shows extent of crop damage during extreme floods as reported by the local farmers. RA and field visit report indicated that in 410 acres of crop land were damaged due to flood during 2007 and 114 acres during 2008. Jujube, banana gardens also were damaged by water logging due to irregular rainfall and unexpected loss in the study area during 2008 (Table 4.18) (case study 3).

Table 4.14

Level of ground water table during 2007

Tools name	Wet season	Dry season
Hand tube wells	24-30 ft.	80-90 ft.
Shallow wells	20-25 ft.	60-80 ft.
Deep wells	180-200 ft.	180-200 ft.

Table 4.15

Period of tube wells running dry per year during recent years

No. of tube wells (%)	Running dry (days)
95-98	90-100 (April-May)
30-35	120-130 (April-July)

Table 4.16

Total annual rain fall in the Puthia upazila during 2004-2008

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
2004	10	-	-	63	85	503	304	217	361	152	-	-	141.2
2005	13	1	101	34	105	92	493	147	115	268	-	-	114.0
2006	-	-	7	37	191	185	120	217	304	36	10	-	92.5
2007	-	27	59	14	126	310	363	218	340	112	1	-	130.8
2008	13	1	-	30	125	245	264	223	176	113	-	-	99.1

Source: Upazila Agriculture Office Puthia, Rajshahi

Table 4.17

Estimated crop damage due to flood in the study area during 2007-2008

Crop name	2007		2008	
	Quantity (acres)	Total loss (TK.)	Quantity (acres)	Total loss (TK.)
Rice	115	2000000	35	270000
Sugarcane	100	2800000	10	360000
Banana	100	5000000	50	110000
Papaya	15	800000	5	200000
Chili	40	2880000	7	50000
Jute	30	450000	4	40000
Others	10	150000	3	50000
Total	410	14080000	114	1080000

Source: Household survey and field visit data collection

Fig. 4.14 Jute and rice field damaged by flood during 2007 in the village Pampara

Fig. 4.15 Rice field damaged by flood during 2007 in the village Pochamaria

Table 4.18
Estimated jujube garden damages due to flood (excess and untimely rainfall) during 2008

Total land area for jujube=30 acres

Total number of plot=60
Study number of plot=17

Plot No.	Area(acres)	Variety	No. of plants	Primary cost(Tk.)	Cost in a year(Tk.)	Fruit/plant kg.	Expected profit(Tk.)	Profit-2008(Tk.)	Loss (Tk.)	Total loss (Tk.)
1	0.16	Apple	42	4200	7200	1	67200	1680	65520	76920
2	0.33	Apple	70	7000	13000	Nil	128550	0	128550	148550
3	0.33	Apple	70	6650	12750	Nil	98000	0	98000	117400
4	0.33	Apple	60	6360	13400	0.5	48000	1200	46800	66560
5	1.33	Apple	430	30000	74500	3	602000	45150	556850	661350
6	1.33	Apple	280	4900	31500	Nil	112000	0	112000	148400
7	1.66	Apple	350	7000	39000	Nil	140000	0	140000	186000
8	0.30	Apple	72	3024	6080	0.5	25200	1260	23940	33044
9	0.33	BAUK	50	15000	7500	2	12500	2500	10000	32500
10	0.66	Apple	140	15400	16800	5	168000	21000	147000	179200
11	0.50	Mixed	60	9000	8400	3	72000	4500	67500	84900
12	0.33	Apple	100	6200	7500	2	40000	4500	35500	49200
13	0.83	Apple	117	8775	9850	4	93600	16380	77220	95845
14	1	Apple	118	4130	15540	2	47200	8260	38940	95845
15	0.40	Mixed	65	9750	4950	2	19500	3600	15900	30600
16	0.33	Apple	55	9075	5750	Nil	88000	0	88000	102825
17	0.40	Apple	80	4800	6600	Nil	64000	0	64000	75400
Total	10.55	17	2159	151264	280320	62.5	1825750	110030	1715720	2147304

Case study 3

Case study of Mr. Bariul Islam

A permanent resident of Pochamaria village, Mr. Bariul Islam is a young well-to-do farmer. Only 31 years old, he is very active and always try to adopt new ideas. When watched a television programme on "Apple kul", a high yielding variety of jujube, he became interested and decided to invest 2 acres of his 7 acres of land for jujube cultivation.

He borrowed Tk 50 thousand and spent it to prepare the land and buy 300 jujube seedlings from Rajshahi Agricultural Farm. He established the jujube field in 2005 took care of the cuttings and had to invest another 10 thousand Taka. He started getting fruits during 2006-2007 seasons and during the two seasons he earned about 21 thousand Taka.

He was expecting a better crop during 2008-2009 season but the plants showed no signs of bloom till late in the season. Only a few plants had some flowers but they dropped off. When reported to the local Thana Agriculture Officer, he said that untimely rainfall and unfavorable temperature were responsible for lack of flower and flower damage this year.

Less than expected return and complete damage of crop compelled Mr. Islam to abandon jujube, he has decided to cut down all his jujube plants and cultivate other more profitable and regular bearing crop.

4.10 Shortage of water and droughts

Indicator: Rain-less month and dry tube wells

The duration of annual periods of drought in the study area ranges from mid February to mid May as reported by the villagers. In bad years like 1995, 1996 and 1997 the drought lasted for 3 months; but in wet years like 1994 the drought lasted only for one month. In recent years, the numbers of dry tube wells and shallow pumps became the major cause of drought and water crisis in the area.

Indicator: crop loss due to drought

The irrigation dependent Boro- paddy during March- April, and Aus and B-aman to some extent, are affected badly by drought during April – May. Crop of both upland and lowland were damaged. An estimate of crop loss by drought in the study area during 2008 and 2009 was given in Table 4.19. Here, about 305 acres of crop fields were affected during 2008 and 550 acres in 2009 (Fig. 4.16 and 4.17).

Indicator: shortage of surface water

Irrigation from surface water bodies where ground water is not available and when tube wells run dry became less and less available during 2000 on wards. Even during droughts when tube well water is unavailable, pond water is used for domestic and drinking. The local community reported that some ponds do not become dry, but availability of safe water becomes a serious problem, especially in upland villages (Fig. 4.18 and 4.19).

4.11 Biodiversity: Species of flora and fauna

Indicator: Habitat destruction and land use changes

The section 4.1(Land Under cultivation); Section 4.2 (Natural vegetation) described changes in the area during 1970-2007 which indicate a substantial decrease in natural habitats. After 1970s, the local people observed a rapid decrease in the wetland and vegetated areas. All these were converted into crop fields and homesteads. The wetlands and transition area are the most biologically diverse ecosystems on earth.

Indicator: Different species in wild fauna; abundance

During the period of 1970 to 2007, an increase in population and crop lands resulted in the decline in natural habitats combined with a remarkable decline in wild animals and plant species. Especially birds, mammals, reptiles as well as other wild plants became increasingly rare (Table 4.20). This table also indicates many common mammals and

Table 4.19
Estimated crop loss due to drought in the study area during 2008-2009

Crop name	2008		2009	
	Quantity (acres)	Total loss (TK.)	Quantity (acres)	Total loss (TK.)
Rice	25	400000	300	1560000
Maize	50	900000	150	2400000
Onion	20	600000	50	5250000
Wheat	100	1600000	-	-
Chili	50	1400000	30	360000
sesame	40	240000	15	45000
Others	20	150000	10	1000000
Total	305	5290000	550	10615000

Source: Household survey and field visit data collection

Table 4.20
Changes in wild animals during the period 1970-2007 in the study area (from memory recall)

Commonly found (1970)		Rarely found (2007)	
Local name	Scientific name	Local name	Scientific name
Sheal	*Vulpus sp.*	Sheal	*Vulpus sp.*
Begi	*Herpestes sp.*	Begi	*Herpestes sp.*
Ban biral	*Felis sp.*	Ban biral	*Felis sp.*
Bagh	*Panthera tigris*	Goma (Ghokra)	*Naza sp.*
Mecho bagh	*Neofelis nebulosa*	Casshop	*Testudo sp.*
Ajogar	*Python molurus*	Guisap	*Varanus sp.*
Goma (Ghokra)	*Naza sp.*	Sona bang	*Rana tigrina*
Casshop	*Testudo sp.*	Gecho bang	*Rhacophorus sp.*
Kumir	*Crocodilus porosus*		
Guisap	*Varanus sp.*		
Sona bang	*Rana tigrina*		
Gecho bang	*Rhacophorus sp.*		

Fig. 4.16 Pond became dry effects of drought during 2009

Fig. 4.17 Effects of drought on banana garden during 2009

Fig. 4.18 Effects of drought on jujube garden during 2009

Fig. 4.19 Coconut tree does not bears fruit (effects of drought in recent years) in the study area

reptiles has been eliminated during the period 1970-2007. Tiger, fish-tiger, python were the common animals before 1970 but during 2007, they has been eliminated.

Local people reported that migratory birds used to visit in large numbers during the winter month in the beels are now totally absent (Tables 4.21 and 4.22). Also, the reduction in the abundance of indigenous fish species has been repeatedly mentioned in the RA in the area. The local fishermen reported the reduction in abundance of local fish species by 25% to 85%. The local people mentioned over fishing, obstacles in fish migration due to flood control devices and lack of reproductive ground of local non-migratory fish species for this decline.

Open-water fishes are seriously affected, their abundance greatly reduced, but the culture fish abundance in local ponds increased, though most of the species being exotic, Thai pangus, grass carp, mirror carp, silver carp, big head, nilotica, tilapia etc.

Indicator: Abundance of plant species

Changes in natural vegetation (section 4.2) directly affected the abundance of plant and tree species in the study area during 1970-2007. The spots of fallow lands and jungles had been removed after 1970s; the low lying wetland and grass lands were drained off and converted into crop lands during 1980s. Most of the aquatic weed and grass species including terrestrial plant species totally disappeared during this period. The villagers and old poor women reported that they used leafy wild plants as vegetables. These vegetables support them economically and provided nutrition. Table 4.23 indicates that upland villagers used most of the vegetables during 1970s but their availability has been decreased during 2007. Table 4.24 shows that in the lowland villages leafy wild vegetables were also reduced. Maximum family used these vegetables and due to lack of availability their used decreased during 2007 (case study 4).

Indicator: Change in building materials

The villagers mentioned that they made their house using bamboo, wood, straw, soil, khola etc. during 1970s. These materials were available in their villages or in fields. But higher demand and low availability of these materials and also for other resources now they built their house by bricks, cement, rods and G.I. sheets (Table 4.25).

Table 4.21
Some local and migratory birds in the study area

Local name	English Name	Scientific Name	Approximate no. Found	Residence status
ShamukBhanga /khol	AsianOpenbill/Open billed stork	*Anastomus oscitans*	1500	Resident and migratory
Brihot Pankowri	Great cormorant	*Phalacrocorax carbo*	300	Both resident and migratory.
Majhari Pankowri	Intermediate Cormorant	*Phalacrocorax fuscicollis*	200	Resident and migratory
Pankowri	Little cormorant	*Phalacrocorax niger*	500	Resident
Jathua or Boro Sada Bok	Great Egret	*Casmerodius albus*	500	Resident,locally migratory
Majhari Bok	Intermediate Egret	*Mesophoyx intermedia*	10	Resident,locally migratory
Choto Sada Bok	Little Egret	Egretta garzetta	500	Resident,locally migratory
Kana Bok	Pond heron	*Ardeola grayii*	500	Resident,locally migratory
Nishi Bok or Waak	Black-crowned Night heron	*Nycticorax nycticorax*	500	Resident,locally migratory
Ghughu	dove	*Streptopelia sp.*	300	Resident
Doel	Magpie	*Copsychus saularis*	150	Resident
Shama	Shama	*Copsychusmalabaricus*	50	Resident
Shalic	Common Myna	*Acridotheres tristis*	450	Resident
Goshalic	Pied Myna	*Sturnus contra*	3500	Resident
Bulbuli	Red Bulbul	*Phcnonotus cafer*	2500	Resident
Gobok	Cattle Egret	*Bubulcus ibis*	100	Resident

Table 4.22
Some endangered wild local birds in the study area during 2007

Local name	English Name	*Scientific Name*	Approximate no. Found	Residence status
Chill	Pariah Kite	*Milvus migrans*	8	Resident
Shankho Chill	Brahminy Kite	*Haliastur Indus*	2	Resident
Shukun	Vulture	*Gyps bengalensis*	13	Resident
Ban Murgi	Red Jangle Fowl	*Gallus gallus*	35	Resident
Dahuk	White Breasted Waterhen	*Amaurornis phooniurus*	150	Resident
Kayem	Purple Moorhen	*Porphyrio porphyrio*	4	Resident
Jalpipi	Bronzewinzed Jacana	*Metopidius indicus*	18	Resident
Kadakhocha	Fantail Snipe	*Gallinago gallinago*	15	Resident
Hatiti	Red Wattled Lapwing	*Vamellus indicus*	6	Resident
Hargila	Adjutant Stork	*Leptoptilos dubius*	10	Resident
Moibuz	Honey Buzzard	*Pernis ptilorhyncus*	20	Resident

Table 4.23

Number of household using/not using leafy wild vegetables in upland villages during 1970-2007

(Sample house hold=18)

Scientific name	Local name	1970		2007	
		Using	Not using	Using	Not using
Amaranthus spinosus	Katanote	18	0	18	0
Ipomoea sp.	Kolmi	16	2	16	2
Colocasia esculenta	Kochu	17	1	17	1
Alternanthera sp.	Helencha	17	1	18	0
Alocasia indica	Mankochu	16	2	16	2
Holarrhena antidysenterica	Thankuni	10	8	11	7
Sonneratia caseolaris	Dheki shak	16	2	16	2
Chenopodium album	Choale	18	0	18	0
Amaranthus viridis	Bothua	18	0	18	0
Amaranthus lividus	Bubkhura	18	0	18	0
Coccianea cordifolia	Ghykhura	5	13	6	12
Polycarpon prostratum	Telakuch	17	1	17	1
Lygadium sp.	Gima	4	14	4	14

Table 4.24

Number of household using/not using leafy wild vegetables in lowland villages during 1970-2007 (Sample house hold=18)

Scientific name	Local name	1970		2007	
		Using	Not using	Using	Not using
Amaranthus spinosus	Katanote	18	0	18	0
Ipomoea sp.	Kolmi	18	0	18	0
Colocasia esculenta	Kochu	12	6	15	3
Alternanthera sp.	Helencha	14	4	16	2
Alocasia indica	Mankochu	7	11	10	8
Holarrhena antidysenterica	Thankuni	17	1	13	5
Sonneratia caseolaris	Dheki shak	18	0	18	0
Chenopodium album	Choale	18	0	18	0
Amaranthus viridis	Bothua	18	0	18	0
Amaranthus lividus	Bubkhura	9	9	11	7
Coccianea cordifolia	Ghykhura	18	0	18	0
Polycarpon prostratum	Telakuch	4	14	6	12
Lygadium sp.	Gima	15	3	17	1

Case study 4

Case study of Mrs. Kalpana Rani

A class five passed house wife of village Pochamaria, Mrs. Kalpana Rani has been living in this home since her childhood. She is married to a local small farmer of the same village and has two children. Her husband owns only about 1 acre of agricultural land and a very small homestead.

From childhood she, with her fellow playmate used to gather leafy vegetables from fallow lands and crop fields. As children from poor marginal farmers, they had little money to buy vegetables. These wild leafy vegetables used to grow around their little homesteads, used to meet their daily demand.

When asked, she said that many different kinds of wild vegetables were easily available near their homes in the past. To meet the need, she said that she had to spend only half an hour before or after school, to collect enough leaves for daily consumption of her family. When asked to mention a few, she named kanta nate (*Amaranthus spinosus),* kalmi *(Ipomoea aquatica),* kachu *(Colocasia esculenta)*, Helencha (*Altemanthera sp.)*, Nate *(Amaranthus viridis)*, Bathua *(Chenopodium sp.),* Telakuch *(Coccianea cordifolia)*, Dheki(ferns), and Shapla or Shaluk*(Nymphea sp.)* etc.

But she said with a tone sadness and despair, very little wild leafy vegetables are available now. "You have to spend hours and walk miles to collect only a handful of leaves", she said. Mrs. Rani also said, "we or driloren seldom go out to gather these now-a-days".

Table 4.25

Changes in building materials used in the study area during 1970-2007

Village name		1970						2007						Change					
		Bamboo /Wood /Straw	Bamboo /Wood /Tin	Soil /Tin	Soil /Khola	Brick /Tin	Brick /Shed	Bamboo /Wood /Straw	Bamboo /Wood /Tin	Soil /Tin	Soil /Khola	Brick /Tin	Brick /Shed	Bamboo /Wood /Straw	Bamboo /Wood /Tin	Soil /Tin	Soil /Khola	Brick /Tin	Brick /Shed
Upland	V1	27	9	2	10	0	0	6	16	11	6	20	7	-21	+7	+9	-4	+20	+7
	V2	23	2	3	3	0	0	4	5	3	2	17	0	-19	+3	+14	-1	+17	0
	V3	17	8	0	1	0	0	3	13	2	0	17	0	-14	+5	+2	-1	+17	0
	Total	67	19	5	14	0	0	13	34	15	8	54	7	-54	+15	+25	-6	+59	+7
Lowland	V1	17	2	2	3	0	0	1	1	11	0	4	0	-16	-1	+9	-3	+4	0
	V2	18	7	0	0	0	0	4	5	8	0	8	0	-14	-2	+8	0	+8	0
	V3	19	3	0	0	0	0	2	7	14	0	2	0	-17	+4	+14	0	+2	0
	Total	54	12	2	3	0	0	7	13	33	0	14	0	-47	+1	+31	-3	+14	0

Indicator: Mat producing plants

The villagers and old poor women reported that they made their mats with palm leaf and mat grass for own use or for sale during 1970s. But lack of palm leaf and mat grass some of them buy these from market during 2007. Table 4.26 mentioned that mat producing household decreased and market demand increased during 2007.

Indicator: Availability of medicinal plant species

Local peoples and some selected 'Kabiraj' reported that many people in the study area used traditional medicine for their common diseases during 1970s, these medicinal plants were found local ecosystem and were available in the study area. Table 4.27 indicates the plants which was very common in the past (1970s) but these are very rare now and many of them were eliminated during the period 1970-2007.

Indicator: Abundance of varieties in cultivated species

A large number of local rice varieties were grown prior to 1970, before the introduction of the high yielding varieties. These local varieties, selected by local farmers, adapted to local soil and flood condition have been totally eliminated during 1980s (Table 4.28). Total land area for rice increased but area under other crop decreased in both areas during the period 1970-2007. This monoculture of rice resulted in loss of the crop species and their local varieties from the study area.

A serious reduction in other crop species has been documented during RA in the area (Table 4.29). This reduction in crop diversity and replacement of traditional cropping system by HYV- fertilizer package had severe effect on soil fertility, pest abundance and other ecosystem functions. Table 4.29 also indicates that local variety decline day by day both in the upland and lowland. Also, Boro varieties were not cultivated during 1970s but now the area under Boro is increasing. Local Aush and Aman are not grown in lowland at present time (2007).

Table 4.26

Number of households making mats for own consumption or sale 30% households in the study area during 1970-2007

Area	Name of plant	Village	1970		2007		Change	
			Own	Market	Own	Market	Own	Market
Upland	Mat (Palm leaf)	V1	45	0	42	3	-3	+3
		V2	12	0	12	0	0	0
		V3	14	0	12	2	-2	+2
		Total	71	0	66	5	-5	+5
	Mat (Mat grass)	V1	4	41	0	45	-4	+4
		V2	2	10	0	12	-2	+2
		V3	3	11	0	14	-3	+3
		Total	9	62	0	71	-9	+9
Low land	Mat (Palm leaf)	V1	6	0	5	1	-1	+1
		V2	10	0	8	2	-2	+2
		V3	14	0	14	0	0	0
		Total	30	0	27	3	-3	+3
	Mat (Mat grass)	V1	2	4	0	6	-2	-2
		V2	2	8	0	10	-2	-2
		V3	3	11	0	14	-3	-3
		Total	7	23	0	30	-7	-7

Table 4.27

Changes in Medicinal plant availability in the study area during 1970-2007

1970				2007			
Very common	Common	Rare	Very rare	Very common	Common	Rare	Very rare
Ocimum sanctum	*Rauwolfia serpentina*	*Atropa belladonna*	*Averrhoa carambola*	*Cynodon dactylon*	*Terminalia arjuna*	*Azadiracta indica*	*Ricinus communis*
Cynodon dactylon	*Solanum melongena*	*Asparagus racemosus*	*Hemidesmus indicus*	*Datura metel*	*Ocimum sanctum*	*Aegle sp*	*Piper nigrum*
Datura metel	*Allium cepa*	*Glycerrhiza glabra*	*Polyalthia longifolia*	*Colocasia esculenta*	*Calotropis procera*	*Syzygium cumini*	*Cinchona officinalis*
Calotropis procera	*Allium sativum*	*Coriandrum sativum*	*Terminalia arjuna*	*Brassica napus*	*Achyranthes aspera*	*Bombax ceiba*	*Acacia nylotica*
Achyranthes aspera	*Bombax ceiba*	*Nelumbium sp.*		*Solanum melongena*	*Adhatoda vasica*	*Acalypha indica*	*Ananas comosus*
Bucttneria pilosa	*Acalypha indica*	*Cinnamomum tamala*		*Allium cepa*	*Rauwolfia serpentina*	*Andrographis paniculata*	*Cassia alata*
Azadiracta indica	*Piper nigrum*			*Allium sativum*	*Averrhoa carambola*		*Atropa belladonna*
Colocasia esculenta	*Aloe indica*			*Aloe indica*			*Asparagus racemosus*
Adhatoda vasica	*Aconitum napellus*			*Citrus sp.*			*Glycerrhiza glabra*
Aegle sp.	*Andrographis paniculata*						*Coriandrum sativum*
Syzygium cumini	*Cinchona officinalis*						*Nelumbium sp.*
Brassica napus	*Cassia alata*						
Ricinus communis	*Acacia nylotica*						

Table 4.28

Comparative data of area under rice (area in acre) in upland and lowland villages during 1970-2007

Year	Village	Upland (Danga)				Lowland (Beel)			
		Total land for crops	Total land area for rice	Only rice	Rice+ others	Total land for crops	Total land area for rice	Only rice	Rice+ others
1970	V1	250	168	110	58	78	70	45	25
	V2	90	30	20	10	150	90	80	10
	V3	233	150	50	100	100	85	80	5
	Total	573	348	180	168	328	245	205	40
2007	V1	400	200	100	100	85	75	70	5
	V2	130	50	30	20	250	200	190	10
	V3	330	130	100	30	115	90	85	5
	Total	860	380	230	150	450	365	345	20

Table 4.29

Comparative data of land under rice variety (area in acre) in upland and lowland in the study area during 1970-2007

Year	Village	Upland (Danga)						Lowland (Beel)					
		Aush		Amon		Boro		Aush		Amon		Boro	
		LV	HYV	LV	HYV	LV	HYV	LV	HYV	LV	HYV	LV	HYV
1970	V1	40	8	105	15	0	0	20	0	45	5	0	0
	V2	7	3	18	2	0	0	12	3	70	5	0	0
	V3	35	5	100	10	0	0	3	12	65	5	0	0
	Total	82	16	223	27	0	0	35	15	180	15	0	0
2007	V1	2	8	3	7	5	175	0	0	0	0	0	75
	V2	1	2	3	4	2	38	0	0	0	0	5	195
	V3	3	7	15	25	5	75	0	0	0	0	5	85
	Total	6	17	21	36	12	288	0	0	0	0	10	355

4.12 Incidence of pests and diseases

Indicator: Number and amount of pesticides used

During the survey, local farmers of the area reported that the use of pesticides has increased rapidly with the introduction of HYVs. The villagers used no insecticides / pesticides during 1970s, but since 1990s the attacks of diseases and pests intensified and more and more amounts of different pesticide have to be used. Many pests and diseases were reported to become uncontrollable even with available pesticides and new diseases and pests are appearing in recent years (Table 4.30).

