Forestry Poverty Linkage Model for India

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This report forms a part of the Integrated Natural Resource Development and Poverty Reduction Project in Haryana

October 2004

National Institute of Public Finance and Policy
New Delhi

PREFACE

The policy for using forest resource base for poverty reduction has been a focal point of a number of studies. The present study analyses the nexus between forestry and poverty alleviation by employing a village level Social Accounting Matrix (SAM) framework for two contrasting ecological zones in India located in the Shivalik region of the Himalayas and the arid region of the Aravalli dunes in the state of Haryana. It takes into account the flow of inputs and outputs, including monetised values of environmental goods and services and the accrual of income, consumption and savings for different income classes of the village. The accounting framework also includes externalities like soil erosion and human health cost due to indoor air pollution. The study then derives accounting, fixed price and mixed multipliers to capture the linkages between forestry sector and poverty. The study finally suggests policy recommendations for poverty alleviation through forestry programmes.

This important study was sponsored by the Japan Bank for International Cooperation. The research was conducted in about seven months period by a team of researchers. The principal authors of the study are Gopinath Pradhan, Subrata Mandal and Manish Gupta. This is the first study in the literature to use a social accounting matrix to explore the nexus between forest resource use and poverty and I hope, this important contribution will evoke more research in this area.

Although the study was conducted at NIPFP, the authors take full responsibility for the views expressed. The Governing Body of the NIPFP does not assume responsibility for the findings of the study or the recommendations contained in it.

October 2004

M. Govinda Rao
Director

Acknowledgement

We are thankful to the people of Pauti and Damdama-Bhogpur for their co-operation and help without which it would have been difficult for us to carry out the survey in these two villages. Thanks are also due the officials of Haryana Forest Department for their cooperation. We would like to acknowledge Government of Haryana for providing us secondary data required for the present study.

The cooperation extended by the School Administration in Pauti for carrying out the household survey in the village helped us a great deal. Last but not the least we would like to record our appreciation for the sincere efforts put in by our team members comprising Research Assistants, Field Investigators, Computer Operators and Multipurpose Office Executives in completing the project on time.

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Executive Summary

1. Introduction

Policy for using the forest resource base for poverty reduction has been a focal point among a number of developmental agencies. The nature of their intervention is, however, diverse.

Forest-poverty link is often evaluated through the benefits derived from the forest by the rural communities. The major categories of forest resources considered are non-timber forest products (NTFPs), timber and environmental services. Fuelwood and fodder also are important forest resources in most of the developing countries. Due to overexploitation and habitat destruction, NTFPs including fuelwood, fodder and other extractive forest products face declining yield. Thus, maintaining their supply to retain the role of safety-net is a challenging task.

The rural households are a heterogeneous group having a differentiated demand for forest resources. Therefore any plan for intervention in the forest sector for the purpose of poverty reduction has to be seen in the context of local peculiarities and the action plan may have to be drawn on a case by case basis.

Incorporating forest as a resource sector of a village level economic set up, the interrelationship among structure of production, the factorial income distribution, and the income distribution by socioeconomic household groups are to be examined for forestry-poverty related issues.

A major task of the present study is to construct social accounting matrices (SAM) for two villages - one located in the Aravalli Range in the southern part and the other in the Shivalik Ranges in the northern part of Haryana. A total of 305 households and 13 shops have been covered which has formed the basis of preparing the village SAMs. The major considerations for selecting the villages were the prevalance of poverty conditions and existence of forest areas in their fringes.

2. State of Forestry in Haryana and Policy Intervention

The forests in India in general are experiencing rapid degradation. As a majority of the rural people depend on forest products for their survival, sustenance of their livelihood needs to be considered. While the programme of Joint Forest Management is trying to restore the degraded forests to some extent overexploitation of the resources for fuelwood and timber, shifting cultivation, and fodder remain major factors for continued degradation of forest.

3. Description of Study Area

The population of Haryana is 21.08 million of which 71% live in rural area. The state is divided into two natural zones, the Shivaliks and the Aravallis hills and the Indo-Gangetic plains. It has a recorded forest area of 175,400 ha which is 3.96% of its total geographic area.

Two villages selected for the construction of the SAM belong to Rewari and Panchkula districts of Haryana.

Rewari district is located in the southwestern part of Haryana in the east of Aravalli hills, bordering the arid regions of Rajasthan. The geographic area of the district is approximately 1559 sq. km. As per the latest Census carried out in 2001, the total population of the district is 765,351 out of which 629,177 is rural. The Scheduled Caste (SC) population in the district is mostly landless and do not have permanent source of employment. The number of SCs in rural area is 121,789 in the district, which is 19.35 % of the total rural population.

The area under forest cover in Rewari district was 40.0 sq. km, in 1992-93, which decreased to 30.0 sq. km, in the year 1995-96.

The soils of the district are highly deficient in organic matter and require heavy doses of manure for improving the fertility. Wind erosion is most the common feature in the district.

The major *kharif* crops of the district are bajra (Spiked Millet, *Pennisetum glaucum*), jowar (*sorghum bicolor*), groundnut and gwara (fodder crop) while the important *rabi* crops are mustard and wheat.

The gross cropped area of the district was 196000 hectares in the year 1995-96. The fertilizer consumption in the district was 93.32 kg/hectare. The main crops under irrigation are wheat and mustard. The district is fairly rich in livestock, which include cattle, buffaloes, sheep, goats, pigs and camels.

The other district for the purpose of the study, Panchkula, is in the Shivalik range which lies in a different climatic zone than that of Rewari.

Despite a large number of streams passing through the district, the area suffers from severe water scarcity. The present water level in the village Damdama – Bhogpur of the area was found to occur at a depth of 157 mts. (525 ft).

The population of the district is 469210 according to 2001 census. The number of SCs in rural area, who are landless, is 49911 in the district, which is 19.19 % of the rural population. The number of rural agricultural labourer is 10,435, which is 9.57 % of total rural workers. 30 % of the population of the district is below the poverty line (BPL)

The forest types occurring in these areas are " Northern tropical dry deciduous forest" and the "Sub tropical forest". The forest contains a number of miscellaneous hard wood species like Chal (*Annogensus latifolius*), Khair (*Acacia catechu*), Jhingan (*Lannea coromandelica*) and Amaltas (*Cassia fistula*).

Paddy and Maize are the two major *kharif* crops while wheat is the principal *rabi* crop of the district. In most of the villages the dairy is supplemented with the agricultural produce for earning a livelihood.

Description of the study Villages:

Pauti village is located in Rewari district in the periphery of Aravalli region. The vegetation is predominantly of dry deciduous scrub. The forest cover of the village is 136 hactares The village has 143 households and a population of 955 of which 9.2% are below the poverty line.

The major activities of the village in relation to livelihood are agriculture and animal husbandry. Important crops grown in the village are wheat, mustard, and millet. Some of the households sell milk to the local co-operative dairy. The landless households earn their livelihood by working either as farm labourers or wage earners in road construction/repair activities. There are around 32 landless households in this village

The forest around the village is located in the dry Sahibi riverbed and consists predominantly of bushes and scrubs. The villagers utilise the forest for grazing, collection of fodder and fuelwood. The village livestock mainly consists of buffaloes and camels, which graze in the forest area.

The other village covered for the study, Damdama-Bhogpur, is located in the foothills of the Shivalik range and has the forest cover of 437 hectares. It has a population of 869 consisting of 163 households. The village has a sizeable Schedule Caste population and a large number of households have Yellow and Pink