Indicator: Quantity of crop lost due to pests

The farmers reported that even after the use of pesticides, a significant proportion of crop ranging from 20% to 50 % were lost every year due to diseases and pests. This problem of crop loss due to pests and diseases has been escalating every year. Many different types of insects became very problematic causing huge damages every year especially between December and April. During 2009, green grass hopper and catter peller damaged a large number of paddy fields (Table 4.31).

Indicator: Diseases of domestic animals and fish

The villagers reported that though normally diseases of domestic animals are not a serious problem, the ulcer of fish has increased in the area. Diseases of the livestock generally occur after floods, though lack of fodder and inferior quality of feed result in malnutrition and ill health of domestic animals in general.

4.13 Agricultural resources

Indicator: Annual production of rice

The annual rice production trends are given in Table 4.32 during the study period. Total rice production has increased by 40 percent (1970 to 2007). Also the area under rice and yield increased (upland 50 and lowland 140 acres and 1.31 and 1.63, t/h respectively).

The Table 4.29, indicated a steady decline in local varieties and increase in HYVs, now (upland 75.7% and lowland 97.2%) of total rice produced is HYV.

Table 4.30

Number and amount of pesticides used in the study area during 1970-2007 (From six farmers)

Farmers name	Age	Total land (bigha)	Pesticides used	
			1970	2007
Ahad Ali Molla	75	25	No	Cypermethrine , Metalexyl, Sulphate, Hexaconazole, Profenophos, Mencozeb, Diazinone, Cartap/Diosulfan, Thiamethoxam 25 WG, Carbondazim, Carbofuran
Rabi Narayan Sarker	60	16	No	Cypermethrine , Metalexyl, Sulphate, Hexaconazole, Profenophos, Mencozeb, Diazinone, Cartap/Diosulfan, Thiamethoxam 25 WG, Dimethoate, Dicloran
Abdur Rahnan Mondal	70	40	No	Cypermethrine , Metalexyl, Sulphate, Hexaconazole, Profenophos, Mencozeb, Diazinone, Cartap/Diosulfan, Thiamethoxam 25 WG Fenvelerate, Emidoclocide 200 SL

Taher Uddin Pramanik	65	7	No	Cypermethrine , Metalexyl, Sulphate, Hexaconazole, Profenophos, Mencozeb, Diazinone, Cartap/Diosulfan, Thiamethoxam 25 WG Abamectine, PGR
MD.Shad Ali	56	5	No	Cypermethrine , Metalexyl, Sulphate, Hexaconazole, Profenophos, Mencozeb, Diazinone, Cartap/Diosulfan, Thiamethoxam 25 WG Propiconazole, Deltamethine 2.5 EC
MD.Nuruzzaman	58	12	No	Cypermethrine , Metalexyl, Sulphate, Hexaconazole, Profenophos, Mencozeb, Diazinone, Cartap/Diosulfan, Thiamethoxam 25 WG Carbodazim, Carbofurn

Table 4.31

Estimated quantity of crop lost due to pests during 2009

Name of the pest	Crop	Loss (Tk.)
Grass hopper	Paddy	320000
Cutter piller	Paddy	280000
Leda poca	Maize, Onion, Sugarcane, Vegetables	500000
Shoyo poca	Jute	50000

Group discussion with: Shahin Mahmud, Unus Ali Sarker, Alamgir Hossain, Shubvanta Kumar, Mohasin Pramanik.

Table 4.32

Annual production of rice (t/h) in the study area during 1970-2007

Year	Upland		Lowland	
	Land area (acres)	Yield (t/h)	Land area (acres)	Yield (t/h)
1970	180	0.87	205	1.09
2007	230	2.18	345	2.72

Source: RA and local farmer's interviews

Indicator: Production of other crops

Tables 4.33, 4.34, 4.35, 4.36, 4.37 and 4.38 show the trend in the production of other crops in the study area during 1970 to 2007. It was indicated from the RA that the type of crops cultivated by the farmers vary from year to year, and the market price and demand play an important role here.

Table 4.33 mentioned the land area of pulses. Total land area for lentil, lathyrus and gram decreased day by day but mung increased now in both upland and lowland. Total land area for pulses is more in upland than lowland.

Table 4.34 indicates the wheat area decreased day by day both land during 1970-2007. Maize was not cultivated during 1970s in lowland but it is increasing now.

Total land area for sugarcane and jute decreased in upland during 1970-2007. Sugarcane was not cultivated in the lowland areas. Jute was cultivated more in upland than lowland (Table 4.35).

Table 4.36 indicates that total land area for chili, coriander and garlic decreased in upland but increased in lowland during 1970-2007. Land area for the onion is increasing in recent years in both the area.

Total land area for oilseed decreased in both upland and lowland during the period 1970-2007. Indigenous species decreased day by day in both areas (Table 4.37).

Table 4.38 mentioned that total land area for vegetables is increasing both in the areas. During 1970-2007, local variety decreased and HYVs increased.

The change of crop diversity and yield over the period (1970-2007) was remarkable increased.

Indicator: Trend in domestic animals

The changes in the variety and production of domestic animals in the study area over the period 1970-2007 are given in Table 4.12. Number of domestic animals has decreased during the period 1970-2007 both upland and lowland but duck and chicken has been increasing in upland.

Indicator: Production of cultured fish

The results of RA indicated that pond fish culture has increased (Table 4.9), though the rate of production has changed little (around 500 to 550 kg/h). But some farmers reported a decline the production in some ponds.

Table 4.33

Land under pulses (area in acre) upland and lowland during 1970-2007

Year	Village	Upland (Danga)				Lowland (Beel)			
		Lentil	Lathyrus	Muag	Gram	Lentil	Lathyrus	Muag	Gram
1970	V1	50	95	0	5	3	21	0	1
	V2	17	15	1	2	1	0.5	0.4	0.1
	V3	25	70	3	2	3	15	0	2
	Total	92	18	4	9	7	36.5	0.4	3.1
2007	V1	5	2	2.5	0.5	1.5	0	0.5	0
	V2	10	1	3	1	1	0	0.5	0.5
	V3	7	2	4	1	1	0.5	0.4	0.1
	Total	22	5	9.5	2.5	3.5	0.5	1.4	0.6

Source: Group discussion with local farmers

Table 4.34

Land under other crops (area in acre) in upland and lowland during 1970-2007

Year	Village	Upland (Danga)		Lowland (Beel)	
		Wheat	Maize	Wheat	Maize
1970	V1	20	0	2	0
	V2	10	1	4	0
	V3	10	5	3	0
	Total	40	6	9	0
2007	V1	15	65	2	3
	V2	10	40	1	5
	V3	8	20	3	10
	Total	33	125	6	18

Source: Group discussion with local farmers

Table 4.35

Land under cash crops (area in acre) in upland and lowland during 1970-2007

Year	Village	Upland(Danga)		Lowland (Beel)	
		Sugarcane	Jute	Sugarcane	Jute
1970	V1	20	30	0	5
	V2	25	20	0	6
	V3	30	40	0	5
	Total	75	90	0	16
2007	V1	20	10	0	2
	V2	20	10	0	5
	V3	15	5	0	10
	Total	55	25	0	17

Source: Group discussion with local farmers

Table 4.36

Land under spices (area in acre) in upland and lowland during 1970-2007

Year	Village	Upland (Danga)					Lowland (Beel)				
		Turmeric	Chili	Coriander	Onion	Garlic	Turmeric	Chili	Coriander	Onion	Garlic
1970	V1	2	15	3	5	5	0.5	1	0.5	1	0
	V2	2	3	5	3	1	0.5	1	0.5	0.5	0.5
	V3	2	5	7	4	2	0.5	1	0.5	0.5	0.5
	Total	6	23	15	12	8	1.5	3	1.5	2	1
2007	V1	2	10	5	30	3	0.5	0.5	0.5	10	0.5
	V2	2	5	1	20	2	0.5	2	1	16	0.5
	V3	2	5	1	15	2	0.5	2	0.5	25	2
	Total	6	20	7	65	7	1.5	4.5	2	51	3

Source: Group discussion with local farmers

Table 4.37

Land under Oilseed crops (area in acre) in upland and lowland during 1970-2007

Year	Village	Upland (Danga)					Lowland (Beel)				
		Sesame	Linseed	Mustard	Sun flower	*Ricinus* sp.	Sesame	Linseed	Mustard	Sun flower	*Ricinus* sp.
1970	V1	80	40	10	5	2	25	0.5	4	0	0.5
	V2	10	6	8	0.5	0.5	6	4	5	0	0
	V3	80	10	25	3	2	4	2	3	0	0
	Total	170	56	43	8.5	4.5	35	6.5	12	0	0.5
2007	V1	6	0.5	7	1.4	0.1	1	0	2.5	0	0
	V2	3	0.5	16	0.5	0	1	0	1	0	0
	V3	4	0.5	5	0.5	0	1	0	6	0	0
	Total	13	1.5	28	2.4	0.1	3	0	9.5	0	0

Source: Group discussion with local farmers

Table 4.38

Study of land under Vegetables (area in acre) in upland and lowland during 1970-2007

Name	Upland (Danga)						Lowland (Beel)					
	1970			2007			1970			2007		
	V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3
Solanum tuberosum	5	3	4	6	5	10	0.5	2	1	0.5	1	2
Alocasia indica	0.1	0.5	0.5	2	0.5	0.5	0.1	0	0.1	0.2	0.5	0.5
Brassica olracea	0.5	0.5	0.5	0.5	0.5	0.5	0.2	0.5	0.1	0.1	0.5	0.5
Basella alba	0.1	0.5	0.5	0.5	0.5	0.5	0.1	0.5	0.5	0.2	0.5	1
Solanum melongena	3	1	1	2	1	2	0.5	0.3	0.3	1	1	3
Dolichos purpureus	1	2	0.5	1	2	1	0.2	0.5	1	0.5	0.5	1
Cucurbita maxima	1	1	1	3	2	2	0.1	0.2	0.2	0.5	1	3
Benincasa hispida	1	0.5	0.5	2	1	3	0.1	0.5	0.5	1	0.5	2
Lagenaria vulgaris	1	1	0.5	1	1	0.5	0.1	0.5	0.6	0.5	0.5	1
Carica papaya	0.3	1	0.5	3	5	2	0.2	0.5	0.5	2	1	3
Teichosanthes dioica	1	2	1	2	1.5	2	0	0	0	0	0	0
Lycopersicon sp.	1	1	0.5	2	1	1	0.3	0.5	0.2	1	1.5	2
Total	15	14	11	25	21	25	2.4	6	5	7.5	8.5	19

Source: Group discussion with local farmers

4.14 Other factors like chemical fertilizers and pesticides

The agricultural inputs like chemical fertilizers, pesticides, seeds of high yielding varieties also have impacts on the resource base of the study area.

Indicator: Amount chemical fertilizers used

Like all over Bangladesh, the use of chemical fertilizers was started during Mid-1970s. Before that, the local farmers used animal manure and organic fertilizers for cropping.

During recent years, the farmers have to use more and more fertilizers to maintain higher yield of crops. During 1970-2007, the amount of chemical fertilizer used per unit crop land had increased many folds (Table 4.39).

Indicator: Pesticides used per unit land

Along with the use of fertilizers, the use of pesticides, mostly insecticides, has increased more than 10 times (RA survey) or more during 1970-2007 in the study area.

Indicator: Improved seed adoption

The area under HYV seed has increased many folds in the study area during 1970-2007(Table 4.40). Till 1975, local farmers used to grow local crop varieties and keep their own seeds. The use of HYV seeds, in particular Boro rice, increased gradually with an access to irrigation in the area, especially with ground water (Fig. 4.20).

Indicator: Area irrigated by ground water

Before 1970, all irrigation was done using surface water from beels and ponds, by 1980s a number of shallow tube wells and in 1990s deep tube wells were introduced. The number of tube wells increased rapidly; currently most of the irrigation water comes from the ground water. A large number of hand operated tube wells provide drinking water, the number of which also increased rapidly (Table 4.41). Total irrigation covered by shallow wells 125 acres and deep wells 675 acres in upland and 60 acres and 380 acres in lowland at present respectively (Fig. 4.21).

Table 4.39

Chemical fertilizer used (%) in the study area during 1970-2007
(Six farmers from each village)

Area	Village	1970	2007
Upland	V1	1	76
	V2	0	70
	V3	0	56
Lowland	V1	0	72
	V2	0	76
	V3	0	81

Table 4.40

Seed source of some selected vegetables during 1970-2007

Total household counted =41

Name of the variety	1970				2007				Change		
	Seed source				Seed source				Seed source		
	Own	Other	Market	Total	Own	Other	Market	Total	Own	Other	Market
Dolichos sp.	16	8	2	26	23	12	6	41	+7	+4	+4
Cucurbita sp.	12	8	1	21	17	6	7	30	+5	-2	+6
Benincasa sp.	11	4	1	16	16	1	5	22	+5	-3	+4
Lagenaria sp.	14	8	1	23	17	6	6	29	+3	-2	+5
Brasella sp.	5	1	0	6	4	1	2	7	-1	0	+2
Brassica sp.	5	6	1	12	11	3	1	15	+6	-3	0
Total	63	35	6	104	88	29	27	144	+25	-6	+21

Table 4.41

Area irrigated by ground water in the study area at present (2008)

Tool name	Area in acres	
	Upland	Lowland
Shallow wells	125	60
Deep wells	675	380

Fig. 4.20 Exogenous species (HYV e.g. *Allium cepa*) replace against local species

Fig. 4.21 Irrigation controlled by Deep tube well (Ground water) in the study area in recent years

Chapter 5

5.1 Observed trends of the natural resource system

This chapter summaries the changes detected and trends observed in the natural resource system of the study area and the possible implications of these changes. Also, the factors affecting the natural resource base originating from outside eg. technology introduced and climate change impacts are emphasized.

The trends in the components of the natural resource system over the period 1970-2007 are summarized in the Table 5.1. The possible impacts, economic and environmental, are also indicated. It is apparent that though positive gains attained in rice production to a large extent, all other sectors indicated a persistent decline. This is, however, also true for the rest of the country as a whole. As population increased, the emphasis on rice production increased. This study, in a micro-level, examined what actually happened as a consequence of this over-emphasis on rice mono-culture and how sustainability of the natural resource system has been challenged due to this.

The livelihood of inhabitants of the study area, 90 percent being poor farmers, depend on natural resources most of which come from the local ecosystem eg. food, water, fodder and fuel. But, they are not isolated, factors outside the local ecosystem, both natural and man-made, also equally contribute to and influence their life. In the modern world of globalization and economic development, it is impossible to separate local and external influences; rather these are intimately inter-mixed, interacting and interdependent.

In spite of this, the importance of the local natural resource base in the satisfaction of needs of the village community is of utmost important. Village households most important needs come from the local natural resource base directly. Also, the users of marginalized resources are more vulnerable and like to income poorer (Dasgupta, 2001). The results of the present study indicates that, all the needs of the villagers except a very few, had been derived from the local nature in the past. The level of technology adoption was also low (Markandya, 2000). Rich diversity, both in the natural ecosystem and agriculture, could meet most of the demands of the local households even during 1970s.

Table 5.1

Summary of changes in the natural resource base

Item	Change	Possible impact
1. Cultivated land	Increased (19.6%)	Higher production, negative environmental impact
2. Perennial water bodies ponds	Increased	More surface water, positive
3. Low flooded land	Decreased	Negative environmental impact
4. Fallow land	Decreased	Higher production, negative environmental impact
5. Natural vegetation and trees	Decreased	Negative environmental impact
6. Tree diversity	Decreased	Negative change
7. Soil fertility	Decreased	Negative impact on production and environment
8. Organic matter	Decreased	Negative
9. Paddy straw	Decreased	Negative
10. Cattle dung	Decreased	Negative
11. Aquatic and dry land weeds	Decreased	Negative
12. Open water fishery	Decreased	Negative
13. Fish diversity	Decreased	Negative
14. Water resources	Declined	Negative
15.Water availability in dry season	Declined	Negative
16.Surface and ground water level	Declined	Negative
17. Rain water: fluctuation	Increased	Negative
18. Inundation: rain and flood water	Increased	Negative
19. Shortage of water	Intensified	Negative
20. Biodiversity: species	Decreased	Negative
21.Habitat destruction	Wide spread	Negative
22.Abundance of flora and fauna	Declined	Negative
23. Crop diversity	Decreased	Negative
24. Incidence of pests and diseases	Increased	Negative
25. Leafy wild vegetables	Decreased	Negative
26. Plant materials for domestic use	Decreased	Negative
27. Medicinal plants for community use	Decreased	Negative
28.Paddy area and production	Increased	Economic gain
29.Other crops production	Declined	Negative economic and environmental impact
30. Domestic animal resources	Declined	Negative
31. Culture fish	Increased	Economic gain
32. Chemical fertilizer and pesticide use	Increased	Economic gain but negative environmental impact

5.2 Stability of the system and climate change

However, the increased demand on resources due to population increase and market economy, though increased rice production through adoption of modern agriculture, has challenged the sustainability of the agricultural production system by weakening the local natural resource base. In addition to the continued decline in soil fertility in the study area, stability of agricultural production has been challenged by three main climate-related seasonal factors. These are:

-drought in the Rabi season

-rainfall related instability in Kharif 1 season

-flood from river water in the Kharif 2 season

The large productivity losses of field and paddy crops observed in the study area become a major threat to the stability of annual productivity.

The introduced technology, HYV rice with high fertilizer, irrigation and insecticide inputs being more sensitive to the strong disturbances of the environment contribute strongly to the reduced stability of production. As the global climate change impacts are already apparent in this part of the world, these environmental disturbances (floods, drought, irregularity in rainfall and temperature) are very likely to intensify in future and the sustainability of agricultural production will be more vulnerable.

Varied and complex linkages exist between climate change and sustainable development. But there is little systematic examination how these linkages may be analyzed and used for sustainable development. Toth (2001) suggested that sustainable development requires changes in technological patterns of resource base, production of goods, structural changes in production systems, economic activities and changes in life styles. The action to address climate change should not be separated from the actions in pursuit of economic, social and environmental gains.

In fact, as an external factor, the impacts of global climate change, will affect more deeply to an agricultural production system which depends more heavily on the fragile and in-put dependant HYV rice. Loss of crop diversity will also make the production system vulnerable to the vagaries of global climate change. Another more vulnerable component in the culture fishery which has to be farmed in protected and resource-dependant controlled environment.

The present study of the changes and trends from 1970 to 2007 in the natural resource base also indicates that the system is facing a gradual reduction in stability due to a change towards less diverse resource utilization pattern in many respects. For example, crops became less diverse; fishery lost diversity, trees and domestic animals lost diversity too. Also, the trend is towards a more external inputs dependant agriculture-HYV, chemical fertilizers, pesticides-all are from outside. Even, the crops have become dependant on more stable environment. All these contribute to the loss of stability of the production system, which will be intensified in the face of global climate change.

5.3 Sustainability of the system

The present investigation, though demonstrated an over-all negative trend for most of the components of the study area's natural resource base, the system has been able to maintain its productivity in spite of these declines. However, it is important to consider whether the natural resource system still possesses this ability to maintain its productivity in the face of 'major disturbance' in future with same resilience(Nasreen, 2000).

The study identified two classes of such hazard which the production system may face:

(a) a sudden major disturbance from the environment such a devastating flood or prolonged drought;

(b) a gradual and cumulative one like decline in soil fertility or build-up of pests and diseases.

The author's observation and the local people's opinion suggested that the study area is already experiencing a large number of different continuous stress factors and their intensity is gradually increasing with time. The most frequently mentioned were the decline in soil fertility and building-up of pests and diseases. The other factors considered serious were drought, instability of rainfall and increasing population. In addition to intensification of need and increasing pressure on the local natural resource system due to local population increase, the local and outside market force also contribute to increased demand and intensification of resource use (Aylward and Barbier, 1992). Thus, the sustainability of the local resource system is under threat and productivity begins to decline rapidly and persistently.

The concept of sustainable production stresses on the preservation of the natural resource base (Sen, 2000) but most all components of which in the study area showed decline during 1970-2007. Thus, a huge uncertainty hangs over the future of the study area in terms of sustainability.

5.4 Soil fertility: major concern

As the economic activities of the study area is overwhelmly dependant on agriculture, the gradual decline in soil fertility has been a major concern of the farmers (Biswas, 1994). A major cause of this decline is the disruption of the biogeochemical cycle- the crops, the crop residues, even the weeds and other biomass of the land concerned were harvested and moved away. No organic matter and soil nutrients are given back to the soil. Decline in the use of organic manure and green manure, collection of leaves and weeds from crop fields became necessary because the inhabitants need domestic fuel for cooking, rice parboiling, and sugarcane juice concentrating and heating.

The decline in cattle population and removal of tree and vegetation cover has also contributed to this degradation. Many investigations showed that natural biomass is positively related increased agricultural production. This is because most of the tropical soils owe their productive qualities to the protective role of the trees. Trees help accelerate the formation of top soil, the creation of favorable soil structure, the storage of soil nutrients used by crops by reducing erosion and silting and by regulation of stream flows.

5.5 Decline in biodiversity: another threat of sustainability

The rapid decline of diversity is another important indicator that the local natural resource system is under risk. Diversity of the local flora, fauna and even crops and domestic animals has decreased. There has been little effort from the local community to conserve the diversity in the components of the system (Gadgil et al. 1993). The drive from earning their living and economic development, the local people adopted whatever technology, crops and intervention they were offered or they could find for increased production. They never considered the impacts of the change in future, also the concept of stability and sustainability of production were ignored (Gadgil and Barkers, 1991).

The question is why the inhabitants behaved this why? In group discursions and the author's observation indicated that prevailing extreme poverty of the local resource users compelled them to abandon their traditional practices and norms of conservation. The income of the majority of the households in the study area remained at a subsistence level for ages, they hardly were able to make any savings or invest for the maintenance of their production system (Lopez, 1992).

Adoption of modern agriculture, high and increasing costs of inputs and lower return from land and market turned the land users poorer and poorer with time (Evenson and Gollin, 2003).

With this was added the problems arising from the environment, sudden floods, repeated inundations, drought, untimely rainfall, storms and cyclones contributed to loss of production and intense poverty. The decline in fish, animals and biodiversity affected badly the poor fisherman and natural resource users.

5.6 Results of other similar studies

A number of research and survey have been done in Bangladesh which were similar to this study and many of the trends in the natural resource system are documented with same trend as in the present study.

Some are FAP 12 (1992), FAP 2 (1993), FAP 6 (1993), Hughes et al. (1994), Rahman et al. (1994), Pagiola (1995), Alam (1996), FSES-BAU (1996), Samina et al. (1996), Zuberi (1996). Most of the trends eg. decline in various components in the natural resource system, are generally in agreement with the outcomes of the present study. Especially the findings of the UK-DFID funded project, Land-Water-Interface (LWI) programme (Alam, 1996 and Zuberi, 1996) carried out in the Ganges floodplains, also indicated the constraints to sustainable development on line with the findings of the present research.

Chapter 6
Summary and conclusions

Prospect in terms of sustainable development

The major findings of the study are summarized in this chapter and some general conclusions are presented in the light of these findings.

The main factors of the natural resource system of the study area have been identified and the trends of natural resource utilization of the inhabitants and impacts over 1970-2007 have been presented. The complicated process of identification and measurement has been explained.

The findings clearly indicate an intense pressure on the natural resource base due to over-exploitation and lack of conservation; the various components are now failing to regenerate. The sad aspect is, even after intense use, the need of the local community remained unsatisfied-thus the over-exploitation continued to intense. Also, the degree of frustration of the under-satisfied resource users leads to decreased care of the resource base thus increases the degradation and instability. This situation was found to exist and gradually intensify over the period of 1970-2007 and the ecosystem has been under continuous stress through the entire period. The symptoms of breakdown of sustainable production capabilities became evident during the study.

Impact of external factors such as global climate change, inflow of new technologies and pressure of the external markets added to the environmental degradation of the resource base.

The documentation of the components of natural resource base and identification of the trends is expected to enable comparing the state of these at any future time and thus will enable to take proper remediation steps for sustainable management. These remediation steps can help in climate change adaptations, sustainability attaining, ecological restoration, biodiversity conservation, planning for renewable energy resource and for developing innovative approaches for solving complex environmental problems.

The main remediation step would be to repair and rehabilitate the natural resource system and to increase the capacity of the agricultural production system of the study area. The first step to do this, an integrated approach should be adopted to use and manage the components of the resource base. A system approach be adopted where the interrelationship among the components should be considered to achieve a sustainable utilization system.

For this, monoculture should be replaced by integrated and organic agriculture; the resource utilization should be diversified; to attain sustainability as well as enhanced productivity. Emphasis on crop-based system should be reduced and non-crop, natural resource based production system be expanded, open water fishery, animal production, fruit and vegetable sector can shift pressure from the sick resource base.

Another important step is to restore and conserve the habitats of wild plants and animals to bring back the ecosystem health so that sustainable supply of ecosystem goods and services can resume. Most important here is the restoration of the local stock of biodiversity. The local community should be involved here.

Biodiversity conservation is rarely viewed as a local priority, rather often remains dependent on centralized concept and donor support. Even local people are considered as problem in conservation. This study indicated that conservation should not be limited to large protected areas like the Sundarbans and confined solely to professional conservationists. It is possible to maintain considerable biodiversity in areas used for other purposes, like a village ecosystem. This can be possible by gaining the cooperation and participation of the local people, farmers and land managers. This study integrated survey inventory with information on how people view and value their natural environment which helps in conservation also addressing needs of the local people. One key constraints of the study area is the supply of energy resources.

Energy is the life of modern civilization. The people of the study area also need energy for their survival. Though most of the global primary energy use (87%) is from fossil fuel eg. (natural gas, oil and coal) these are not available to the people of the study area except diesel for irrigation pumps and kerosene for domestic use for light. Most of the energy used by the villagers is for cooking, parboiling rice and other foods processing. Regeneration of sources of biomass fuel is to be supplemented with provision of coal, natural gas or electricity for the local community. The energy resource can be put under

control and management of local community. Community based management has been recognized as an appropriate approach to conserve natural resources. It is considered that local communities have higher stakes, better knowledge and increased interest in the resource base.

Though implantation of community based management has problems to overcome, these are recent examples of success in attaining sustainable management of natural resources (BP, 2005).

It is very true these natural systems, like the natural resource system of the study area, are very complex. For sustainability of such complex system, consistency in resource use and management is crucial. This involves actions, objectives, scientific information and guidance be consistent with sustainable management questions. But the studied natural system of the villages concerned is largely devoid of such consistency. Human decision making are largely drived by the external market forces in addition to the local domestic needs of the households. Uncertainties of the climate, ground water, land degradation, availability of inputs and adoption of new technologies (modern agriculture and crops like jujube and banana cultivation) had introduced large inconsistency to the local system.

So, management should ideally include change or modification with consistency that is systemic pattern-based management which can bring back stability in the system.

Further research may focus on identifying specific trends and consequences of resource use, identify the impact on the inter-relationship of the components of the system and use a resource development model to further assess and monitor resource use, impacts and development potentials.

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Appendix 1

Changes in water supply in village 1 (Danga) during 1970-2007

Tools name	1970	2007	Change
	No.	No.	
Ring well	9	0	-9
Tube well	1	48	+47
Deep well	1	2	+1
Shallow well	0	30	+30
Pond	12	14	+2
Total	23	94	+71

Changes in water supply in village 2 (Danga) during 1970-2007

Tools name	1970	2007	Change
	No.	No.	
Ring well	2	0	-2
Tube well	1	14	+13
Deep well	0	1	+1
Shallow well	0	3	+3
Pond	4	5	+1
Total	7	23	+16

Changes in water supply in village 3 (Danga) during 1970-2007

Tools name	1970	2007	Change
	No.	No.	
Ring well	6	0	-6
Tube well	1	12	+11
Deep well	1	2	+1
Shallow well	0	30	+30
Pond	12	13	+1
Total	20	57	+37

Contd.

Changes in water supply in village 1 (Beel) during 1970-2007

Tools name	1970	2007	Change
	No.	No.	
Ring well	1	0	-1
Tube well	0	7	+7
Deep well	0	1	+1
Shallow well	0	12	+12
Pond	4	5	+1
Total	5	25	+20

Changes in water supply in village 2 (Beel) during 1970-2007

Tools name	1970	2007	Change
	No.	No.	
Ring well	1	0	-1
Tube well	0	18	+18
Deep well	0	3	+3
Shallow well	0	15	+15
Pond	6	10	+4
Total	7	46	+39

Changes in water supply in village 3 (Beel) during 1970-2007

Tools name	1970	2007	Change
	No.	No.	
Ring well	2	0	-2
Tube well	0	24	+24
Deep well	1	1	+0
Shallow well	0	15	+15
Pond	6	7	+1
Total	9	47	+38

Appendix 2

Food plants in village 1 (Beel)

Plant name	Past			present			Age		Past		present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Under-5	5+	S	G	S	G
Litchi chinensis	1931-50	0,0,0,0,0,0	0	1991-2007	2,0,0,0,0,0	2	2	0	1	0	0	2
	1951-70	0,0,0,0,0,0	0									
	1971-90	1,0,0,0,0,0	1									
Psidium guajava	1931-50	1,1,0,0,0,0	2	1991-2007	3,2,0,0,1,1	7	7	5	6	0	5	2
	1951-70	0,0,0,0,0,0	0									
	1971-90	1,0,0,2,0,1	4									
Zizyphus mauritiana	1931-50	1,0,1,0,0,0	2	1991-2007	50,2,2,0,0,0	54	45	9	5	0	4	50
	1951-70	1,1,0,0,0,0	2									
	1971-90	1,0,0,0,0,0	1									
Citrus sp.	1931-50	0,0,0,0,0,0	0	1991-2007	3,1,1,1,0,2	8	6	2	4	2	6	2
	1951-70	1,0,0,0,0,0	1									
	1971-90	1,1,1,0,1,1	5									
Spondias dulsis	1931-50	0,0,0,0,0,0	0	1991-2007	2,0,0,1,1,0	4	3	1	1	0	4	0
	1951-70	0,0,0,0,0,0	0									
	1971-90	1,0,0,0,0,0	1									
Averrhoa camrambola	1931-50	0,0,0,0,0,0	0	1991-2007	1,0,0,0,0,0	1	1	0	0	0	0	1
	1951-70	0,0,0,0,0,0	0									
	1971-90	0,0,0,0,0,0	0									
Syzygium samarengense	1931-50	0,0,0,0,0,0	0	1991-2007	1,0,0,0,0,0	1	1	0	0	0	0	1
	1951-70	0,0,0,0,0,0	0									
	1971-90	0.0.0.0.0.0	0									
Annona sp.	1931-50	1.0.0.0.0.0	1	1991-2007	0.0.0.0.0.0	0	0	0	5	0	0	0
	1951-70	1.1.0.0.0.0	2									
	1971-90	0.1.0.0.1.0	2									
Punica granatum	1931-50	0.0.0.0.0.0	0	1991-2007	1.0.0.0.0.0	1	1	0	0	2	0	1
	1951-70	0.0.0.0.0.0	0									
	1971-90	1.1.0.0.0.0	2									
Aegle sp.	1931-50	2,0,2,0,0,0	4	1991-2007	1,0,2,0,0,1	4	2	2	10	0	4	0
	1951-70	1,0,1,0,0,0	2									
	1971-90	2,0,1,0,0,1	4									
Areca catechu	1931-50	3,1,1,0,0,0	5	1991-2007	17,3,7,0,2,0	29	9	20	10	0	29	0
	1951-70	1,1,1,0,0,0	3									
	1971-90	1,0,1,0,0,,0	2									

Contd.

S= Seedling, G= Graft

Food plants in village 2(Beel)

Plant name	Past			present			Age		Past		present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Under-5	5+	S	G	S	G
Litchi chinensis	1931-50	0,0,0,2,0,0,0,0,0,0,0,0,0,0	2	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,0,1,0	1	1	0	5	3	0	1
	1951-70	0,2,0,1,0,0,0,2,0,0,0,0,0,1,0	6									
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
Psidium guajava	1931-50	0,0,0,0,0,0,0,0,1,0,0,0,0,0,0	1	1991-2007	0,5,1,2,1,2,1,3,0,0,0,1,4,0,1	21	16	5	11	0	19	2
	1951-70	1,0,0,0,0,1,0,0,1,0,0,0,0,0,0	3									
	1971-90	1,0,0,0,0,2,1,0,0,0,0,2,1,0,0	7									
Zizyphus mauritiana	1931-50	0,1,0,0,0,0,0,0,0,0,0,0,0,0,0	1	1991-2007	0,1,0,0,0,4,17,0,0,0,0,0,6,8,1	37	34	3	6	2	4	33
	1951-70	0,1,0,0,0,0,0,2,0,0,1,0,0,0,0	4									
	1971-90	1,0,0,0,0,0,0,0,0,0,1,1,0,0	3									
Citrus sp.	1931-50	0,0,0,1,0,0,0,0,0,0,0,0,0,0,0	1	1991-2007	0,0,0,1,2,3,1,4,1,0,0,1,4,1,2	20	14	6	4	1	16	4
	1951-70	0,0,0,0,0,0,0,0,1,0,0,0,0,0,0	1									
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,2,0,1	3									
Spondias dulsis	1931-50	0,0,0,1,0,0,0,0,0,0,0,0,0,0,0	1	1991-2007	0,0,0,0,0,1,0,0,0,0,0,0,0,0,0	1	0	1	3	0	1	0
	1951-70	0,1,0,0,0,0,0,0,0,0,0,0,0,0,0	1									
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,1	1									
Averrhoa camrambola	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,1,0,0,0,0,0,0,0,0,0	1	0	1	0	0	0	1
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
Syzygium samarengense	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,0,0,1	1	0	1	0	0	0	1
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
Annona sp.	1931-50	0,0,0,1,0,0,0,0,0,0,0,0,0,0,0	1	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	0	0	1	0	0	0
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
Punica granatum	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	0	0	0	0	0	0
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
Aegle sp.	1931-50	0,0,0,1,0,0,0,0,1,0,0,0,0,0,0	2	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,2,0,0	2	1	1	7	0	2	0
	1951-70	1,0,0,0,0,0,0,1,0,0,0,0,0,0,0	2									
	1971-90	1,0,0,0,0,0,0,0,0,0,0,2,0,0	3									
Areca catechu	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	2,0,0,0,5,0,0,20,2,0,0,0,2,1,3	35	26	9	4	0	35	0
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
	1971-90	1,0,0,0,0,0,0,0,0,0,0,3,0,0	4									

Contd.

S= Seedling, G= Graft

Food plants in village 3 (Beel)

Plant name	Past			present			Age		Past		present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Under-5	5+	S	G	S	G
Litchi chinensis	1931-50	0,0,0,0,0,0,0,0,0,0	0	1991-2007	1,0,0,0,0,0,0,13,6,1	21	19	2	0	0	0	21
	1951-70	0,0,0,0,0,0,0,0,0,0	0									
	1971-90	0,0,0,0,0,0,0,0,0,0	0									
Psidium guajava	1931-50	1,2,0,0,0,0,0,0,0,0	3	1991-2007	1,1,4,1,0,1,2,1,3,1	15	8	7	15	0	15	0
	1951-70	1,0,1,0,0,0,0,0,2,0	5									
	1971-90	3,0,0,0,0,0,0,2,0,2	7									
Zizyphus mauritiana	1931-50	1,2,0,0,0,0,1,0,0,0	4	1991-2007	1,1,0,0,0,0,1,49,16,2	70	59	11	2	15	6	64
	1951-70	2,0,0,0,0,1,0,5,1,1	10									
	1971-90	2,0,0,0,0,0,0,0,0,1	3									
Citrus sp.	1931-50	1,1,0,0,0,0,0,0,0,0	2	1991-2007	3,1,1,0,0,1,2,1,2,2	13	8	5	5	3	7	6
	1951-70	2,0,0,0,0,0,0,0,0,0	2									
	1971-90	3,0,0,0,0,0,0,0,1,0	4									
Spondias dulsis	1931-50	0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,2,0,0,0,1,1,1,0	5	1	4	1	0	5	0
	1951-70	0,0,0,0,0,0,0,0,0,0	0									
	1971-90	1,0,0,0,0,0,0,0,0,0	1									
Averrhoa camrambola	1931-50	0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,1,0,0,0,0,0,0,1	2	1	1	0	0	2	0
	1951-70	0,0,0,0,0,0,0,0,0,0	0									
	1971-90	0,0,0,0,0,0,0,0,0,0	0									
Syzygium samarengense	1931-50	0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,1,0,0	1	0	1	1	0	1	0
	1951-70	0,0,0,0,0,0,0,0,0,0	0									
	1971-90	1,0,0,0,0,0,0,0,0,0	1									
Annona sp.	1931-50	0,0,0,0,0,0,0,0,1,0	1	1991-2007	0,0,2,0,1,1,0,1,0,0	5	2	3	3	0	5	0
	1951-70	0,0,0,0,0,0,0,0,1,0	1									
	1971-90	0,0,0,0,0,0,1,0,0,0	1									
Punica granatum	1931-50	0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,1,1,0	2	0	2	0	3	0	2
	1951-70	0,0,0,0,0,0,0,0,1,1	2									
	1971-90	0,0,0,0,0,0,0,0,0,1	1									
Aegle sp.	1931-50	0,1,0,0,0,0,0,0,1,0	2	1991-2007	0,0,0,0,0,0,1,0,0,1	2	1	1	8	0	2	0
	1951-70	0,0,1,0,0,0,0,2,0,0	3									
	1971-90	2,0,0,0,0,0,0,0,0,1	3									
Areca catechu	1931-50	0,2,0,0,0,0,0,0,0,0	2	1991-2007	5,4,3,0,3,1,2,30,15,3	66	55	11	7	0	66	0
	1951-70	0,0,0,0,0,0,0,0,2,0	2									
	1971-90	0,0,0,0,2,0,0,0,1,0	3									

Contd.

S= Seedling, G= Graft

Food plants in village 1(Danga)

Plant name	Past			present			Age		Past		present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Zuvinile	Mature	S	G	S	G
Litchi chinensis	1931-50	0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0	3	1991-2007	5,0,7,0,10,1,0,0,0,0,1,0,0,1,1,0,0,2,1,0,0,0,6,0,7,2,0,0,0,0,10,0,0,5,0,1,0,1,0	61	29	32	14	3	2	59
	1951-70	0,0,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0	6									
	1971-90	0,0,1,0,2,1,0,0,0,0,0,0,0,0,0,0,0,2,0,0,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,0,0,0,0	8									
Psidium guajava	1931-50	1,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1	4	1991-2007	4,2,7,1,5,3,2,1,0,0,2,4,1,1,3,1,4,3,4,1,1,1,3,1,2,2,1,1,1,0,2,0,7,1,2,1,0,1,0	76	38	38	60	0	76	0
	1951-70	1,0,0,0,1,1,0,0,1,0,0,0,0,0,1,0,0,2,0,0,0,0,0,0,0,0,1,0,1,1,1,1,0,0,1,0,0,1,1,1	16									
	1971-90	1,0,2,1,1,2,0,1,0,0,1,1,0,1,1,2,3,2,0,0,2,0,0,0,2,2,1,1,1,1,1,1,0,3,1,0,2,2,1	40									
Zizyphus mauritiana	1931-50	2,0,1,0,1,1,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1	7	1991-2007	195,2,200,3,20,7,101,1,0,0,2,25,1,1,2,0,0,200,30,1,1,11,3,0,136,2,0,2,1,0,50,0,1,15,2,2,1,320,34	1372	1340	32	47	4	23	1349
	1951-70	1,0,2,1,1,1,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,1,0,0,0,0,0,0,1,4,0,0,0,0,0,0,0,1,1	16									
	1971-90	1,0,2,1,2,1,0,1,0,0,1,1,0,1,2,0,0,1,0,1,1,1,0,0,1,1,1,1,1,0,0,1,0,1,1,0,0,2,1	28									
Citrus sp.	1931-50	0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	1	1991-2007	5,2,8,0,2,0,2,1,0,0,3,0,0,0,4,0,1,2,1,1,1,0,3,1,60,0,0,0,1,1,1,0,0,1,0,0,0,3,0	103	82	21	37	3	20	83
	1951-70	1,0,1,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,1,0,1,0,0,0,0,0,1,0,1,0,0,1,0,0,0,1,0	10									
	1971-90	1,0,1,0,1,0,0,2,0,0,1,5,0,0,1,0,0,2,0,0,2,0,2,0,1,0,0,0,4,1,1,0,0,2,1,0,0,1,0	29									

Contd.

Spondias dulsis	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0	0	1991-2007	2,0,1,0,2,1,0,0,0,0,1,1 1,0,1,1,0,6,4,2,0,0,0,1 ,0,2,0,0,1,0,1,0,0,1,0, 1,0,0,0	30	13	17	8	0	30	0
	1951-70	0,0,0,0,0,1,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0	1									
	1971-90	0,0,1,0,0,0,0,0,0,0,0,0,0,0,0, 0,2,1,0,0,0,0,2,0,1,0,0,0,0,0, 0,0,0,0,0,0,0,0,0	7									
Averrhoa camrambola	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0	0	1991-2007	1,0,2,0,3,1,0,0,0,0,0,1 ,0,0,1,0,0,0,1,0,0,0,1, 0,1,1,0,0,1,0,0,0,0,0,0 ,0,0,1,0	15	3	12	3	0	15	0
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0	0									
	1971-90	0,0,1,0,0,1,0,0,0,0,0,0,0,0,0, 0,0,0,0,1,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0	3									
Syzygium samarengense	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,1,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0,0,0,0,0,0,1, 0,1,0,0,0,0,0,0,0,0,0,0 ,0,0,0,0	3	0	3	0	5	0	3
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0	0									
	1971-90	0,1,1,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,1,0,1,0,0,0,0,0, 0,0,0,1,0,0,0,0,0	5									
Annona sp.	1931-50	5,0,5,1,8,0,0,0,0,0,0,0,0,0,1, 0,0,0,0,0,0,0,0,0,0,0,0,0,1,0, 0,0,0,0,0,0,0,5,5	31	1991-2007	2,1,3,0,6,0,0,0,0,0,2,0 ,1,0,0,2,0,0,2,1,0,0,0, 1,0,0,0,0,0,0,0,3,0,0,4 ,0,0,0,2,0	30	8	22	100	0	30	0
	1951-70	3,0,7,1,5,1,0,1,0,0,1,1,1,0,2, 0,0,1,0,0,0,0,0,0,0,0,0,0,1,2, 0,0,0,1,0,0,0,3,3	34									
	1971-90	4,0,5,1,2,1,0,2,0,0,2,2,1,0,2, 0,0,2,0,0,0,0,0,0,0,0,0,0,1,3, 1,0,0,2,0,0,0,2,2	35									

Contd.

Punica granatum	1931-50	1,0,1,0,0,0,0,0,0,0,0,0,0,0, 0,0,1,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0	3	1991-2007	2,0,1,0,0,0,1,1,0,0,2,0 ,0,0,0,0,0,3,1,0,0,0,0, 0,0,1,0,0,0,0,3,0,0,0,0 ,0,0,1,0	16	4	12	15	0	12	4
	1951-70	1,0,1,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0	2									
	1971-90	1,0,1,0,0,0,0,0,0,0,0,0,0,0, 0,0,2,0,0,0,0,0,0,0,0,0,0,0, 1,0,0,3,0,0,0,2,0	10									
Aegle sp.	1931-50	4,0,5,0,3,0,0,0,0,0,0,1,0,0, 0,0,0,0,0,0,0,0,0,0,0,0,0,2, 0,0,0,0,0,0,0,1,0	16	1991-2007	3,1,2,0,4,1,0,0,0,0,2,0 ,3,0,0,0,0,1,0,1,0,0,1, 0,1,0,0,0,0,0,0,0,0,1,1 ,0,0,2,0	23	10	13	53	0	23	0
	1951-70	3,0,3,0,2,0,0,0,0,0,0,0,0,0, 0,0,1,1,0,0,0,0,0,1,0,0,0,1,1, 0,0,0,0,0,0,0,1,0	14									
	1971-90	3,1,2,0,2,1,0,0,0,0,0,0,0,1, 1,0,2,1,1,0,0,0,0,0,0,0,4,2, 0,0,0,1,0,0,0,1,0	23									
Areca catechu	1931-50	3,0,10,1,10,0,0,0,0,0,0,0,0, 0,0,1,0,0,0,0,0,0,3,0,0,0,1,10 ,0,0,0,0,0,0,0,0,5,0	44	1991-2007	5,5,50,0,50,1,0,0,0,0, 0,0,0,0,10,1,10,30,50, 0,0,0,25,3,60,0,0,2,12 ,5,25,0,1,25,7,3,0,60, 0	440	257	183	212	0	440	0
	1951-70	4,0,15,1,7,0,0,0,0,0,0,0,0,1 0,0,1,0,0,0,0,0,0,13,0,0,0,2, 10,0,0,0,0,0,0,0,10,0	71									
	1971-90	8,0,5,2,13,1,0,0,0,0,0,0,0,2,1 ,0,0,1,0,0,0,0,2,0,14,0,0,0,4, 10,3,0,0,0,0,0,0,25,0	97									

S= Seedling, G= Graft

Contd.

Food plants in village 2 (Danga)

Plant name	Past			present			Age		Past		present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Zuvinile	Mature	S	G	S	G
Litchi chinensis	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,5,0,1,65,7,0,0,0,0,25	103	30	73	2	3	0	103
	1951-70	0,0,0,0,0,0,0,0,0,0,0,1	1									
	1971-90	0,0,1,2,0,0,0,0,0,0,0,1	4									
Psidium guajava	1931-50	0,0,0,0,0,0,1,0,0,0,0,0	1	1991-2007	2,2,3,4,3,207,2,0,3,0,1,146	373	300	73	19	0	253	20
	1951-70	0,0,1,0,0,0,2,0,0,0,0,2	5									
	1971-90	0,1,0,2,3,2,1,1,0,0,1,2	13									
Zizyphus mauritiana	1931-50	0,1,0,0,0,0,0,0,0,0,0,0	1	1991-2007	1,17,200,12,150,400,150,0,5,0,0,100	1081	1000	81	15	7	30	1051
	1951-70	0,1,0,0,1,0,2,0,0,0,0,1	5									
	1971-90	0,1,2,1,1,3,6,1,1,0,0,0	16									
Citrus sp.	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,5,9,1,250,17,1,1,2,0,16	302	270	32	12	13	50	252
	1951-70	0,0,2,0,0,0,3,0,0,0,0,0	5									
	1971-90	1,2,3,8,2,3,0,0,0,0,0,1	20									
Spondias dulsis	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,1,0,1,2,5,0,1,0,1,2	13	5	8	5	0	13	0
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0	0									
	1971-90	0,0,1,1,2,1,0,0,0,0,0,0	5									
Averrhoa camrambola	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,1,1,0,1,2,3,0,0,0,0,1	9	2	7	3	0	5	4
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0	0									
	1971-90	0,0,1,0,0,0,0,0,0,0,0,2	3									
Syzygium samarengense	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,1,0,0,1,0,0,0,0,0,2	4	0	4	0	2	0	4
	1951-70	0,0,0,0,0,0,1,0,0,0,0,1	2									
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0	0									
Annona sp.	1931-50	0,0,0,0,0,0,2,0,1,0,0,0	3	1991-2007	0,1,2,0,1,3,3,0,3,0,0,10	23	4	19	27	0	23	0
	1951-70	0,0,1,0,0,0,3,0,2,0,0,0	6									
	1971-90	0,1,1,3,2,3,2,0,2,2,0,2	18									
Punica granatum	1931-50	0,0,2,0,0,0,0,0,0,0,0,0	2	1991-2007	0,0,1,1,2,2,2,1,0,0,0,2	11	4	7	0	11	0	11
	1951-70	0,0,0,0,0,0,2,0,0,0,0,0	2									
	1971-90	0,1,0,1,4,0,0,0,0,0,0,1	7									
Aegle sp.	1931-50	0,1,0,0,0,0,0,0,0,0,0,0	1	1991-2007	0,1,1,2,0,2,4,0,0,0,0,10	20	5	15	27	0	20	0
	1951-70	0,2,1,0,1,0,2,0,0,0,0,1	7									
	1971-90	0,1,1,1,3,10,1,0,0,0,2	19									
Areca catechu	1931-50	0,0,2,0,0,0,0,0,1,0,0,0	3	1991-2007	6,0,9,3,20,200,6,0,2,0,3,60	309	200	109	36	0	309	0
	1951-70	0,0,3,0,0,0,4,0,2,0,0,6	15									
	1971-90	0,0,0,3,5,0,3,0,1,0,0,6	18									

Contd.

S= Seedling, G= Graft

Food plants in village 3 (Danga)

Plant name	Past			present			Age		Past		present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Under-5	5+	S	G	S	G
Litchi chinensis	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,2,3,1,0,0,0,2,1,3,0	40	3	37	2	0	3	37
	1951-70	0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,1,0	2									
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
Psidium guajava	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1	1	1991-2007	3,1,1,1,1,4,2,2,1,2,3,2,0,2,5,1,1	32	5	27	24	0	32	0
	1951-70	1,0,0,0,0,0,0,1,0,0,0,0,1,4,1,2,0	10									
	1971-90	0,2,1,0,4,0,0,0,0,1,1,3,0,0,1,0,0	13									
Zizyphus mauritiana	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	2,0,20,1,1,102,12,150,480,170,3,0,0,66,8,1,0	716	701	15	13	3	14	702
	1951-70	0,0,0,0,0,0,0,2,0,0,0,0,1,0,1,1,0	5									
	1971-90	1,0,1,0,2,0,0,0,1,1,1,3,0,0,0,0,1	11									
Citrus sp.	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	1,0,0,1,0,3,0,2,4,0,0,1,0,1,7,1,0	21	6	15	20	0	19	2
	1951-70	0,2,0,0,0,0,0,1,0,0,0,2,1,0,2,2,0	10									
	1971-90	2,0,2,0,1,0,0,0,1,2,0,0,0,1,0,0,1	10									
Spondias dulsis	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,1,0,0,0,1,0,0,1,1,0	4	2	2	5	0	4	0
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0									
	1971-90	0,0,1,0,0,1,0,0,1,0,1,1,0,0,0,0,0	5									
Averrhoa camrambola	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,1,0,0,1,0,0,1,0,0,2,1,0	6	2	4	2	0	6	0
	1951-70	0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	1									
	1971-90	1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	1									

Contd.

Syzygium samarengense	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,0,0,1	0	0	0	0	1	0	0
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0	1									
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,,0	0									
Annona sp.	1931-50	0,0,0,0,0,0,0,2,0,0,0,2,0,0,2,0,0	6	1991-2007	1,0,0,0,0,2,0,1,2,0,0,4,0,1,0,0,0	11	8	3	31	0	11	0
	1951-70	0,1,0,0,0,0,0,1,2,0,0,8,1,1,2,3,0	19									
	1971-90	2,0,0,0,2,0,1,1,0,0,1,5,0,1,0,2,1	16									
Punica granatum	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,1,0,0,0,0,0,0,0,0,1,0,0,1,0,1,0	4	2	2	0	7	0	4
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,0	2									
	1971-90	0,0,0,0,1,1,1,0,0,0,0,0,0,1,0,1	5									
Aegle sp.	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	1,0,0,0,0,0,0,0,1,0,0,2,0,1,0,0,0	5	2	3	11	0	5	0
	1951-70	2,0,0,0,0,0,0,1,1,0,0,0,0,0,1,0,0	5									
	1971-90	1,0,0,0,0,0,0,1,0,0,0,0,0,0,0,3,1	6									
Areca catechu	1931-50	0,0,0,0,0,0,0,2,0,0,0,0,0,2,0,5,0	9	1991-2007	6,13,3,0,0,100,0,50,30,0,1,5,0,50,10,8,3	279	62	217	95	0	279	0
	1951-70	0,0,0,0,0,0,0,2,4,0,0,0,3,15,0,0,20,2	46									
	1971-90	2,0,0,0,0,0,0,1,0,0,0,0,0,0,0,3,1	40									

S= Seedling, G= Graft

Contd.

Multi plants in village 1(Beel)

Plant name	Past			present			Age		Past		present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Under-5	5+	S	G	S	G
Mangifera indica	1931-50	7,3,8,1,0,1	20	1991-2007	25,7,13,6,6,2	59	42	17	61	14	19	40
	1951-70	11,5,5,1,2,0	24									
	1971-90	12,4,9,1,4,1	31									
Artocarpus heterophyllus	1931-50	1,0,0,1,0,1	3	1991-2007	3,2,1,3,2,1	12	7	5	13	0	12	0
	1951-70	1,1,0,2,0,1	5									
	1971-90	0,0,0,4,0,1	5									
Syzygium cumini	1931-50	10,5,40,4,0,0	59	1991-2007	3,1,1,3,0,0	8	6	2	141	0	8	0
	1951-70	12,2,30,2,0,0	46									
	1971-90	3,2,30,1,0,0	36									
Cocos nucifera	1931-50	0,0,2,0,2,1	5	1991-2007	11,2,4,6,1,2	26	16	10	10	0	26	0
	1951-70	0,0,2,0,0,1	3									
	1971-90	0,0,1,0,0,1	2									
Phoenix sylvestris	1931-50	7,7,10,3,0,1	28	1991-2007	7,3,24,2,0,5	41	20	21	53	0	41	0
	1951-70	5,3,5,1,1,1	16									
	1971-90	3,3,11,1,1,0	19									
Borassus flabelifera	1931-50	0,2,1,2,1,0	6	1991-2007	4,2,5,4,0,0	15	4	11	15	0	15	0
	1951-70	1,2,0,2,0,0	5									
	1971-90	1,1,1,1,0,0	4									
Tamarindus indica	1931-50	3,2,1,0,1,0	7	1991-2007	1,1,0,2,0,1	5	2	3	16	0	5	0
	1951-70	3,1,1,2,0,0	7									
	1971-90	1,1,0,0,0,0	2									
Bombax ceiba	1931-50	0,2,1,0,0,0	3	1991-2007	0,0,1,1,0,0	2	0	2	8	0	2	0
	1951-70	0,1,0,1,0,0	2									
	1971-90	0,1,1,1,0,0	3									
Ficus hispida	1931-50	5,1,4,4,0,1	15	1991-2007	2,1,2,1,3,0	9	3	6	32	0	9	0
	1951-70	4,1,2,2,0,0	9									
	1971-90	3,1,2,1,1,0	8									

S= Seedling, G= Graft

Contd.

Multi plants in village 2(Beel)

Plant name	Past			present			Age		Past		present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Under-5	5+	S	G	S	G
Mangifera indica	1931-50	3,2,0,10,0,0,0,0,5,0,0,0,0,0,0	20	1991-2007	0,25,5,8,9,35,8,12,4,0,0,8,50,6,10	180	154	26	136	7	50	130
	1951-70	2,3,5,0,0,0,0,35,0,10,0,0,0,7,0	62									
	1971-90	2,2,0,0,9,20,4,0,0,0,0,3,14,0,7	61									
Artocarpus heterophyllus	1931-50	0,0,0,1,0,0,0,0,0,0,0,0,0,0,0	1	1991-2007	0,1,1,1,3,4,0,1,1,0,1,2,5,3,2	25	9	16	34	0	25	0
	1951-70	0,0,0,0,0,0,0,0,2,1,0,0,0,2,0	5									
	1971-90	1,0,0,0,2,3,0,1,0,0,0,4,16,0,1	28									
Syzygium cumini	1931-50	12,0,0,60,0,0,0,0,0,0,0,0,0,0,0	72	1991-2007	0,0,1,0,1,2,0,1,0,0,0,0,2,1,2	10	3	7	99	0	10	0
	1951-70	5,1,0,0,0,0,0,1,0,0,0,0,0,0,0	7									
	1971-90	3,0,0,0,16,0,0,0,0,0,0,0,0,0,1	20									
Cocos nucifera	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	2,5,2,1,8,6,4,6,4,2,1,4,25,8,5	83	24	59	27	0	83	0
	1951-70	0,0,0,4,0,0,0,0,0,0,0,0,0,1,0	5									
	1971-90	1,5,0,0,5,0,0,4,0,0,0,0,7,0,0	22									
Phoenix sylvestris	1931-50	2,0,0,15,0,0,0,0,8,0,0,0,0,0,0	25	1991-2007	1,6,2,2,9,20,5,8,1,0,0,0,50,0,8	112	80	32	203	0	112	0
	1951-70	2,0,5,20,20,0,0,0,30,0,0,0,0,0,3,0	80									
	1971-90	1,5,0,15,45,5,2,0,0,3,2,0,5,0,15	98									

Contd.

Borassus flabelifera	1931-50	0,0,0,2,0,0,0,0,0,0,0,0,0,0,0	2	1991-2007	0,8,0,0,1,10,3,2,1,0,0,0,16,0,8	49	11	38	31	0	49	0
	1951-70	1,0,0,0,0,0,0,0,0,0,0,0,0,2,0	3									
	1971-90	1,7,0,0,3,2,0,0,0,1,0,0,8,0,4	26									
Tamarindus indica	1931-50	0,0,0,1,0,0,0,0,0,0,0,0,0,0,0	1	1991-2007	0,0,0,0,2,0,0,1,0,0,0,0,0,0,0	3	1	2	10	0	3	0
	1951-70	1,1,0,0,0,0,0,0,0,0,0,0,0,0,0	2									
	1971-90	2,0,0,0,1,1,0,0,0,0,0,0,3,0,0	7									
Bombax ceiba	1931-50	0,0,0,1,0,0,0,0,1,0,0,0,0,0,0	2	1991-2007	0,0,1,0,0,2,0,1,1,0,0,0,0,1,0	6	2	4	15	0	6	0
	1951-70	1,0,1,0,0,0,0,1,0,0,0,0,0,1,0	4									
	1971-90	1,1,0,0,1,0,0,0,0,0,0,5,0,1	9									
Ficus hispida	1931-50	0,0,0,1,0,0,0,0,0,0,0,0,0,0,0	1	1991-2007	0,1,1,0,1,6,1,3,0,0,0,0,0,1,4	18	5	13	16	0	18	0
	1951-70	0,1,0,0,0,0,0,1,0,0,0,0,0,0,0	2									
	1971-90	0,0,0,0,0,5,0,0,0,0,0,2,1,0,5	13									

S= Seedling, G= Graft

Contd.

Multi plants in village 3 (Beel)

Plant name	Past			present			Age		Past		present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Under-5	5+	S	G	S	G
Mangifera indica	1931-50	7,25,0,0,0,0,1,7,10,5	55	1991-2007	12,6,7,5,8,12,12,90, 35,19	206	111	95	155	14	46	160
	1951-70	5,9,5,0,15,7,1,19,15,10	86									
	1971-90	4,0,0,0,5,3,2,4,5,5	28									
Artocarpus heterophyllus	1931-50	0,0,0,0,1,0,0,1,1,1	4	1991-2007	2,1,1,1,1,2,2,5,3,5	23	7	16	13	0	23	0
	1951-70	0,1,1,0,0,0,0,1,1,2	6									
	1971-90	1,0,0,0,0,0,0,1,0,1	3									
Syzygium cumini	1931-50	25,0,15,0,0,0,0,25,2,30	97	1991-2007	1,0,5,0,0,0,6,2,2,8	24	8	16	183	0	24	0
	1951-70	10,5,10,0,1,0,0,15,4,15	60									
	1971-90	5,0,5,0,0,0,0,10,1,5	26									
Cocos nucifera	1931-50	1,1,0,0,0,0,0,1,2,1	6	1991-2007	8,0,3,0,3,7,7,7,8,7	50	32	18	18	0	50	0
	1951-70	1,0,0,0,0,1,0,2,1,3	8									
	1971-90	0,0,0,0,0,0,0,1,2,1	4									
Phoenix sylvestris	1931-50	3,0,4,0,0,2,0,10,7,4	30	1991-2007	16,2,6,1,16,4,11,35, 20,20	131	90	41	86	0	131	0
	1951-70	1,4,3,0,2,3,2,11,4,5	35									
	1971-90	1,0,2,0,1,2,3,4,4,4	21									
Borassus flabelifera	1931-50	1,3,0,0,0,0,0,0,1,2	7	1991-2007	2,3,2,0,0,0,0,2,2,12	23	12	11	30	0	23	0
	1951-70	4,3,0,0,1,1,0,1,1,3	14									
	1971-90	2,0,0,0,0,2,0,1,1,3	9									
Tamarindus indica	1931-50	0,1,0,0,0,1,0,0,1,1	4	1991-2007	1,0,0,0,0,1,0,0,0,4	6	4	2	13	0	6	0
	1951-70	1,0,1,0,0,2,0,0,0,2	6									
	1971-90	0,0,0,0,0,1,0,0,0,2	3									
Bombax ceiba	1931-50	1,2,0,0,0,0,0,1,1,0	5	1991-2007	3,0,0,1,0,1,2,0,3,0	10	7	3	11	0	10	0
	1951-70	1,0,0,0,0,1,0,1,1,0	4									
	1971-90	0,0,1,0,0,0,0,1,0,0	2									
Ficus hispida	1931-50	0,0,0,0,0,1,0,1,0,0	2	1991-2007	0,0,2,2,0,1,0,0,0,0	5	2	3	9	0	5	0
	1951-70	1,1,0,0,1,1,0,1,0,0	5									
	1971-90	0,0,1,0,0,1,0,0,0,0	2									

S= Seedling, G= Graft

Contd.

Multi plants in village 1 (Danga)

Plant name	Past			present			Age		Past		Present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Under-5	5+	S	G	S	G
Mangifera indica	1931-50	13,0,10,0,15,5,1,5,0,0,0,0,1,3,15,0,0,10,2,0,0,0,0,0,0,0,0,0,0,5,20,0,0,10,0,0,0,7,150	272	1991-2007	41,2,150,3,30,3,80,3,2,0,10,13,3,25,10,9,10,71,33,12,7,2,17,2,30,30,3,5,25,7,65,4,3,60,3,2,4,55,13	847	551	296	720	68	349	498
	1951-70	15,0,0,0,20,0,1,10,0,0,0,0,1,4,7,3,1,15,2,0,3,2,0,0,0,10,0,0,7,5,5,0,0,10,0,0,0,15,100	46									
	1971-90	23,3,10,2,15,10,2,10,0,0,2,8,2,3,8,4,6,15,3,25,4,3,118,1,9,10,2,7,8,10,5,0,0,5,0,0,3,14,30	270									
Artocarpus heterophyllus	1931-50	2,0,1,0,1,1,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,0,1,0	10	1991-2007	4,1,20,0,2,0,1,2,1,0,4,4,3,3,2,1,0,8,1,1,2,0,7,0,2,2,0,0,4,0,2,2,0,20,2,1,0,10,0	112	49	63	75	0	112	0
	1951-70	3,0,2,0,1,0,1,0,0,0,0,0,0,1,1,0,0,3,0,0,2,0,0,0,3,0,0,0,0,0,0,0,0,0,0,0,0,1,0	18									
	1971-90	3,0,3,0,2,0,1,3,0,0,1,1,1,2,1,0,2,8,2,0,0,0,2,0,2,2,0,0,2,2,4,0,0,2,0,0,0,1,0	47									
Syzygium cumini	1931-50	200,0,100,0,100,7,0,15,0,0,0,0,30,25,5,0,90,6,35,0,0,0,0,0,0,0,0,0,15,7,0,0,50,0,0,0,90,125	819	1991-2007	100,2,65,0,5,2,3,0,0,0,1,0,0,0,2,2,0,2,0,4,0,0,4,2,0,1,0,10,0,2,0,1,6,0,0,0,0,1	215	22	193	1991	0	215	0
	1951-70	150,0,25,0,25,10,0,10,0,0,0,0,0,10,15,4,0,20,3,30,0,0,0,20,10,0,0,25,15,8,0,0,30,0,0,1,30,100	530									
	1971-90	50,0,25,2,25,11,0,10,0,0,1,0,1,10,10,3,1,7,3,35,1,2,2,10,15,0,2,10,5,5,0,0,20,0,0,2,30,20	642									

Contd.

Cocos nucifera	1931-50	4,0,4,0,2,2,0,0,0,0,0,0,0,0,1,0,5,5,2,0,0,0,0,0,0,0,0,0,0,2,2,0,0,0,0,0,0,1,0	30	1991-2007	8,3,30,0,9,4,20,4,0,0,0,3,4,1,15,5,10,7,4,2,0,3,3,4,11,14,0,4,25,2,5,3,1,7,3,2,3,65,0	184	119	65	160	0	184	0
	1951-70	3,0,3,0,2,2,0,2,0,0,0,2,0,0,1,0,5,5,2,0,0,0,0,0,10,0,0,0,0,3,0,0,1,0,0,0,2,	46									
	1971-90	3,0,5,1,3,2,0,2,0,0,0,5,2,5,2,1,8,2,1,0,0,1,0,0,11,4,0,3,10,4,5,1,0,1,0,0,1,1,0	84									
Phoenix sylvestris	1931-50	5,0,10,1,3,1,2,0,0,2,0,0,1,5,0,2,5,1,0,0,0,0,0,0,0,0,0,0,0,10,0,0,5,0,0,1,5,50	100	1991-2007	9,4,50,5,25,9,3,2,0,0,5,0,2,40,20,0,4,8,30,26,6,25,30,0,18,5,1,0,2,0,8,1,0,7,5,5,4,7,60	426	311	115	404	0	426	0
	1951-70	7,0,10,1,5,5,1,3,0,0,2,2,1,6,3,0,5,5,2,0,0,0,0,0,0,0,0,0,2,0,15,0,0,8,0,0,2,10,20	115									
	1971-90	8,2,10,2,7,3,1,4,0,0,4,2,2,7,7,1,10,5,2,2,15,12,4,0,25,0,3,0,2,0,15,0,0,10,2,0,2,10,10	189									
Borassus flabelifera	1931-50	1,0,2,0,4,2,0,0,0,0,0,0,0,0,1,1,0,1,3,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,5,5	25	1991-2007	2,0,13,0,7,0,0,1,0,0,0,0,0,0,2,1,0,7,0,5,2,1,1,0,0,4,0,0,0,0,3,2,0,8,0,0,1,30,3	93	22	71	83	0	93	0
	1951-70	1,0,3,0,3,0,0,0,0,0,0,0,0,1,1,0,1,3,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,8,3	25									
	1971-90	1,0,2,1,5,2,0,1,0,0,0,0,0,3,2,2,1,4,0,7,0,1,0,0,2,0,0,0,1,0,0,0,0,0,0,0,1,2,2	33									
Tamarindus indica	1931-50	4,0,0,2,0,1,1,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,0,0,0,0,0,0,1,20	33	1991-2007	2,0,2,0,2,1,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,1,0,1,0,1,1,0,0,0,0,0,0,0,0,0,0,0,1,0,1	15	4	11	108	0	15	0
	1951-70	2,8,1,0,2,0,1,1,0,0,0,0,0,1,1,0,0,1,1,1,2,0,0,0,0,1,0,0,2,0,2,0,0,0,0,0,1,1,15	36									
	1971-90	2,0,1,1,3,0,1,1,0,0,0,0,0,1,1,0,2,2,1,2,4,0,0,1,2,0,0,0,2,0,1,0,0,1,0,0,1,2,7	39									

Contd.

Bombax ceiba	1931-50	4,0,3,0,1,0,0,1,0,0,0,0,0,1,1,1,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,1,0	16	1991-2007	2,0,2,0,1,2,0,1,0,0,1,0,0,0,1,0,4,0,4,6,0,4,0,1,5,0,0,7,0,1,0,0,3,0,0,1,4,0	50	9	41	95	0	50	0
	1951-70	2,0,3,0,1,0,0,1,0,0,0,0,1,1,0,1,0,2,1,2,0,0,0,0,0,0,0,0,5,1,2,0,0,1,0,0,1,2,0	28									
	1971-90	2,0,2,0,2,1,0,1,0,0,1,1,2,1,1,1,1,3,1,4,2,0,2,1,3,0,0,0,7,2,3,0,0,1,0,0,2,4,0	51									
Ficus hispida	1931-50	15,0,3,0,2,1,0,0,0,0,0,0,0,1,1,1,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,5,0,0,0,10,15	55	1991-2007	7,0,4,0,2,2,0,0,3,0,1,1,1,1,2,0,0,1,0,0,4,0,0,0,3,0,0,0,7,0,0,1,0,3,0,0,1,1,1	46	17	29	172	0	46	0
	1951-70	10,3,5,0,2,1,0,0,0,0,0,1,1,1,1,1,0,1,1,0,0,0,0,0,12,0,0,0,7,0,0,0,0,10,0,0,0,5,10	69									
	1971-90	5,0,7,0,3,2,0,0,0,0,2,1,2,1,1,1,0,2,1,0,1,0,0,0,8,0,0,0,5,0,0,1,0,5,0,0,1,2,5	48									

S= Seedling, G= Graft

Contd.

Multi plants in village 2 (Danga)

Plant name	Past			present			Age		Past		present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Under-5	5+	S	G	S	G
Mangifera indica	1931-50	0,3,9,0,9,19,7,0,0,0,0,4	51	1991-2007	4,12,65,12,60,400, 135,6,7,2,1,62	766	310	456	183	13	40	716
	1951-70	0,2,6,20,2,7,8,0,1,0,0,9	63									
	1971-90	3,2,4,30,19,4,5,0,3,0,0,12	82									
Artocarpus heterophyllus	1931-50	0,0,2,0,2,0,1,0,0,0,0,0	5	1991-2007	1,1,10,3,12,60,13,1,2, 0,0,16	119	40	79	72	0	19	0
	1951-70	0,0,4,0,4,30,1,0,0,0,0,2	41									
	1971-90	0,0,3,3,2,10,1,0,0,0,1,6	26									
Syzygium cumini	1931-50	0,20,4,0,15,190,40,0,0,0,0,0	269	1991-2007	0,7,2,0,0,3,14,0,0,0,0, 5	31	11	20	747	0	31	0
	1951-70	0,30,5,1,20,150,50,0,0,0,0,4	260									
	1971-90	2,10,5,3,15,160,10,0,3,0,2,8	218									
Cocos nucifera	1931-50	0,2,2,0,2,3,20,0,0,0,0,2	31	1991-2007	2,8,18,8,15,8,30,5,1,3 ,2,40	130	70	60	119	0	130	0
	1951-70	0,3,5,1,1,5,30,0,0,0,0,2	47									
	1971-90	0,2,5,2,2,7,20,0,0,1,0,2	41									
Phoenix sylvestris	1931-50	0,4,6,0,7,20,30,0,0,0,0,4	71	1991-2007	0,60,12,2,30,1000,60, 0,1,1,2,180	1347	570	777	345	0	1347	0
	1951-70	0,10,9,30,7,50,30,0,2,2,0,9	149									
	1971-90	1,6,3,40,6,30,30,0,5,6,0,7	134									
Borassus flabelifera	1931-50	0,1,1,0,0,1,1,0,0,0,0,0	4	1991-2007	0,1,4,2,0,1,60,0,4,3,0, 1	76	16	60	21	0	76	0
	1951-70	0,1,2,3,0,2,2,0,0,0,0,0	10									
	1971-90	0,1,3,0,0,2,1,0,0,0,0,0	7									
Tamarindus indica	1931-50	0,2,2,0,0,2,1,0,0,0,0,1	8	1991-2007	0,1,0,0,0,0,3,0,0,0,0,1	5	2	3	30	0	5	0
	1951-70	0,2,2,0,1,4,2,0,0,0,0,2	13									
	1971-90	0,1,1,1,1,2,1,0,1,0,0,1	9									
Bombax ceiba	1931-50	0,1,2,0,1,5,2,0,0,0,0,0	11	1991-2007	0,2,2,2,1,2,16,0,3,0,1, 1	30	10	20	52	0	30	0
	1951-70	0,1,4,0,2,7,8,0,0,0,0,1	23									
	1971-90	1,1,2,0,1,5,5,0,1,0,1,1	18									
Ficus hispida	1931-50	0,2,0,1,0,8,6,0,0,0,0,1	18	1991-2007	1,1,2,0,3,2,8,1,0,1,0,1	20	9	11	70	0	20	0
	1951-70	0,2,2,0,2,7,8,0,0,0,0,1	22									
	1971-90	0,1,1,1,3,10,13,0,1,0,0,1	30									

S= Seedling, G= Graft

Contd.

Multi plants in village 3 (Danga)

Plant name	Past			present			Age		Past		present	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Under-5	5+	S	G	S	G
Mangifera indica	1931-50	1,5,0,0,2,15,5,6,0,3,0,10,2,4,2,4,0	65	1991-2007	10,1,12,4,20,46,7,35,49,64,7,12,4,110,105,8,2	496	340	156	209	8	442	54
	1951-70	8,6,0,0,3,25,10,7,10,3,0,15,2,2,4,5,2	103									
	1971-90	5,1,2,0,3,10,5,2,0,2,5,5,1,2,3,5,1	49									
Artocarpus heterophyllus	1931-50	2,0,0,0,0,2,0,0,0,0,0,0,0,0,1,0,0	5	1991-2007	2,2,4,2,4,0,2,5,7,0,1,0,0,10,6,1,0	46	24	22	37	0	46	0
	1951-70	3,0,0,0,0,5,0,1,3,0,0,0,1,1,2,1,0	17									
	1971-90	2,0,1,0,0,7,0,1,0,0,0,0,1,0,1,1,1	15									
Syzygium cumini	1931-50	2,0,0,0,0,0,2,3,0,20,0,2,0,3,0,1,0	33	1991-2007	5,0,0,0,0,1,0,1,1,20,0,2,0,1,2,0,0	33	7	26	87	0	33	0
	1951-70	2,0,0,0,0,0,2,3,20,5,0,2,1,3,1,1,0	40									
	1971-90	1,1,0,0,2,0,0,1,0,5,1,1,0,2,0,0,2	16									
Cocos nucifera	1931-50	1,0,0,0,0,5,1,7,0,2,0,5,2,7,0,5,0	36	1991-2007	8,4,1,5,7,1,4,6,12,53,2,5,10,3,65,15,3,1	214	154	60	152	0	214	0
	1951-70	2,0,0,0,3,25,3,5,10,6,0,7,3,6,1,7,2	80									
	1971-90	1,3,0,0,3,5,1,3,0,1,1,3,3,7,1,3,1	36									
Phoenix sylvestris	1931-50	3,2,0,0,0,2,1,6,0,0,0,4,6,2,2,4,2	34	1991-2007	55,1,15,1,2,5,1,25,10,3,0,7,0,4,150,5,3	287	200	87	145	0	287	0
	1951-70	2,4,0,0,2,6,2,4,25,1,0,4,3,1,3,8,2	67									
	1971-90	2,1,1,0,3,0,2,4,0,0,5,2,5,2,3,13,1	44									

Contd.

Borassus flabelifera	1931-50	1,0,0,0,0,0,1,1,0,2,0,0,0,4,1,1,0	11	1991-2007	8,1,7,0,3,4,3,2,20,0,0,15,1,15,14,2,0	95	30	65	55	0	95	0
	1951-70	2,0,1,0,0,0,3,2,10,2,0,3,0,2,2,2,0	29									
	1971-90	1,0,1,0,0,0,1,2,0,0,0,0,0,2,2,5,1	15									
Tamarindus indica	1931-50	0,0,0,0,0,0,1,1,0,0,0,0,0,0,0,1,0	3	1991-2007	0,0,0,0,1,1,0,1,0,0,0,1,0,2,0,0,0	6	2	4	15	0	6	0
	1951-70	1,1,0,0,1,0,0,1,0,0,0,0,0,1,1,1,0	7									
	1971-90	0,0,2,0,0,0,0,0,0,0,1,0,0,0,1,1	5									
Bombax ceiba	1931-50	2,0,0,0,0,0,0,1,0,1,0,0,0,1,1,1,0	7	1991-2007	2,1,1,0,0,2,0,1,2,0,1,1,0,3,0,0,0	14	3	11	32	0	14	0
	1951-70	2,0,0,0,1,2,1,1,1,2,0,1,0,2,0,2,0	15									
	1971-90	2,0,2,0,0,0,0,1,0,0,1,0,1,1,1,1,0	10									
Ficus hispida	1931-50	0,0,0,0,0,0,0,1,0,1,0,1,0,1,1,5,0	10	1991-2007	1,0,1,0,2,0,0,2,0,0,0,0,0,1,4,2,1	14	5	9	41	0	14	0
	1951-70	2,0,0,0,0,1,0,5,2,1,0,2,1,1,2,4,1	22									
	1971-90	0,0,2,0,1,0,0,2,0,0,0,1,0,0,0,2,1	9									

S= Seedling, G= Graft

Contd.

Wood plant in village 1 (Beel)

Plant name	Past			Present			Age	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Juvenile	Mature
Albizia procera	1931-50	12.3.10.2.0.0	27	1991-2007	4.0.2.3.0.1	10	1	8
	1951-70	10.1.5.1.0.0	17					
	1971-90	8.1.5.2.1.2	19					
Acacia nylotica	1931-50	7.4.0.0.0.0	11	1991-2007	4.0.0.0.0.0	4	1	3
	1951-70	4.2.0.0.0.0	6					
	1971-90	4.1.0.0.0.0	5					
Acacia catechu	1931-50	1.1.0.0.0.0	2	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	1.0.0.0.0.0	1					
	1971-90	1.0.0.0.0.0	1					
Amoora rohituca	1931-50	9.2.5.1.0.0	17	1991-2007	2.0.1.3.0.2	8	8	2
	1951-70	3.1.3.1.0.1	9					
	1971-90	3.1.5.1.0.0	10					
Azadiracta indica	1931-50	3.0.1.0.0.0	4	1991-2007	3.0.0.1.1.0	5	1	4
	1951-70	1.0.1.0.0.0	2					
	1971-90	1.0.1.0.1.0	3					
Alstonia scholaris	1931-50	1.0.0.0.0.0.	1	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.	0					
	1971-90	0.0.0.0.0.0	0					
Ficus benghalensis	1931-50	0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	1.0.0.0.0.0	1					
	1971-90	0.0.0.0.0.0	0					

Contd.

Ficus rumphii	1931-50	0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	1.0.0.0.0.0	1					
	1971-90	0.0.0.0.0.0	0					
Beringtonia acutangula	1931-50	18.5.15.2.0.0	40	1991-2007	2.0.0.0.0.0.0	12	3	9
	1951-70	10.3.10.0.0.0	23					
	1971-90	2.1.5.0.0.0	8					
Anthocephalus cadamba	1931-50	6.0.0.0.0.0.0	6	1991-2007	0.0.0.0.0.0	2	1	1
	1951-70	4.0.0.0.0.0	4					
	1971-90	2.0.0.0.0.0	2					
Diospyros ebenum	1931-50	4.0.0.0.0.0.0	4	1991-2007	1.0.0.0.0.0	1	0	1
	1951-70	2.0.0.0.0.0.0	2					
	1971-90	1.0.0.0.0.0.0	1					
Cassia fistula	1931-50	1.0.0.0.0.0.0	1	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	1.0.0.0.0.0.	1					
	1971-90	0.0.0.0.0.0	0					
Swietenia mahogany	1931-50	0.0.0.0.0.0	0	1991-2007	50.15.1.0.0.9	75	55	20
	1951-70	0.0.0.0.0.0	0					
	1971-90	0.0.0.0.5.0	5					
Dulbergia sissoo	1931-50	0.0.0.0.0.0	0	1991-2007	13.4.0.0.0.0	17	7	10
	1951-70	0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0	0					
Lannea coromandealica	1931-50	0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0	0					
Polyalthia longifolia	1931-50	0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0	0					

Contd.

Terminalia arjuna	1931-50	0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0	0					
Leucaena latisiliqua	1931-50	0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0	0					
Kleinhovia hospital	1931-50	0.0.0.0.0.0	0	1991-2007	5.5.0.1.0.0	11	2	9
	1951-70	0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0	0					
Piper longum	1931-50	0.2.0.0.0.0	2	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0	0					
Flacoutia ramontchi	1931-50	3.0.0.0.0.0	3	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0	0					
	1971-90	4.0.0.0.0.0	4					
Crataeva nurvala	1931-50	7.4.3.0.0.0	30	1991-2007	2.0.0.0.0.0	2	1	1
	1951-70	10.4.3.0.0.0	14					
	1971-90	12.4.5.1.0.0	17					
Acacia moniliformis	1931-50	12.4.5.1.0.0	22	1991-2007	3.0.0.3.0.0	6	2	4
	1951-70	8.3.2.1.0.0	14					
	1971-90	5.1.2.1.0.0	9					
Eucalyptus dives	1931-50	0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0	0					

Contd.

Wood plant in village 2 (Beel)

Plant name	Past			Present			Age	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Juvenile	Mature
Albizia procera	1931-50	4.5.2.2.1.4.0.6.0.0.0.0.0.0	24	1991-2007	0.0.1.0.1.20.0.3.1.0.0.0.2.0.1	29	4	25
	1951-70	2.4.2.2.1.3.0.2.1.4.0.0.0.0	21					
	1971-90	2.3.1.1.2.1.0.2.0.0.0.0.12.0.7	31					
Acacia nylotica	1931-50	0.2.0.1.0.5.0.5.0.0.0.0.0.0	14	1991-2007	0.1.0.0.0.0.1.1.0.0.0.0.0.0	3	2	1
	1951-70	0.2.2.1.0.2.0.4.0.3.0.0.0.0	14					
	1971-90	0.1.0.0.1.1.0.3.0.0.0.0.0.0.1	7					
Acacia catechu	1931-50	0.0.0.1.11.0.0.0.0.0.0.0.0.	12	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.1.10.0.0.0.0.0.0.0.0.0.0.	11					
	1971-90	0.0.0.0.4.0.0.0.0.0.0.0.	4					
Amoora rohituca	1931-50	0.0.0.0.4.0.0.0.0.0.0.0.0.0	4	1991-2007	0.0.0.0.0.0.0.2.1.0.0.0.0.0.2	5	1	4
	1951-70	10.0.0.1.0.0.0.0.0.0.0.0.0.0	11					
	1971-90	8.0.0.0.1.0.0.0.1.2.0.0.0.0.0	12					
Azadiracta indica	1931-50	1.0.0.1.0.0.0.0.0.0.0.0.0.0	2	1991-2007	1.1.0.0.1.15.0.4.1.0.0.0.1.0.5 0	74	68	6
	1951-70	1.0.0.1.0.0.0.0.0.0.1.0.0.0.0	3					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.5.0.0	5					
Alstonia scholaris	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
Ficus benghalensis	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
Ficus rumphii	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					

Contd.

Beringtonia acutangula	1931-50	8.0.0.0.0.0.0.0.0.0.0.0.0.0	8	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	3.0.0.0.1.0.0.0.0.0.0.0.0.0	4					
	1971-90	1.0.0.0.0.0.0.0.0.0.0.0.0.0	1					
Anthocephalus cadamba	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
Diospyros ebenum	1931-50	2.0.0.0.0.0.0.0.0.0.0.0.0.0	2	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	1.0.0.0.0.0.0.0.0.0.0.0.0.0	1					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
Cassia fistula	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
Swietenia mahogany	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	2.15.4.3.8.15.2.14.3.0.0.1.20.2.0	89	77	12
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
Dulbergia sissoo	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.2.0.0.0.0.0.0.0.0.0	2	0	2
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.1.0.0.0.0.0.0.1.0.0.25.0.0	27					
Lannea coromandealica	1931-50	0.0.0.1.0.0.0.0.0.0.0.0.0.0	1	1991-2007	1.0.0.0.0.0.0.0.0.0.0.0.0.3	4	1	3
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	1.0.0.0.0.0.0.0.0.0.0.0.0.0	1					
Polyalthia longifolia	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
Terminalia arjuna	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.1.0.0.0.0.0.0.0.0	1	1	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					

Contd.

Leucaena latisiliqua	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	1.0.0.0.2.0.0.1.3.0.0.0.0.0.0	7	2	5
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.5.0.0.0.0.0.0.0.0.0	5					
Kleinhovia hospital	1931-50	0.0.0.1.0.0.0.0.0.0.0.0.0.0	1	1991-2007	0.0.0.0.0.0.0.0.1.0.0.0.2.0.0	3	1	2
	1951-70	1.0.0.0.0.0.0.0.0.0.0.0.0.0	1					
	1971-90	0.0.0.0.0.0.0.0.1.0.0.0.2.0.0	3					
Piper longum	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.3.0.0.0.0.0.1.0.0	4	1	3
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.2.0.0	2					
Flacoutia ramontchi	1931-50	3.0.0.0.0.0.0.0.0.0.0.0.0.0	3	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	1.1.0.0.0.0.0.0.0.0.0.0.0.0	2					
	1971-90	1.0.0.0.0.0.0.0.0.0.0.0.0.0	1					
Crataeva nurvala	1931-50	2.1.0.0.0.0.0.0.0.0.0.0.0.0	3	1991-2007	0.0.0.0.0.0.0.0.0.1.0.0.0.0	1	1	0
	1951-70	1.1.0.0.0.0.0.0.0.0.0.0.0.0	2					
	1971-90	2.1.0.0.0.0.0.0.0.0.0.0.0.0	3					
Acacia moniliformis	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
Eucalyptus dives	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.1.0.0.0.0.0.0.0.0.0.0.0.0	1	1	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					

Contd.

Wood plant in village 3 (Beel)

Plant name	Past			Present			Age	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Juvenile	Mature
Albizia procera	1931-50	7.6.0.0.0.0.04.2.2	21	1991-2007	1.0.1.1.0.1.2.3.1.3	13	3	10
	1951-70	6.4.3.0.0.0.0.6.2.2	23					
	1971-90	2.0.1.0.0.0.0.6.1.2	12					
Acacia nylotica	1931-50	5.0.0.0.0.0.0.4.2.2	13	1991-2007	0.0.0.0.0.0.0.1.0	1	1	0
	1951-70	4.0.0.0.0.0.0.5.4.1	14					
	1971-90	35.0.0.0.0.0.0.3.1.1	8					
Acacia catechu	1931-50	35.0.0.0.50.0.0.30.0.0	115	1991-2007	0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	15.0.0.0.25.0.0.50.0.0	90					
	1971-90	10.0.0.0.0.25.0.0.20.0.0	55					
Amoora rohituca	1931-50	8.0.1.0.0.0.3.4.1	17	1991-2007	3.0.5.0.0.0.1.4.2.3	17	4	13
	1951-70	4.2.2.0.0.0.0.15.2.1	26					
	1971-90	3.0.0.0.0.0.2.2.1	8					
Azadiracta indica	1931-50	1.0.0.0.0.0.2.2.1	6	1991-2007	0.0.2.0.0.2.0.1.3.5	13	5	8
	1951-70	1.0.2.0.0.0.0.2.6.1	12					
	1971-90	1.0.0.0.0.0.0.1.2.0	4					
Alstonia scholaris	1931-50	0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.1	1					
	1971-90	0.0.0.0.0.0.0.0.0.0	0					
Ficus benghalensis	1931-50	0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0	0					
Ficus rumphii	1931-50	0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.1.0.0.0.1	2	0	2
	1951-70	0.0.1.0.0.0.0.0.0.0	1					
	1971-90	0.0.0.0.0.0.0.0.0.0	0					

Contd.

Beringtonia acutangula	1931-50	0.12.1.0.0.0.0.15.6.2	36	1991-2007	0.0.1.0.0.0.0.1.1.4	7	2	5
	1951-70	0.12.3.0.1.0.1.25.6.2	50					
	1971-90	0.1.0.0.0.0.20.3.1	25					
Anthocephalus cadamba	1931-50	0.0.0.0.0.0.0.2.2.0	4	1991-2007	0.0.2.0.1.0.0.0.1.0	4	1	3
	1951-70	0.0.0.0.1.0.0.2.1.0	4					
	1971-90	0.0.0.0.0.1.0.1.1.0	3					
Diospyros ebenum	1931-50	0.0.0.0.0.0.0.0.2.1	3	1991-2007	0.0.0.0.0.0.0.0.2.1	3	1	2
	1951-70	0.0.0.0.0.0.0.0.1.1	2					
	1971-90	0.0.0.0.0.0.0.0.3.0	3					
Cassia fistula	1931-50	0.0.0.0.0.0.0.0.1.0	1	1991-2007	0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.1.0	1					
	1971-90	0.0.0.0.0.0.0.0.1.0	1					
Swietenia mahogany	1931-50	0.0.0.0.0.0.0.0.0.0	0	1991-2007	15.0.20.2.8.0.12.70.25.30	182	170	12
	1951-70	0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0	0					
Dulbergia sissoo	1931-50	0.0.0.0.0.0.0.0.0.0	0	1991-2007	2.0.1.0.0.0.0.0.1	4	1	3
	1951-70	0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.8.0.0	8					
Lannea coromandealica	1931-50	0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.3.0.0.0.0.0.	3	1	2
	1951-70	0.0.0.0.0.0.0.0.0.1	1					
	1971-90	0.0.0.0.1.0.0.0.0.0	1					
Polyalthia longifolia	1931-50	0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0	0					
Terminalia arjuna	1931-50	0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0.0	0					

Contd.

Leucaena latisiliqua	1931-50	0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.2.12	14	4	10
	1951-70	0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.1.0.1.0.0.0.0	2					
Kleinhovia hospita	1931-50	1.0.0.0.0.0.0.0.0	1	1991-2007	1.0.0.0.0.0.0.0.2	3	1	2
	1951-70	2.2.0.0.0.0.0.1.1	6					
	1971-90	2.0.0.0.0.0.0.0.1	3					
Piper longum	1931-50	0.0.0.0.0.0.0.2.1	3	1991-2007	0.0.0.0.0.1.0.0.2.1	4	2	2
	1951-70	0.0.0.0.0.0.0.2.1	3					
	1971-90	0.0.0.0.0.0.0.2.0	2					
Flacoutia ramontchi	1931-50	0.0.0.0.0.0.4.2.0	6	1991-2007	0.0.1.0.0.1.0.0.2.0	4	2	2
	1951-70	0.0.0.0.0.0.5.3.0	10					
	1971-90	0.0.0.0.0.0.3.2.0	5					
Crataeva nurvala	1931-50	0.0.0.0.0.0.3.1.1	5	1991-2007	0.0.0.0.0.0.0.0.0			
	1951-70	0.0.0.0.0.0.2.1.1	8					
	1971-90	0.0.0.0.0.0.1.1.1	3					
Acacia moniliformis	1931-50	0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.0.0.0	0					
Eucalyptus dives	1931-50	0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0	0					
	1971-90	0.0.0.0.0.0.2.0.0	2					

Contd.

Wood plant in village 1 (Danga)

Plant name	Past			Present			Age	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Juvenile	Mature
Albizia procera	1931-50	20,0,20,1,9,0,0,5,0,0,0,0,2,1,5,0, 0,2,2,2,0,0,0,0,0,0,0,0,4,0,2,0,0, 15,0,0,0,2,50	101	1991-2007	25,1,7,1,2,0,0,0,0,0,0,0 ,0,0,2,0,0,4,1,0,0,0,0,0, 0,4,0,0,0,0,0,0,0,30,0,1 ,0,1,1	80	29	51
	1951-70	10,0,10,1,8,0,0,9,0,0,0,0,3,2,2,0, 0,1,2,4,2,0,0,0,0,0,0,0,2,0,5,0,0, 15,0,0,2,50	128					
	1971-90	10,0,5,1,7,0,0,9,0,0,0,0,3,1,3,1,1, 1,1,2,0,0,1,0,4,3,0,0,1,0,3,0,0,20, 0,0,1,2,40	120					
Acacia nylotica	1931-50	10,0,10,1,9,4,2,9,0,0,0,0,0,7,7,0, 0,0,1,10,5,0,0,0,0,0,0,0,1,0,9,0,0, 20,0,0,0,50,30	167	1991-2007	0,0,3,0,0,0,0,0,0,0,0,0, 0,0,0,0,1,0,0,0,0,0,0,0, 0,12,0,0,0,0,0,0,0,3,0,0 ,0,0,2	21	13	8
	1951-70	10,0,3,2,15,2,4,9,0,0,0,0,0,5,5,1, 2,0,1,15,9,0,0,0,0,0,0,0,2,2,9,0,0, 20,0,0,0,25,30	191					
	1971-90	5,0,2,1,6,1,6,6,0,0,0,0,0,3,3,1,2,1 ,2,10,5,0,4,0,4,0,0,0,2,5,12,0,0, 20,0,0,2,25,20	144					

Contd.

Acacia catechu	1931-50	10,0,12,2,95,12,1,4,0,0,0,10,0,20 ,9,18,0,1,1,60,0,0,0,0,0,0,0,0,4, 10,15,0,0,2,0,0,1,20,0	307	1991-2007	0,0,0,0,2,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0	2	0	2
	1951-70	7,0,8,1,90,10,2,4,0,0,0,10,0,20,9, 18,0,1,1,90,0,0,0,0,0,0,0,0,5,10, 10,0,0,3,0,0,1,30,0	325					
	1971-90	3,0,5,2,65,8,1,3,0,0,0,5,0,10,4,7, 0,1,1,50,0,0,0,0,0,0,0,0,6,5,5,0,0, 2,0,0,1,20,0	204					
Amoora rohituca	1931-50	100,0,25,2,65,0,0,0,0,0,0,0,0,1,2, 0,0,4,0,1,1,0,0,0,0,0,0,0,5,1,2,0,0 ,9,0,0,0,10,5	233	1991-2007	20,0,15,0,2,0,0,0,0,0,1, 0,0,6,0,0,0,6,0,0,0,0,7, 0,4,5,0,0,2,1,0,0,3,0,0, 0,0,12,3	87	42	45
	1951-70	90,0,25,2,25,0,0,1,0,0,0,0,0,1,1,0 ,0,2,0,2,2,0,0,0,2,4,0,0,5,1,2,0,0, 9,0,0,0,10,5	189					
	1971-90	60,0,5,1,10,0,0,1,0,0,0,1,0,1,1,0, 1,1,0,3,1,0,0,0,6,3,0,0,5,1,6,1,0,7 ,0,0,0,10,2	127					
Azadiracta indica	1931-50	5,0,5,0,4,0,0,4,0,0,2,0,0,1,1,0,0,2 ,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,1,3	29	1991-2007	39,1,2,0,2,0,1,2,0,0,0,7 ,1,4,3,1,0,3,0,1,4,0,18, 0,3,3,0,0,2,0,1,0,0,15,0 ,2,2,3,1	121	82	39
	1951-70	15,0,4,0,4,0,0,3,0,0,2,0,1,1,2,2,0, 2,0,0,0,0,0,0,0,0,0,0,0,1,5,0,0,0,0 ,0,0,1,1	44					
	1971-90	20,0,3,0,2,0,1,2,0,0,2,0,3,1,1,1,1, 1,0,0,1,0,3,0,0,0,0,0,3,1,5,0,0,2,0 ,0,0,2,1	56					

Contd.

Alstonia scholaris	1931-50	3,0,4,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,0,0	10	1991-2007	1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	2	0	2
	1951-70	2,0,2,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,0,0,0,1,0,1,0,0,1,0,0,0,0,0	9					
	1971-90	2,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,0	5					
Ficus benghalensis	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	0	0
	1951-70	1,0,1,0,1,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1	8					
	1971-90	0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	1					
Ficus rumphii	1931-50	1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	3	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	4	0	4
	1951-70	1,0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	3					
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0					

Contd.

Beringtonia acutangula	1931-50	4,0,10,0,2,0,0,0,0,0,0,0,0,10,2,0,1,0,0,7,0,0,0,0,0,0,0,0,0,1,5,0,0,1,0,0,0,0,50	93	1991-2007	0,0,2,0,0,0,0,0,0,0,0,0,0,2,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0	6	1	5
	1951-70	2,0,10,2,9,0,0,0,0,0,0,0,0,4,1,0,2,1,0,9,0,0,0,0,0,0,0,0,0,0,2,3,0,0,1,0,0,0,0,30	76					
	1971-90	2,0,5,3,4,0,0,0,0,0,0,0,0,1,1,1,2,2,0,9,0,0,0,0,0,0,0,0,0,0,2,2,0,0,2,0,0,0,0,25	103					
Anthocephalus cadamba	1931-50	10,0,5,0,2,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0	19	1991-2007	2,0,2,0,1,0,0,0,0,0,0,1,0,0,1,0,0,0,0,0,0,3,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0	11	6	5
	1951-70	7,0,2,0,3,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,1,0,0,0,0,0,0,0,0,0	15					
	1971-90	3,0,1,0,2,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,1,0,0,0,0,1,2,1,0,0,0,0,0,0,0,0	13					
Diospyros ebenum	1931-50	15,0,2,0,2,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,8,0,0,0,10,0	38	1991-2007	7,0,3,0,2,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,8,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,3,0	25	3	22
	1951-70	5,0,2,0,2,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,8,0,0,0,10,0	29					
	1971-90	5,0,1,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,3,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,9,0,0,0,10,0	30					

Contd.

Cassia fistula	1931-50	30,0,8,0,9,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,9,0	56	1991-2007	2,0,2,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	4	1	3
	1951-70	20,0,4,0,4,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,4,0	33					
	1971-90	10,0,4,0,4,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,8,0,0,0,0,0,0,0,0,4,0	31					
Swietenia mahogany	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	1	1991-2007	10,5,150,4,100,2,60,6,5,0,15,8,0,20,50,6,5,4,0,30,5,20,2,50,4,170,200,7,5,0,15,20,2,1,150,0,5,11,200,50	1524	225	1299
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	1					
	1971-90	10,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,30,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	41					
Dulbergia sissoo	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,15,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	15	1991-2007	2,6,7,0,2,2,1,0,0,0,0,4,0,0,0,3,12,0,3,0,10,0,1,6,0,0,7,0,5,0,0,10,0,0,0,0,0,0,1	60	23	37
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,9,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	9					
	1971-90	28,0,0,0,30,0,0,0,0,0,0,0,0,0,6,0,0,0,0,0,0,0,0,20,0,9,12,0,0,0,0,0,0,0,0,0,0,0,15,0	120					

Contd.

Lannea coromandealica	1931-50	0,0,2,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	2	1991-2007	0,2,1,0,12,0,2,0,0,0,0,0,0,0,1,0,0,0,0,0,5,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	23	7	16
	1951-70	0,0,1,0,4,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,6,6,0,0,0,0,0,0	18					
	1971-90	0,2,2,0,3,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,2,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	10					
Polyalthia longifolia	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	1	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	1	0	1
	1951-70	6,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	8					
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	2					
Terminalia arjuna	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,6,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	6	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0	2	0	2
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0					
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0					

Contd.

Leucaena latisiliqua	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	2,3,7,0,0,2,1,0,0,0,0,0, 0,1,0,0,0,1,0,0,0,0,1,0, 0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0	18	15	3
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0					
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,1,0,2,0,0,0,0,0,0,0,0,0,0,0,0,0	4					
Kleinhovia hospital	1931-50	8,0,1,0,4,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	14	1991-2007	0,0,3,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0, 1,0,0	4	3	1
	1951-70	5,0,2,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,1,1,0	11					
	1971-90	2,0,2,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,2,0,0,0,0,0,0,1,1,0	10					
Piper longum	1931-50	25,0,9,1,5,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,5,0,0,0,0,0	45	1991-2007	3,0,3,1,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,4,0, 0,0,0,0,0,0,0,0,0,4,0,0, 0,0,0	15	5	10
	1951-70	25,0,7,1,4,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,0,0,0,0,0,0,5,0,0,0,0,0	45					
	1971-90	20,0,2,0,3,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,5,0,0,0,0,0	31					

Contd.

Flacoutia ramontchi	1931-50	80,0,12,0,12,0,0,0,0,0,0,0,0,4,0,0,0,2,0,0,0,0,0,0,0,0,0,0,0,9,0,2,0,0,5,0,0,1,9,90	226	1991-2007	20,0,5,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,3,0,0,0,0,0,0,0,0,0,0,5,0,0,0,0,5,0,0,2,0,2	43	22	21
	1951-70	30,0,10,1,7,0,0,0,0,0,0,0,1,2,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,6,0,2,0,0,5,0,0,2,9,80	157					
	1971-90	40,0,8,0,1,6,0,0,0,0,0,0,0,1,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,10,0,1,0,0,5,0,0,2,12,10	98					
Crataeva nurvala	1931-50	6,0,7,0,10,0,0,0,0,0,0,0,0,1,0,0,0,3,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,15,0,0,0,5,80	127	1991-2007	0,0,6,0,0,0,0,0,0,0,0,0,0,1,0,0,0,2,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	9	4	5
	1951-70	8,0,5,0,2,2,0,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,1,0,0,20,0,0,0,5,80	124					
	1971-90	6,0,3,0,1,0,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,2,0,2,0,0,15,0,0,0,2,10	43					
Acacia moniliformis	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,0,0,0,0,0,0,0,0,0	2	2	0
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	0					
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,4,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	4					

Contd.

Eucalyptus dives	1931-50	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0,0, 0,4,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,4,0,0, 0,3,0	11	10	1
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0	0					
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,3,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0	3					

Contd.

Wood plant in village 2 (Danga)

Plant name	Past			Present			Age	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Juvenile	Mature
Albizia procera	1931-50	0,5,2,0,0,0,50,0,0,0,0,0	57	1991-2007	0,3,0,0,4,1,20,0,0,0,3,4	35	17	18
	1951-70	0,15,3,0,0,20,0,0,0,0,0,6	44					
	1971-90	1,10,0,6,16,0,0,0,1,0,1,0	35					
Acacia nylotica	1931-50	0,12,5,0,0,10,20,0,0,0,0,0	47	1991-2007	0,5,0,0,0,2,3,0,0,0,0,1	11	5	6
	1951-70	0,15,4,7,0,0,40,0,0,0,0,7	73					
	1971-90	0,8,0,0,15,60,10,0,3,0,0,0	86					
Acacia catechu	1931-50	0,20,13,0,0,1,60,0,0,0,0,0	94	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0	0	0	0
	1951-70	0,25,2,25,200,30,0,0,0,0,20	302					
	1971-90	0,5,0,0,18,10,10,0,0,0,0,0	43					
Amoora rohituca	1931-50	0,0,8,0,0,100,2,0,0,0,0,0	110	1991-2007	0,0,6,1,2,5,10,0,0,0,0,3	27	10	17
	1951-70	0,2,4,2,0,60,3,0,0,0,0,2	73					
	1971-90	3,3,4,0,0,40,2,0,1,0,0,0	63					
Azadiracta indica	1931-50	0,4,20,0,0,2,6,0,0,0,0,0	32	1991-2007	1,5,11,1,8,101,22,0,0,3 ,0,10	162	109	53
	1951-70	0,3,12,1,0,5,4,0,0,0,0,3	28					
	1971-90	0,3,0,0,24,1,3,0,5,0,0,0	36					
Alstonia scholaris	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0	0	0	0
	1951-70	0,1,1,0,0,0,0,0,0,0,0,0	2					
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0	0					
Ficus benghalensis	1931-50	0,1,0,0,0,1,2,0,0,0,0,2	6	1991-2007	0,0,0,0,0,0,1,0,0,0,0,0	1	0	1
	1951-70	0,1,0,0,0,3,1,0,0,0,0,0	5					
	1971-90	0,0,0,0,0,0,1,0,0,0,0,0	1					

Contd.

Ficus rumphii	1931-50	0,0,3,0,0,0,0,0,0,0,0,0	3	1991-2007	0,0,1,0,0,0,0,0,0,0,0,0	1	0	1
	1951-70	0,0,0,0,0,2,0,0,0,0,0,0	2					
	1971-90	0,0,0,0,0,0,1,0,0,0,0,0	1					
Beringtonia acutangula	1931-50	0,2,1,0,0,0,2,0,0,0,0,0	5	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0	0	0	0
	1951-70	0,2,1,0,0,30,3,0,1,0,0,0	37					
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0	0					
Anthocephalus cadamba	1931-50	0,0,0,0,0,0,2,0,0,0,0,0	2	1991-2007	0,0,0,0,0,0,1,0,0,0,0,0	1	0	1
	1951-70	0,0,0,0,0,0,4,0,0,0,0,0	4					
	1971-90	0,0,0,0,0,0,1,0,0,0,0,0	1					
Diospyros ebenum	1931-50	0,0,0,0,0,2,0,0,0,0,0,0	2	1991-2007	0,0,0,0,0,2,0,0,0,0,0,0	2	1	1
	1951-70	0,0,0,0,1,2,0,0,1,0,0,0	4					
	1971-90	0,0,0,0,2,1,0,0,0,0,0,0	3					
Cassia fistula	1931-50	0,0,0,0,0,0,2,0,0,0,0,0	2	1991-2007	0,0,0,0,0,0,2,0,0,0,0,0	2	0	2
	1951-70	0,0,0,0,1,0,2,0,0,0,0,0	3					
	1971-90	0,0,0,0,1,0,2,0,0,0,0,0	3					
Swietenia mahogany	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,500,150,50,200,30, 7,16,5,2,500	1460	907	553
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0	0					
	1971-90	0,0,0,7,0,0,32,0,0,0,0,50	89					
Dulbergia sissoo	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,5,0,0,0,2,0,0,0,0,2	9	3	6
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0	0					
	1971-90	0,0,40,200,5,200,12,0,0,0,0,50	507					
Lannea coromandealica	1931-50	0,0,0,0,0,0,8,0,0,0,0,0	8	1991-2007	0,0,3,1,0,0,0,0,0,0,0,0	4	3	1
	1951-70	0,0,4,1,0,0,4,0,0,0,0,0	9					
	1971-90	0,0,3,2,0,0,3,0,0,0,0,0	8					
Polyalthia longifolia	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0	0	0	0
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0	0					
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0	0					

Contd.

Terminalia arjuna	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,0,0,0,0,1	1	0	1
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0	0					
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0	0					
Leucaena latisiliqua	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,2,0,0,0,2,0,0,0,0,4	8	2	6
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0	0					
	1971-90	0,0,3,0,0,0,4,0,0,0,0,5	12					
Kleinhovia hospital	1931-50	0,1,1,0,0,0,2,0,0,0,0,0	4	1991-2007	0,2,0,0,0,0,2,0,0,0,0,0	4	1	3
	1951-70	0,1,2,0,0,0,4,0,0,0,0,0	7					
	1971-90	0,1,1,0,0,2,2,0,0,0,0,0	6					
Piper longum	1931-50	0,0,2,0,0,0,0,0,0,0,0,0	2	1991-2007	0,0,15,0,1,0,7,0,0,0,0,0	23	2	21
	1951-70	0,0,8,0,0,3,5,0,0,0,0,0	16					
	1971-90	0,0,2,0,7,0,5,0,0,0,0,0	14					
Flacoutia ramontchi	1931-50	0,0,4,0,0,30,2,0,0,0,0,0	36	1991-2007	0,0,2,0,1,0,1,0,0,0,0,0	4	2	2
	1951-70	0,5,2,0,0,7,5,0,0,0,0,0	19					
	1971-90	0,0,1,15,3,0,1,0,0,0,0,0	20					
Crataeva nurvala	1931-50	0,0,6,0,0,15,12,0,0,0,0,0	33	1991-2007	0,0,1,0,0,0,3,0,0,0,0,0	4	1	3
	1951-70	0,25,6,0,2,10,2,0,0,0,0,0	45					
	1971-90	0,0,2,3,0,0,1,0,0,0,0,0	6					
Acacia moniliformis	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,0,0,0,0,0,0,0,0,0,0	0	0	0
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0	0					
	1971-90	0,0,2,0,0,0,0,0,0,0,0,0	2					
Eucalyptus dives	1931-50	0,0,0,0,0,0,0,0,0,0,0,0	0	1991-2007	0,0,4,0,0,0,0,0,0,0,0,2	6	6	0
	1951-70	0,0,0,0,0,0,0,0,0,0,0,0	0					
	1971-90	0,0,0,0,0,0,0,0,0,0,0,0	0					

Contd.

Wood plant in village 3 (Danga)

Plant name	Past			Present			Age	
	Duration of year	Plant No./house	Total	Duration of year	Plant No./house	Total	Juvenile	Mature
Albizia procera	1931-50	2.0.0.0.0.0.0.2.0.1.0.5.0.2.2.0.0	14	1991-2007	5.1.0.0.0.2.1.1.5.0.1.2.0.1 .0.0.0	19	7	12
	1951-70	1.1.0.0.1.1.0.2.0.1.0.0.0.2.2.1.0	22					
	1971-90	1.0.0.2.1.1.0.1.1.0.0.0.1.0.1.1.1	11					
Acacia nylotica	1931-50	5.0.9.2.1.1.0.3.30.30.0.12.1.10.2.0.0	108	1991-2007	2.2.1.0.1.2.1.0.1.0.0.10.0. 1.0.0.0	21	4	17
	1951-70	3.1.7.6.2.1.1.7.5.20.0.10.1.7.1.3.0	85					
	1971-90	2.2.1.2.1.0.1.4.5.10.0.3.1.3.2.2.2	35					
Acacia catechu	1931-50	25.0.0.2.2.0.1.12.60.200.0.15.0.7.15.0.0	339	1991-2007	0.0.0.1.0.0.0.0.0.0.2.0.0.0	4	1	3
	1951-70	20.0.0.4.2.0.1.5.30.100.0.10.0.3.10.10.0	186					
	1971-90	5.0.1.2.0.0.0.3.10.50.0.5.0.2.5.5.2	90					
Amoora rohituca	1931-50	2.0.0.0.0.1.1.1.2.0.20.5.0.2.0.0	34	1991-2007	0.1.0.0.1.0.3.0.1.0.0.20.0. 1.0.0.0	27	6	21
	1951-70	1.1.0.0.1.0.2.1.1.2.0.10.3.0.1.1.0	24					
	1971-90	1.1.0.0.1.0.2.1.1.2.0.10.3.0.1.1.0	24					
Azadiracta indica	1931-50	1.0.0.0.0.0.1.4.1.1.0.2.0.1.2.0.0	13	1991-2007	1.0.0.5.0.0.6.3.12.0.0.1.0. 7.15.1.0	61	44	17
	1951-70	1.1.2.0.0.0.1.5.1.1.0.2.0.1.1.2.0	18					
	1971-90	2.0.16.0.0.0.0.1.0.0.0.0.0.1.3.1	24					
Alstonia scholaris	1931-50	0.0.0.0.0.0.0.1.0.0.0.0.0.0.0.0.0	1	1991-2007	1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0	1	0	1
	1951-70	1.0.0.0.0.0.0.0.0.0.1.0.0.0.0	2					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0					
Ficus benghalensis	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	1991-2007	0.0.0.0.0.0.0.0.1.0.0.0.0.0.0.	1	0	1
	1951-70	0.0.0.0.0.0.0.1.0.0.0.0.0.1.0.0	2					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0					
Ficus rumphii	1931-50	0.0.0.0.0.0.0.0.1.0.0.0.0.0.0.0	1	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.1.0.0	1	0	1
	1951-70	0.1.0.0.0.0.1.0.0.0.0.0.0.1.0.0	2					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0					

Contd.

Beringtonia acutangula	1931-50	0.0.0.0.0.0.0.0.2.2.0.2.0.0.0.0	6	1991-2007	0.0.0.0.0.0.0.0.0.0.1.0.0.5.0.0	6	2	4
	1951-70	0.0.0.0.0.0.1.0.3.2.0.2.0.0.0.1.0	9					
	1971-90	0.0.0.0.0.0.0.0.2.1.0.0.1.0	4					
Anthocephalus cadamba	1931-50	0.0.0.0.0.0.0.1.0.0.0.0.0.0.0.	1	1991-2007	0.0.0.0.0.0.1.0.0.0.1.0.0.0 .1.0.0	3	1	2
	1951-70	0.0.0.0.0.0.0.1.0.0.0.0.0.0.2.0	3					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.1.1.	2					
Diospyros ebenum	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0.1.1	2	1991-2007	0.0.0.0.0.0.0.1.0.0.0.0.0.0 .0.1.0	2	0	2
	1951-70	0.0.0.0.0.0.0.2.0.0.0.0.1.0.0.0	3					
	1971-90	0.0.0.0.0.0.2.0.0.0.0.1.0.4.0	7					
Cassia fistula	1931-50	0.0.0.0.0.0.1.0.0.0.0.0.1.0.0.0	2	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 .0.0.0.0.	0	0	0
	1951-70	0.0.1.0.0.0.0.1.0.0.0.0.0.0.0.0.	2					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0					
Swietenia mahogany	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0	1991-2007	10.8.3.4.60.150.7.170.30 0.0.6.20.10.40.9.25.5	1768	1768	64
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0					
	1971-90	0.0.8.0.0.0.0.0.0.0.14.0.0.0	22					
Dulbergia sissoo	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0	1991-2007	0.6.0.0.0.0.2.1.0.0.20.0.5. 1.0	36	20	16
	1951-70	0.0.0.0.0.0.0.0.0.10.0.30.0.0.0.0.0	40					
	1971-90	0.0.20.0.3.0.0.15.400.60.0.40.4.5.0.0.7	554					
Lannea coromandealica	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0	1991-2007	0.0.0.0.0.0.0.1.0.0.0.6.0.1	9	3	6
	1951-70	0.0.0.0.0.0.1.0.0.0.0.0.0.0.0.0.0	1					
	1971-90	0.0.0.0.0.0.0.1.0.3.0.0.0.0.2	6					
Polyalthia longifolia	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0	1	1	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0					
Terminalia arjuna	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0.0	1	1	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0					
	1971-90	0.0.2.0.0.0.0.0.0.0.0.0.0.0.	2					

Contd.

Leucaena latisiliqua	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.	0	1991-2007	0.0.0.0.0.0.0.1.0.0.0.03.0.0.0	31	7	24
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.	0					
	1971-90	0.0.2.0.0.0.0.0.0.0.5.0.0.0.0.0.	7					
Kleinhovia hospital	1931-50	0.0.0.0.0.0.0.1.1.0.0.0.0.0.	2	1991-2007	0.0.0.0.0.0.0.1.0.0.0. 0.1.0.0	2.	1	1
	1951-70	0.0.0.0.0.0.0.1.0.0.0.1.1.0.0.1.0	4					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0	0					
Piper longum	1931-50	2.0.0.0.0.0.3.0.0.0.0.1.0.2.0.0	8	1991-2007	2.0.0.0.14.0.0.0.0.0.0.15.3.0.0	21	8	13
	1951-70	3.0.0.0.0.0.2.0.0.0.1.0.1.0.0.	7					
	1971-90	1.0.3.2.3.0.0.2.0.0.0.0.1.1.1.0.0	14					
Flacoutia ramontchi	1931-50	1.2.0.0.0.0.3.3.0.0.5.0.1.1.0.0	16	1991-2007	3.0.0.0.0.0.0.2.2.0.0.3.0.1.0.0.0	11	4	7
	1951-70	2.8.0.0.0.0.2.0.7.3.0.10.0.1.1.3.0	28					
	1971-90	2.2.0.0.1.0.0.1.0.0.0.0.0.0.2.1	9					
Crataeva nurvala	1931-50	0.3.0.0.0.0.0.2.0.15.0.0.0.1.0.0.0	21	1991-2007	0.0.0.0.0.0.0.0.0.0.0.1.0.0.0	1.	0	1
	1951-70	0.5.0.0.0.0.0.1.0.7.0.0.0.1.0.0.0.	14					
	1971-90	0.2.0.0.0.0.1.0.3.0.0.1.0.0.0	7					
Acacia moniliformis	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0					
Eucalyptus dives	1931-50	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0	1991-2007	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0	0	0	0
	1951-70	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0					
	1971-90	0.0.0.0.0.0.0.0.0.0.0.0.2.0.0.0.	2					

Contd.

Fruit Plants in village 1(Beel)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Matur
Litchi chinensis	1	1	0	2	0	2	2	0
Psidium guajava	6	6	0	7	5	2	2	5
Zizyphus mauritiana	5	5	0	54	4	50	45	9
Citrus sp.	6	4	2	8	6	2	6	2
Spondias dulsis	1	1	0	4	4	0	3	1
Averrhoa camrambola	0	0	0	1	0	1	1	0
Syzygium samarengense	0	0	0	1	0	1	1	0
Annona sp.	5	5	0	0	0	0	0	0
Punica granatum	2	0	2	1	0	1	1	0
Aegle sp.	10	10	0	4	4	0	2	2
Areca catechu	10	10	0	29	9	20	29	0
Total	46	42	4	111	32	79	92	19

Contd.

Multi plants in village 1(Beel)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Mature
Mangifera indica	75	55	20	59	9	50	42	17
Artocarpus heterophyllus	13	13	0	12	12	0	7	5
Syzygium cumini	141	141	0	8	8	0	6	2
Cocos nucifera	10	10	0	26	26	0	16	10
Phoenix sylvestris	63	63	0	41	41	0	20	21
Borassus flabelifera	15	15	0	15	15	0	4	11
Tamarindus indica	16	16	0	5	5	0	2	3
Bombax ceiba	8	8	0	2	2	0	0	2
Ficus hispida	32	32	0	9	9	0	3	6
Total	373	353	20	177	127	50	100	77

Contd.

Wood Plants in village 1(Beel)

Plant name	1970	2007		
	Total no. of plants	Total no. of plants	Age	
			Juvenile	Mature
Albizia procera	63	10	2	8
Acacia nylotica	22	4	1	3
Acacia catechu	4	0	0	0
Amoora rohituca	36	8	2	6
Azadiracta indica	9	5	1	4
Alstonia scholaris	1	0	0	0
Ficus benghalensis	1	0	0	0
Ficus rumphii	1	0	0	0
Beringtonia acutangula	71	12	3	9
Anthocephalus cadamba	12	2	1	1
Diospyros ebenum	7	1	0	1
Cassia fistula	2	0	0	0
Swietenia mahogany	5	75	55	20
Dulbergia sissoo	0	17	7	10
Lannea coromandealica	0	0	0	0
Polyalthia longifolia	0	0	0	0
Terminalia arjuna	0	0	0	0
Leucaena latisiliqua	0	11	2	9
Kleinhovia hospital	2	0	0	0
Piper longum	7	0	0	0
Flacoutia ramontchi	61	2	1	1
Crataeva nurvala	45	6	2	4
Acacia moniliformis	0	0	0	0
Eucalyptus dives	0	0	0	0
Total	349	153	77	76

Contd.

Fruit Plants in village 2(Beel)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Mature
Litchi chinensis	8	5	3	1	0	1	1	0
Psidium guajava	11	11	0	21	19	2	16	5
Zizyphus mauritiana	8	6	2	37	4	33	34	3
Citrus sp.	5	4	1	20	16	4	14	6
Spondias dulsis	3	3	0	1	1	0	0	1
Averrhoa camrambola	0	0	0	1	0	1	0	1
Syzygium samarengense	0	0	0	1	0	1	0	1
Annona sp.	1	1	0	0	0	0	0	0
Punica granatum	0	0	0	0	0	0	0	0
Aegle sp.	7	7	0	2	2	0	1	1
Areca catechu	4	4	0	35	35	0	26	9
Total	47	41	6	119	77	42	92	27

Contd.

Multi plants in village 2(Beel)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Mature
Mangifera indica	143	136	7	180	50	130	154	26
Artocarpus heterophyllus	34	34	0	25	25	0	9	16
Syzygium cumini	99	99	0	10	10	0	3	4
Cocos nucifera	27	27	0	83	83	0	24	59
Phoenix sylvestris	203	203	0	112	112	0	80	32
Borassus flabelifera	31	31	0	49	49	0	11	38
Tamarindus indica	10	10	0	3	3	0	1	2
Bombax ceiba	15	15	0	6	6	0	2	4
Ficus hispida	16	16	0	18	18	0	5	13
Total	578	571	7	486	356	130	289	197

Contd.

Wood Plants in village 2(Beel)

Plant name	1970	2007		
	Total no. of plants	Total no. of plants	Age	
			Juvenile	Mature
Albizia procera	76	29	4	25
Acacia nylotica	35	3	2	1
Acacia catechu	27	0	0	0
Amoora rohituca	28	5	1	4
Azadiracta indica	10	74	68	6
Alstonia scholaris	0	0	0	0
Ficus benghalensis	0	0	0	0
Ficus rumphii	0	0	0	0
Beringtonia acutangula	13	0	0	0
Anthocephalus cadamba	0	0	0	0
Diospyros ebenum	3	0	0	0
Cassia fistula	0	0	0	0
Swietenia mahogany	0	89	77	12
Dulbergia sissoo	27	2	0	2
Lannea coromandealica	2	4	1	3
Polyalthia longifolia	0	0	0	0
Terminalia arjuna	0	1	1	0
Leucaena latisiliqua	5	7	2	5
Kleinhovia hospital	5	3	1	2
Piper longum	2	4	1	3
Flacoutia ramontchi	6	0	0	0
Crataeva nurvala	8	1	1	0
Acacia moniliformis	0	0	0	0
Eucalyptus dives	0	1	1	0
Total	247	223	160	63

Contd.

Fruit Plants in village 3(Beel)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Mature
Litchi chinensis	0	0	0	21	0	21	19	2
Psidium guajava	15	15	0	15	15	0	8	7
Zizyphus mauritiana	17	2	15	70	6	64	59	11
Citrus sp.	8	5	3	13	7	6	8	5
Spondias dulsis	1	1	0	5	5	0	1	4
Averrhoa camrambola	0	0	0	2	2	0	1	1
Syzygium samarengense	1	1	0	1	1	0	0	1
Annona sp.	3	3	0	5	5	0	2	3
Punica granatum	3	0	3	2	0	2	0	2
Aegle sp.	8	8	0	2	2	0	1	1
Areca catechu	7	7	0	66	66	0	55	11
Total	63	42	21	202	109	93	154	48

Contd.

Multi plants in village 3(Beel)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Mature
Mangifera indica	169	155	14	206	46	160	111	95
Artocarpus heterophyllus	13	13	0	23	23	0	7	16
Syzygium cumini	183	183	0	24	24	0	4	16
Cocos nucifera	18	18	0	50	50	0	32	18
Phoenix sylvestris	86	86	0	131	131	0	90	41
Borassus flabelifera	30	30	0	23	23	0	12	11
Tamarindus indica	13	13	0	6	6	0	4	2
Bombax ceiba	11	11	0	10	10	0	7	3
Ficus hispida	9	9	0	5	5	0	2	3
Total	532	518	14	478	318	160	273	205

Contd.

Wood Plants in village 3(Beel)

Plant name	1970	2007		
	Total no. of plants	Total no. of plants	Age	
			Juvenile	Mature
Albizia procera	56	13	3	10
Acacia nylotica	35	1	1	0
Acacia catechu	260	0	0	0
Amoora rohituca	51	17	4	13
Azadiracta indica	22	13	5	8
Alstonia scholaris	1	0	0	0
Ficus benghalensis	0	0	0	0
Ficus rumphii	1	2	0	2
Beringtonia acutangula	111	7	2	5
Anthocephalus cadamba	11	4	1	3
Diospyros ebenum	8	3	1	2
Cassia fistula	3	0	0	0
Swietenia mahogany	0	182	170	12
Dulbergia sissoo	8	4	1	3
Lannea coromandealica	2	3	1	2
Polyalthia longifolia	0	0	0	0
Terminalia arjuna	0	0	0	0
Leucaena latisiliqua	2	14	1	2
Kleinhovia hospital	10	3	1	2
Piper longum	8	4	2	2
Flacoutia ramontchi	21	4	2	2
Crataeva nurvala	16	0	0	0
Acacia moniliformis	0	0	0	0
Eucalyptus dives	2	0	0	0
Total	628	274	198	76

Contd.

Fruit Plants in village 1 (Danga)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Mature
Litchi chinensis	17	14	3	61	2	59	29	32
Psidium guajava	60	60	0	76	76	0	38	38
Zizyphus mauritiana	51	47	4	1372	23	1349	1340	32
Citrus sp.	40	37	3	103	20	83	82	21
Spondias dulsis	8	8	0	30	30	0	13	17
Averrhoa camrambola	3	3	0	15	15	0	3	12
Syzygium samarengense	5	0	5	3	0	3	0	3
Annona sp.	100	100	0	30	30	0	8	22
Punica granatum	15	15	0	16	12	4	4	12
. Aegle sp.	53	53	0	23	23	0	10	13
Areca catechu	212	212	0	440	440	0	257	183
Total	564	569	15	2169	671	1498	1772	397

Contd.

Multi plants in village 1 (Danga)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Mature
Mangifera indica	788	720	68	847	349	498	551	296
Artocarpus heterophyllus	75	75	0	112	112	0	49	63
Syzygium cumini	1991	1991	0	215	215	0	22	193
Cocos nucifera	160	160	0	184	184	0	119	65
Phoenix sylvestris	404	404	0	426	426	0	311	115
Borassus flabelifera	83	83	0	93	93	0	22	71
Tamarindus in dica	108	108	0	15	15	0	4	11
Bombax ceiba	95	95	0	50	50	0	9	41
Ficus hispida	172	172	0	46	46	0	17	29
Total	3832	3764	68	1988	1490	498	1104	884

Contd.

Wood Plants in village 1 (Danga)

Plant name	1970	2007		
	Total no. of plants	Total no. of plants	Age	
			Juvenile	Mature
Albizia procera	349	80	29	51
Acacia nylotica	502	21	13	8
Acacia catechu	836	2	0	2
Amoora rohituca	549	87	42	45
Azadiracta indica	129	121	82	39
Alstonia scholaris	24	2	0	2
Ficus benghalensis	9	0	0	0
Ficus rumphii	6	4	0	1
Beringtonia acutangula	230	6	1	5
Anthocephalus cadamba	47	11	6	5
Diospyros ebenum	97	25	3	22
Cassia fistula	120	4	1	3
Swietenia mahogany	43	1524	225	1299
Dulbergia sissoo	144	60	23	37
Lannea coromandealica	30	23	7	16
Polyalthia longifolia	11	1	0	1
Terminalia arjuna	6	2	0	2
Leucaena latisiliqua	4	18	15	3
Kleinhovia hospital	35	4	3	1
Piper longum	121	15	5	10
Flacoutia ramontchi	481	43	22	21
Crataeva nurvala	294	9	4	5
Acacia moniliformis	4	2	2	0
Eucalyptus dives	3	11	10	1
Total	4074	2075	493	1582

Contd.

Fruit Plants in village 2 (Danga)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Mature
Litchi chinensis	5	2	3	103	0	103	30	73
Psidium guajava	19	19	0	373	353	20	300	73
Zizyphus mauritiana	22	15	7	1081	30	1051	1000	81
Citrus sp.	25	12	13	302	50	252	270	32
Spondias dulsis	5	5	0	13	13	0	5	8
Averrhoa camrambola	3	3	0	9	5	4	2	7
Syzygium samarengense	2	0	2	4	0	4	0	4
Annona sp.	27	27	0	23	23	0	4	19
Punica granatum	11	0	11	11	0	11	4	7
Aegle sp.	27	27	0	20	20	0	5	15
Areca catechu	36	36	0	309	309	0	200	109
Total	182	146	36	2248	803	1445	1820	428

Contd.

Multi plants in village 2 (Danga)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Mature
Mangifera indica	196	183	13	766	40	716	310	456
Artocarpus heterophyllus	72	72	0	119	119	0	40	79
Syzygium cumini	747	747	0	31	31	0	11	20
Cocos nucifera	119	119	0	130	130	0	70	60
Phoenix sylvestris	354	345	0	1347	1347	0	570	777
Borassus flabelifera	21	21	0	76	76	0	16	60
Tamarindus indica	30	30	0	5	5	0	2	3
Bombax ceiba	52	52	0	30	30	0	10	20
Ficus hispida	70	70	0	20	20	0	9	11
Total	1661	1648	13	2524	1808	716	1038	1486

Contd.

Wood Plants in village 2 (Danga)

Plant name	1970	2007		
	Total no. of plants	Total no. of plants	Age	
			Juvenile	Mature
Albizia procera	136	35	17	18
Acacia nylotica	206	11	5	6
Acacia catechu	439	0	0	0
Amoora rohituca	246	27	10	17
Azadiracta indica	96	162	109	53
Alstonia scholaris	2	0	0	0
Ficus benghalensis	12	1	0	1
Ficus rumphii	6	1	0	1
Beringtonia acutangula	42	0	0	0
Anthocephalus cadamba	7	1	0	1
Diospyros ebenum	9	2	1	1
Cassia fistula	8	2	0	2
Swietenia mahogany	89	1460	907	553
Dulbergia sissoo	507	9	3	6
Lannea coromandealica	25	4	3	1
Polyalthia longifolia	0	0	0	0
Terminalia arjuna	0	1	0	1
Leucaena latisiliqua	12	8	2	6
Kleinhovia hospital	17	4	1	3
Piper longum	32	23	2	21
Flacoutia ramontchi	75	4	2	2
Crataeva nurvala	84	4	1	3
Acacia moniliformis	2	0	0	0
Eucalyptus dives	0	6	6	0
Total	2052	1765	1069	696

Contd.

Fruit Plants in village 3 (Danga)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Mature
Litchi chinensis	2	2	0	40	3	37	3	37
Psidium guajava	24	24	0	32	32	0	5	27
Zizyphus mauritiana	16	13	3	716	14	702	701	15
Citrus sp.	20	20	0	21	19	2	6	15
Spondias dulsis	5	5	0	4	4	0	2	2
Averrhoa camrambola	2	2	0	6	6	0	2	4
Syzygium samarengense	1	0	1	0	0	0	0	0
Annona sp.	31	31	0	11	11	0	8	3
Punica granatum	7	0	7	4	0	4	2	2
Aegle sp.	11	11	0	5	5	0	2	3
Areca catechu	95	95	0	279	279	0	62	277
Total	214	203	11	1118	373	745	793	325

Contd.

Multi plants in village 3 (Danga)

Plant name	1970			2007				
	Total no. of plants	seedling	graft	Total no. of plants	seedling	graft	Age	
							Juvenile	Mature
Mangifera indica	217	209	8	496	442	54	340	156
Artocarpus heterophyllus	37	37	0	46	46	0	24	22
Syzygium cumini	89	89	0	33	33	0	7	26
Cocos nucifera	152	152	0	214	214	0	154	60
Phoenix sylvestris	145	145	0	287	287	0	200	87
Borassus flabelifera	55	55	0	95	95	0	30	65
Tamarindus indica	15	15	0	6	6	0	2	4
Bombax ceiba	32	32	0	14	14	0	3	11
Ficus hispida	41	41	0	14	14	0	5	9
Total	783	775	8	1205	1151	54	765	440

Contd.

Wood Plants in village 3 (Danga)

Plant name	1970	2007		
	Total no. of plants	Total no. of plants	Age	
			Juvenile	Mature
Albizia procera	47	19	7	12
Acacia nylotica	228	21	4	17
Acacia catechu	615	4	1	3
Amoora rohituca	82	27	6	21
Azadiracta indica	55	61	44	17
Alstonia scholaris	3	1	0	1
Ficus benghalensis	2	1	0	1
Ficus rumphii	3	1	0	1
Beringtonia acutangula	19	6	2	4
Anthocephalus cadamba	6	3	1	2
Diospyros ebenum	15	2	0	2
Cassia fistula	4	0	0	0
Swietenia mahogany	22	1768	1704	64
Dulbergia sissoo	594	36	20	16
Lannea coromandealica	7	9	3	6
Polyalthia longifolia	0	1	1	0
Terminalia arjuna	2	1	1	0
Leucaena latisiliqua	7	31	7	24
Kleinhovia hospital	6	2	1	1
Piper longum	29	21	8	13
Flacoutia ramontchi	53	11	4	7
Crataeva nurvala	42	1	0	1
Acacia moniliformis	0	0	0	0
Eucalyptus dives	2	0	0	0
Total	1843	2027	1814	213

Contd.

Change in number of Fruit plants 1 (Beel)

Plant name	1931-50	1951-70	1971-90	1991-2007
Litchi chinensis	0	0	1	2
Psidium guajava	2	0	4	7
Zizyphus mauritiana	2	2	1	54
Citrus sp.	0	1	5	8
Spondias dulsis	0	0	1	4
Averrhoa camrambola	0	0	0	1
Syzygium samarengense	0	0	0	1
Annona sp.	1	2	2	0
Punica granatum	0	0	2	1
Aegle sp.	4	2	4	4
Areca catechu	5	3	2	29
Total	14	10	22	111

Change in number of Multi plants 1 (Beel)

Plant name	1931-50	1951-70	1971-90	1991-2007
Mangifera indica	20	24	31	59
Artocarpus heterophyllus	3	5	5	12
Syzygium cumini	59	46	36	8
Cocos nucifera	5	3	2	26
Phoenix sylvestris	28	16	19	41
Borassus flabelifera	6	5	4	15
Tamarindus indica	7	7	2	5
Bombax ceiba	3	2	3	2
Ficus hispida	15	9	8	9
Total	146	117	110	177

Contd.

Change in number of Wood plants 1 (Beel)

Plant name	1931-50	1951-70	1971-90	1991-2007
Albizia procera	27	17	19	10
Acacia nylotica	11	6	5	4
Acacia catechu	2	1	1	0
Amoora rohituca	17	9	10	8
Azadiracta indica	4	2	3	5
Alstonia scholaris	1	0	0	0
Ficus benghalensis	1	0	0	0
Ficus rumphii	0	1	0	0
Beringtonia acutangula	40	23	8	12
Anthocephalus cadamba	6	4	2	2
Diospyros ebenum	4	2	1	1
Cassia fistula	1	1	0	0
Swietenia mahogany	0	0	5	75
Dulbergia sissoo	0	0	0	17
Lannea coromandealica	0	0	0	0
Polyalthia longifolia	0	0	0	0
Terminalia arjuna	0	0	0	0
Leucaena latisiliqua	0	0	0	11
Kleinhovia hospital	2	0	0	0
Piper longum	3	0	4	0
Flacoutia ramontchi	30	14	17	2
Crataeva nurvala	22	14	9	6
Acacia moniliformis	0	0	0	0
Eucalyptus dives	0	0	0	0
Total	171	94	66	153

Contd.

Change in number of Fruit plants 2 (Beel)

Plant name	1931-50	1951-70	1971-90	1991-2007
Litchi chinensis	2	6	0	1
Psidium guajava	1	3	7	21
Zizyphus mauritiana	1	4	3	37
Citrus sp.	1	1	3	20
Spondias dulsis	1	1	1	1
Averrhoa camrambola	0	0	0	1
Syzygium samarengense	0	0	0	1
Annona sp.	1	0	0	0
Punica granatum	0	0	0	0
Aegle sp.	2	2	3	7
Areca catechu	0	0	4	35
Total	9	17	21	124

Change in number of Multi plants 2 (Beel)

Plant name	1931-50	1951-70	1971-90	1991-2007
Mangifera indica	20	62	61	180
Artocarpus heterophyllus	1	5	28	25
Syzygium cumini	72	7	20	10
Cocos nucifera	0	5	22	83
Phoenix sylvestris	25	80	98	112
Borassus flabelifera	2	3	26	49
Tamarindus indica	1	2	7	3
Bombax ceiba	2	4	9	6
Ficus hispida	1	2	13	18
Total	124	170	284	486

Contd.

Change in number of Wood plants 2 (Beel)

Plant name	1931-50	1951-70	1971-90	1991-2007
Albizia procera	24	21	31	29
Acacia nylotica	14	14	7	3
Acacia catechu	12	11	4	0
Amoora rohituca	11	12	5	5
Azadiracta indica	2	3	5	74
Alstonia scholaris	0	0	0	0
Ficus benghalensis	0	0	0	0
Ficus rumphii	0	0	0	0
Beringtonia acutangula	8	4	1	0
Anthocephalus cadamba	0	0	0	0
Diospyros ebenum	2	1	0	0
Cassia fistula	0	0	0	0
Swietenia mahogany	0	0	0	89
Dulbergia sissoo	0	0	27	2
Lannea coromandealica	1	0	1	4
Polyalthia longifolia	0	0	0	0
Terminalia arjuna	0	0	0	1
Leucaena latisiliqua	0	0	5	7
Kleinhovia hospital	1	1	3	3
Piper longum	0	0	2	4
Flacoutia ramontchi	3	2	1	0
Crataeva nurvala	3	2	3	1
Acacia moniliformis	0	0	0	0
Eucalyptus dives	0	0	0	1
Total	81	71	95	223

Contd.

Change in number of Fruit plants 3 (Beel)

Plant name	1931-50	1951-70	1971-90	1991-2007
Litchi chinensis	0	0	0	21
Psidium guajava	3	5	7	15
Zizyphus mauritiana	4	10	3	70
Citrus sp.	2	2	4	13
Spondias dulsis	0	0	1	5
Averrhoa camrambola	0	0	0	2
Syzygium samarengense	0	0	1	1
Annona sp.	1	1	1	5
Punica granatum	0	2	1	2
Aegle sp.	2	3	3	2
Areca catechu	2	2	3	66
Total	14	25	24	202

Change in number of Multi plants 3 (Beel)

Plant name	1931-50	1951-70	1971-90	1991-2007
Mangifera indica	55	86	28	206
Artocarpus heterophyllus	4	6	3	23
Syzygium cumini	97	60	26	24
Cocos nucifera	6	8	4	50
Phoenix sylvestris	30	35	21	131
Borassus flabelifera	7	14	9	23
Tamarindus indica	4	6	3	6
Bombax ceiba	5	4	2	10
Ficus hispida	2	5	2	5
Total	210	224	98	478

Contd.

Change in number of Wood plants 3 (Beel)

Plant name	1931-50	1951-70	1971-90	1991-2007
Albizia procera	21	23	12	13
Acacia nylotica	13	14	8	1
Acacia catechu	115	90	55	0
Amoora rohituca	17	26	8	17
Azadiracta indica	6	12	4	13
Alstonia scholaris	0	1	0	0
Ficus benghalensis	0	0	0	0
Ficus rumphii	0	1	0	2
Beringtonia acutangula	36	50	25	7
Anthocephalus cadamba	4	4	3	4
Diospyros ebenum	3	2	3	3
Cassia fistula	1	1	1	0
Swietenia mahogany	0	0	0	182
Dulbergia sissoo	0	8	0	4
Lannea coromandealica	0	1	1	3
Polyalthia longifolia	0	0	0	0
Terminalia arjuna	0	0	0	0
Leucaena latisiliqua	0	0	2	14
Kleinhovia hospital	1	6	3	3
Piper longum	3	3	2	4
Flacoutia ramontchi	6	10	5	4
Crataeva nurvala	5	8	3	0
Acacia moniliformis	0	0	0	0
Eucalyptus dives	0	0	2	0
Total	231	260	137	274

Contd.

Change in number of fruit plants 1 (Danga)

Plant name	1931-50	1951-70	1971-90	1991-2007
Litchi chinensis	3	6	8	61
Psidium guajava	4	16	40	76
Zizyphus mauritiana	7	16	28	1372
Citrus sp.	1	10	29	103
Spondias dulsis	0	1	7	30
Averrhoa camrambola	0	0	3	15
Syzygium samarengense	0	0	5	3
Annona sp.	31	34	35	30
Punica granatum	3	2	10	16
. Aegle sp.	26	14	23	23
Areca catechu	44	71	97	440
Total	109	141	285	2169

Change in number of Multi plants 1 (Danga)

Plant name	1931-50	1951-70	1971-90	1991-2007
Mangifera indica	272	246	270	847
Artocarpus heterophyllus	10	18	47	112
Syzygium cumini	819	530	642	215
Cocos nucifera	30	46	84	184
Phoenix sylvestris	100	115	189	426
Borassus flabelifera	25	25	33	93
Tamarindus indica	33	36	39	15
Bombax ceiba	16	28	51	50
Ficus hispida	55	69	48	46
Total	1360	1113	1403	1988

Contd.

Change in number of Wood plants 1 (Danga)

Plant name	1931-50	1951-70	1971-90	1991-2007
Albizia procera	101	128	120	80
Acacia nylotica	167	191	144	21
Acacia catechu	307	325	204	2
Amoora rohituca	233	189	127	87
Azadiracta indica	29	44	56	121
Alstonia scholaris	10	9	5	2
Ficus benghalensis	0	8	1	0
Ficus rumphii	3	3	0	4
Beringtonia acutangula	93	76	61	6
Anthocephalus cadamba	19	15	13	11
Diospyros ebenum	38	29	30	25
Cassia fistula	56	33	31	4
Swietenia mahogany	1	1	41	1524
Dulbergia sissoo	15	9	120	60
Lannea coromandealica	2	18	10	23
Polyalthia longifolia	1	8	2	1
Terminalia arjuna	6	0	0	2
Leucaena latisiliqua	0	0	4	18
Kleinhovia hospital	14	11	10	4
Piper longum	45	45	31	15
Flacoutia ramontchi	226	157	98	43
Crataeva nurvala	127	124	43	9
Acacia moniliformis	0	0	4	2
Eucalyptus dives	0	0	3	11
Total	1493	1423	1158	2075

Contd.

Change in number of Fruit plants 2 (Danga)

Plant name	1931-50	1951-70	1971-90	1991-2007
Litchi chinensis	0	1	4	103
Psidium guajava	1	5	13	373
Zizyphus mauritiana	1	5	16	1081
Citrus sp.	0	5	20	302
Spondias dulsis	0	0	5	13
Averrhoa camrambola	0	0	3	9
Syzygium samarengense	0	2	0	4
Annona sp.	3	6	18	23
Punica granatum	2	2	7	11
Aegle sp.	1	7	19	20
Areca catechu	1	11	16	42
Total	9	44	121	1981

Change in number of Multi plants 2 (Danga)

Plant name	1931-50	1951-70	1971-90	1991-2007
Mangifera indica	51	63	82	766
Artocarpus heterophyllus	5	41	26	119
Syzygium cumini	269	260	218	31
Cocos nucifera	31	47	41	130
Phoenix sylvestris	71	149	134	1347
Borassus flabelifera	4	10	7	76
Tamarindus indica	8	13	9	5
Bombax ceiba	11	23	18	30
Ficus hispida	18	22	30	20
Total	468	628	565	2524

Contd.

Change in number of Wood plants 2 (Danga)

Plant name	1931-50	1951-70	1971-90	1991-2007
Albizia procera	57	44	35	35
Acacia nylotica	47	73	86	11
Acacia catechu	94	302	43	0
Amoora rohituca	110	73	63	27
Azadiracta indica	32	28	36	162
Alstonia scholaris	0	2	0	0
Ficus benghalensis	6	5	1	1
Ficus rumphii	3	2	1	1
Beringtonia acutangula	5	37	0	0
Anthocephalus cadamba	2	4	1	1
Diospyros ebenum	2	4	3	2
Cassia fistula	2	3	3	2
Swietenia mahogany	0	0	89	1460
Dulbergia sissoo	0	0	507	9
Lannea coromandealica	8	9	8	4
Polyalthia longifolia	0	0	0	0
Terminalia arjuna	0	0	0	1
Leucaena latisiliqua	0	0	12	8
Kleinhovia hospital	4	7	6	4
Piper longum	2	16	14	23
Flacoutia ramontchi	36	19	20	4
Crataeva nurvala	33	45	6	4
Acacia moniliformis	0	0	2	0
Eucalyptus dives	0	0	0	6
Total	443	673	936	1765

Contd.

Change in number of Fruit plants 3 (Danga)

Plant name	1931-50	1951-70	1971-90	1991-2007
Litchi chinensis	0	2	0	40
Psidium guajava	1	10	13	31
Zizyphus mauritiana	0	5	11	716
Citrus sp.	0	10	10	21
Spondias dulsis	0	0	5	4
Averrhoa camrambola	0	1	1	6
Syzygium samarengense	0	1	0	0
Annona sp.	6	19	16	11
Punica granatum	0	2	5	4
Aegle sp.	0	5	6	5
Areca catechu	9	46	40	279
Total	16	101	107	1118

Change in number of Multi plants 3 (Danga)

Plant name	1931-50	1951-70	1971-90	1991-2007
Mangifera indica	65	103	49	496
Artocarpus heterophyllus	5	17	15	46
Syzygium cumini	33	40	16	33
Cocos nucifera	36	80	36	214
Phoenix sylvestris	34	61	44	287
Borassus flabelifera	11	29	15	95
Tamarindus indica	3	7	5	6
Bombax ceiba	7	15	10	14
Ficus hispida	10	22	9	14
Total	204	380	199	1205

Contd.

Change in number of Wood plants 3 (Danga)

Plant name	1931-50	1951-70	1971-90	1991-2007
Albizia procera	14	22	11	19
Acacia nylotica	108	85	35	21
Acacia catechu	339	186	90	4
Amoora rohituca	34	24	24	27
Azadiracta indica	13	18	24	61
Alstonia scholaris	1	2	0	1
Ficus benghalensis	0	2	0	1
Ficus rumphii	1	2	0	1
Beringtonia acutangula	6	9	4	6
Anthocephalus cadamba	1	3	2	3
Diospyros ebenum	3	7	5	2
Cassia fistula	2	2	0	0
Swietenia mahogany	0	0	22	1464
Dulbergia sissoo	0	40	554	36
Lannea coromandealica	0	1	6	9
Polyalthia longifolia	0	0	0	1
Terminalia arjuna	0	0	2	1
Leucaena latisiliqua	0	0	7	31
Kleinhovia hospital	2	4	0	2
Piper longum	8	7	14	21
Flacoutia ramontchi	16	28	9	11
Crataeva nurvala	21	14	7	1
Acacia moniliformis	0	0	0	0
Eucalyptus dives	0	0	2	0
Total	569	456	818	2027

Appendix 3

Change of organic manure (%) in village 1 (Danga) during 1970 – 2007

(Six households of each village)

House hold no.	1970					2007					Change				
	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others
1	95	0	0	0	5	80	20	0	0	0	-15	+20	0	0	-5
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	90	0	0	5	5	60	20	0	5	15	-30	+20	0	0	+10
4	75	0	15	5	5	90	0	0	0	10	+15	0	-15	-5	+5
5	95	5	0	0	0	0	0	0	0	0	-95	-5	0	0	0
6	80	5	2	3	10	100	0	0	0	0	+20	-5	-2	-3	-10

Contd.

Change of organic manure (%) in village 2 (Danga) during 1970 – 2007

House hold no.	1970					2007					Change				
	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others
1	95	0	0	0	5	95	0	0	0	5	0	0	0	0	0
2	90	0	5	0	5	0	0	0	0	0	-90	0	-5	0	-5
3	90	0	0	0	10	0	0	0	0	0	-90	0	0	0	-10
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	90	0	0	0	10	90	0	0	5	5	0	0	0	+5	+5
6	95	0	0	0	5	85	0	0	5	10	-15	0	0	+5	+5

Contd.

Change of organic manure (%) in village 3 (Danga) during 1970 – 2007

House hold no.	1970					2007					Change				
	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others
1	90	5	0	2	3	95	0	0	0	5	+5	-5	0	-2	+2
2	95	0	0	0	5	90	0	0	10	0	-5	0	0	+10	-5
3	95	0	0	0	5	90	0	0	5	5	-5	0	0	+5	0
4	90	0	0	0	10	95	0	0	0	5	+5	0	0	0	-5
5	95	0	2	0	3	95	0	0	0	5	0	0	-2	0	+2
6	90	0	0	5	5	90	0	5	0	5	0	0	+5	-5	0

Contd.

Change of organic manure (%) in village 1 (Beel) during 1970 – 2007

House hold no.	1970					2007					Change				
	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others
1	95	0	0	5	0	0	0	0	90	10	-95	0	0	+85	+10
2	95	0	0	0	5	90	0	0	0	10	-5	0	0	0	+5
3	95	0	0	0	5	95	0	0	0	5	0	0	0	0	0
4	100	0	0	0	0	95	0	0	0	5	-5	0	0	0	+5
5	95	0	0	0	5	90	0	0	0	10	-5	0	0	0	+5
6	90	0	0	5	5	0	0	0	0	0	-90	0	0	-5	-5

Contd.

Change of organic manure (%) in village 2 (Beel) during 1970 – 2007

House hold no.	1970					2007					Change				
	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others
1	90	0	2	3	5	95	0	0	0	5	+5	0	-2	-3	0
2	90	0	5	0	5	95	0	0	0	5	+5	0	-5	0	0
3	90	0	5	0	5	90	0	0	5	5	0	0	-5	+5	0
4	95	0	0	0	5	100	0	0	0	0	+5	0	0	0	-5
5	95	0	0	0	5	0	0	0	0	0	-95	0	0	0	-5
6	80	0	5	0	15	90	0	0	5	5	+10	0	-5	+5	-10

Contd.

Change of organic manure (%) in village 3 (Beel) during 1970 – 2007

House hold no.	1970					2007					Change				
	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others	Cow dung	Compost	Green manure	Poultry dust	Others
1	90	0	0	5	5	95	0	0	0	5	+5	0	0	-5	0
2	90	0	0	0	10	0	0	0	0	100	-90	0	0	0	+90
3	25	0	0	0	75	15	0	0	0	95	-10	0	0	0	-75
4	90	0	0	0	10	95	0	0	0	5	+5	0	0	0	-5
5	80	0	0	0	15	90	0	0	5	5	+10	0	0	+5	-10
6	90	0	0	0	10	95	0	0	0	5	+5	0	0	0	-5

Appendix 4

Use of different sources of fuel (%) in six households of village 1 (Danga) in 1970 – 2007

House hold no.	1970									2007									Change								
	R	WH	S	M	C	B	WO	L	O	R	WH	S	M	C	B	WO	L	O	R	WH	S	M	C	B	WO.	L	O
1	5	0	5	0	20	25	25	0	20	5	0	0	0	50	5	5	25	10	0	0	-5	0	+30	-20	-20	+25	-10
2	5	0	0	0	0	70	10	10	5	0	0	5	0	5	60	0	20	10	-5	0	+5	0	+5	-10	-10	+10	+5
3	0	0	2	0	20	30	40	5	3	5	2	0	15	5	10	5	55	3	+5	+2	-2	+15	-15	-20	-35	+45	0
4	0	0	5	0	20	30	35	5	5	2	1	2	2	10	5	1	75	2	+2	+1	-3	+2	-10	-25	-34	+70	-3
5	0	0	5	0	20	40	30	2	3	0	0	0	5	0	0	0	90	5	0	0	-5	+5	-20	-40	-30	+88	+2
6	0	0	10	0	20	50	15	0	5	5	0	10	3	20	5	2	50	5	+5	0	0	+3	0	-45	-13	50	0

Rice Straw =R , Wheat Straw=WH , Sugarcane=S , Maize Straw =M, Bamboo =B , Wood =WO, Leaf =L, Others (Jute stick , Weeds)

Contd.

Use of different sources of fuel (%) in six households of village 2 (Danga) in 1970 – 2007

House hold no.	1970									2007									Change								
	R	WH	S	M	C	B	WO.	L	O	R	WH	S	M	C	B	WO	L	O	R	WH	S	M	C	B	WO.	L	O
1	0	0	5	0	25	10	10	5	45	5	2	3	20	5	2	3	40	20	+5	+2	-3	+20	-20	-8	-7	+35	-25
2	5	0	10	0	20	30	25	5	5	15	0	5	0	0	15	10	50	5	+10	0	-5	0	-20	-15	-15	+45	0
3	10	0	10	0	25	30	15	5	5	0	0	5	5	25	5	5	50	5	-10	0	-5	+5	0	-25	-10	+45	0
4	10	0	10	0	20	30	20	5	5	0	0	10	10	25	5	5	40	5	-10	0	0	+10	+5	-25	-15	+35	0
5	5	0	10	0	20	30	25	5	5	10	0	5	5	25	15	5	30	10	+5	0	-5	+5	+5	-15	-20	+25	+5
6	5	0	10	0	20	30	25	5	5	0	2	5	3	30	10	5	40	5	-5	+2	-5	+3	+10	-20	-20	+35	0

Rice Straw =R , Wheat Straw=WH , Sugarcane=S , Maize Straw =M, Bamboo =B , Wood =WO , Leaf =L, Others (Jute stick , Weeds)

Contd.

Use of different sources of fuel (%) in six households of village 3 (Danga) in 1970 – 2007

House hold no.	1970									2007									Change							
	R	WH	S	M	C	B	WO.	L	O	R	WH	S	M	C	B	WO	L	O	R	WH	S	M	C	B	WO.	L	O
1	5	0	5	0	10	40	30	5	5	10	5	15	0	20	10	5	30	5	+5	+5	+10	0	+10	-30	-25	+25	0
2	15	0	20	0	5	30	20	5	5	5	5	10	10	20	3	2	40	5	-10	+5	-10	+10	+15	-27	-18	+35	0
3	0	0	5	0	20	40	25	5	5	0	0	25	25	20	10	5	10	5	0	0	+20	+25	0	-30	-20	+5	0
4	5	0	5	0	45	30	10	0	5	70	0	5	0	0	5	5	10	5	+65	0	0	0	-45	-25	-5	+10	0
5	5	0	5	0	10	20	40	10	10	10	0	0	5	20	5	50	5	5	+5	0	-5	+5	+10	-15	+10	-5	-5
6	5	0	5	0	25	20	30	5	10	3	2	0	5	10	5	0	55	20	-2	+2	-5	+5	-15	-15	-30	+50	+10

Rice Straw =R, Wheat Straw=WH, Sugarcane=S, Maize Straw =M, Bamboo =B, Wood =WO, Leaf =L, Others (Jute stick, Weeds)

Contd.

Use of different sources of fuel (%) in six households of village 1 (Beel) in 1970 – 2007

House hold no.	1970									2007									Change								
	R	WH	S	M	C	B	WO.	L	O	R	WH	S	M	C	B	WO	L	O	R	WH	S	M	C	B	WO.	L	O
1	40	0	0	0	30	15	10	3	2	0	0	0	0	20	5	5	60	10	-40	0	0	0	-10	-10	-5	+57	+8
2	5	0	0	0	20	40	20	5	10	10	0	0	5	25	10	5	40	5	+5	0	0	+5	+5	-30	-15	+35	-5
3	10	0	0	0	20	20	20	10	20	5	0	0	5	25	10	5	40	10	-5	0	0	+5	+5	-10	-15	+30	-10
4	5	0	0	0	25	30	30	5	5	15	0	0	5	30	10	5	30	5	+10	0	0	+5	+5	-20	-25	+25	0
5	5	0	0	0	25	40	20	5	5	10	0	0	5	40	10	5	20	10	+5	0	0	+5	+15	-30	-15	+15	+5
6	10	0	0	0	15	30	30	5	10	15	5	0	0	30	15	10	25	5	+5	+5	0	0	+15	-15	-20	+20	-5

Rice Straw =R , Wheat Straw=WH , Sugarcane=S , Maize Straw =M, Bamboo =B , Wood =WO, Leaf =L, Others (Jute stick , Weeds)

Contd.

Use of different sources of fuel (%) in six households of village 2 (Beel) in 1970 – 2007

House hold no.	1970									2007									Change								
	R	WH	S	M	C	B	WO	L	O	R	WH	S	M	C	B	WO	L	O	R	WH	S	M	C	B	WO	L	O
1	10	0	0	0	20	30	30	5	5	15	0	0	5	25	10	5	30	10	+5	0	0	+5	+5	-20	-25	+25	+5
2	10	0	0	0	10	30	30	10	10	0	2	0	3	50	10	5	25	5	-10	+2	0	+3	+40	-20	-25	+15	-5
3	5	0	0	0	10	30	25	15	15	10	0	0	5	25	5	0	50	5	+5	0	0	+5	+15	-25	-25	+35	-10
4	5	0	0	0	15	25	25	10	20	20	0	0	5	25	10	0	30	10	+15	0	0	+5	+10	-15	-25	+20	-10
5	20	0	0	0	20	30	15	0	15	5	0	0	5	0	0	0	80	10	-15	0	0	+5	-20	-30	-15	+80	-5
6	20	0	0	0	60	10	5	0	5	5	0	0	5	30	5	0	40	15	-15	0	0	+5	-30	-5	-5	+40	+10

Rice Straw =R , Wheat Straw=WH , Sugarcane=S , Maize Straw =M, Bamboo =B , Wood =WO, Leaf =L, Others (Jute stick , Weeds)

Contd.

Use of different sources of fuel (%) in six households of village 3 (Beel) in 1970 – 2007

House hold no.	1970									2007									Change							
	R	WH	S	M	C	B	WO.	L	O	R	WH	S	M	C	B	WO	L	O	R	WH	S	M	C	B	WO.	L	O
1	5	0	0	0	10	50	25	5	5	10	5	0	5	25	15	5	30	5	+5	+5	0	+5	+15	-35	-20	+25	0
2	0	0	0	0	10	50	30	5	5	0	2	0	3	0	5	5	80	5	0	+2	0	+3	-10	-45	-25	+75	0
3	5	0	0	0	10	30	30	10	15	20	0	0	3	25	10	2	30	10	+15	0	0	+3	+15	-20	-28	+20	-5
4	5	0	0	0	20	30	20	5	20	10	0	0	5	25	10	5	40	5	+5	0	0	+5	+5	-20	-15	+35	-15
5	10	0	0	0	10	30	30	10	10	15	0	0	0	25	10	10	30	10	+5	0	0	0	+15	-20	-20	+20	0
6	5	0	0	0	10	40	30	5	10	3	2	0	5	20	10	5	50	5	-2	+2	0	+5	+10	-30	-25	+45	-5

Rice Straw =R , Wheat Straw=WH , Sugarcane=S , Maize Straw =M, Bamboo =B , Wood =WO, Leaf =L, Others (Jute stick , Weeds)

Appendix 5

Domestic animals in village 1 (Danga)

House hold No.	1970																2007															
	Name and number								Income %								Name and number								Income %									
	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	
1	6	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	5	0	0	0	0	3	0	10	80	0	0	0	0	5	0	10	
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	95	0	0	0	0	0	5	0	
3	3	0	0	0	0	3	5	10	80	0	0	0	0	5	5	10	2	0	0	0	0	5	0	6	80	0	0	0	0	10	0	10	
4	5	5	2	0	7	0	40	5	35	10	40	0	5	0	5	5	4	6	0	0	0	3	15	0	50	30	0	0	0	5	15	0	
5	2	0	0	0	0	4	8	0	90	0	0	0	0	5	5	0	2	1	0	0	0	8	6	0	80	10	0	0	0	5	5	0	
6	7	9	0	0	0	0	12	20	60	20	0	0	0	0	5	15	6	18	0	0	0	50	60	10	55	20	0	0	0	10	10	5	
Total	23	14	2	0	7	7	65	35									19	27	0	0	0	69	83	26									

Cow =C, Goat =G, Buffalo=B, Horse =H, Ram=R, Duck =D, Hen=He, Pigeon=P

Contd.

Domestic animals in village 2 (Danga)

House hold No.	1970																2007															
	Name and number								Income %								Name and number								Income %							
	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P
1	13	14	0	1	0	10	15	0	60	25	0	5	0	5	5	0	2	0	0	0	0	0	12	0	90	0	0	0	0	0	10	0
2	10	0	2	0	0	4	12	50	50	0	40	0	0	2	3	5	0	3	0	0	0	25	35	20	0	60	0	0	0	20	20	0
3	2	4	0	0	0	8	4	0	60	30	0	0	0	5	5	0	1	2	0	0	2	6	18	10	50	20	0	0	10	5	15	0
4	0	0	0	0	0	12	10	0	0	0	0	0	0	60	40	0	1	4	2	0	0	8	16	0	50	40	0	0	0	5	5	0
5	6	4	2	1	0	6	16	0	40	10	40	5	0	2	3	0	0	0	0	0	0	10	12	0	0	0	0	0	0	50	50	0
6	8	4	2	0	3	10	14	0	30	10	50	0	2	5	3	0	1	1	0	0	0	4	9	0	50	30	0	0	0	10	10	0
Total	39	26	6	2	3	50	71	50									5	10	2	0	2	53	102	30								

Cow =C, Goat =G , Buffalo=B, Horse =H, Ram =R, Duck =D, Hen =He, Pigeon =P

Contd.

Domestic animals in village 3 (Danga)

House hold No.	1970																2007														
	Name and number								Income %								Name and number								Income %							
	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P
1	8	5	2	1	0	7	10	200	40	5	40	0	0	2	3	10	0	0	2	0	0	0	0	30	0	0	100	0	0	0	0	0
2	4	0	2	0	0	0	4	0	15	0	80	0	0	0	5	0	2	7	0	0	0	6	5	0	70	20	0	0	0	5	5	0
3	6	14	2	0	0	0	15	70	40	10	40	0	0	0	5	5	4	4	2	0	0	0	5	10	30	8	60	0	0	0	2	0
4	4	0	0	0	7	8	10	50	60	0	0	0	10	5	5	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	14	0	2	0	0	0	0	200	40	0	40	0	0	0	0	20	1	0	2	0	0	5	0	40	20	0	70	0	0	10	0	0
6	6	0	2	0	0	4	0	0	40	0	55	0	0	5	0	0	2	0	0	0	0	0	2	0	95	0	0	0	0	0	5	0
Total	42	19	10	1	7	19	39	520									9	11	6	0	0	11	12	80								

Cow =C, Goat =G, Buffalo=B, Horse =H, Ram=R, Duck =D, Hen=He, Pigeon=P

Contd.

Domestic animals in village 1 (Beel)

House hold No.	1970																2007															
	Name and number								Income %								Name and number								Income %									
	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P
1	3	5	0	0	0	10	12	0	80	10	0	0	0	5	5	0	5	0	0	0	0	30	10	8	70	0	0	0	0	20	5	5
2	6	4	0	0	3	8	14	0	60	30	0	0	5	2	3	0	2	2	0	0	0	2	4	0	80	10	0	0	0	5	5	0
3	8	4	0	0	12	20	14	26	70	5	0	0	10	5	5	5	4	2	0	0	2	7	8	0	60	20	0	0	10	5	5	0
4	4	2	0	0	4	8	15	0	70	10	0	0	10	5	5	0	1	0	0	0	0	2	7	0	80	0	0	0	0	10	10	0
5	6	4	0	0	3	8	12	0	70	10	0	0	10	5	5	0	2	1	0	0	0	6	4	0	80	5	0	0	0	10	5	0
6	2	1	0	0	0	0	5	0	80	10	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	29	20	0	0	22	54	72	26									14	5	0	0	0	47	33	8								

Cow =C, Goat =G, Buffalo=B, Horse =H, Ram =R, Duck =D, Hen =He, Pigeon =P

Contd.

Domestic animals in village 2 (Beel)

House hold No.	1970																2007															
	Name and number								Income %								Name and number								Income %							
	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P
1	4	3	0	0	2	10	14	0	60	20	0	0	10	5	5	0	2	0	0	0	0	4	12	16	50	0	0	0	0	10	20	30
2	7	15	0	0	0	10	20	0	50	30	0	0	0	10	10	0	3	0	0	0	0	6	10	0	80	0	0	0	0	10	10	0
3	2	4	0	0	6	12	10	0	40	30	0	0	20	5	5	0	1	0	0	0	0	6	7	0	80	0	0	0	0	10	10	0
4	2	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	2	0	0	0	0	4	0	0	90	0	0	0	0	10	0	0
5	6	6	0	0	0	3	10	0	60	20	0	0	0	5	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	8	0	0	0	0	0	7	0	90	0	0	0	0	0	10	0	1	0	0	0	0	4	10	4	80	0	0	0	0	10	5	5
Total	29	28	0	0	8	35	61	0									9	0	0	0	0	24	39	20								

Cow =C, Goat =G, Buffalo=B, Horse =H, Ram =R, Duck =D, Hen =He, Pigeon =P

Contd.

Domestic animals in village 3 (Beel)

House hold No.	1970																2007															
	Name and number								Income %								Name and number								Income %							
	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P	C	G	B	H	R	D	He	P
1	7	4	0	0	4	4	14	0	60	20	0	0	5	5	10	0	2	1	0	0	0	4	5	0	70	10	0	0	0	10	10	0
2	4	6	0	0	2	12	16	0	50	30	0	0	10	5	5	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	100	0
3	4	3	0	0	0	0	4	20	60	20	0	0	0	0	5	15	5	6	0	0	0	6	12	0	70	10	0	0	0	10	10	0
4	2	0	0	1	0	4	8	26	50	0	0	5	0	5	10	30	0	0	0	0	0	10	2	16	0	0	0	0	0	60	10	30
5	2	4	0	0	3	8	12	0	50	20	0	0	10	10	10	0	1	6	0	0	0	12	4	0	40	40	0	0	0	15	5	0
6	4	2	0	0	0	4	4	0	80	10	0	0	0	5	5	0	2	0	0	0	0	2	3	0	99	0	0	0	0	5	5	0
Total	23	19	0	1	9	32	58	46									10	13	0	0	0	34	34	16								

Cow =C, Goat =G , Buffalo=B, Horse =H, Ram =R, Duck =D, Hen =He, Pigeon =P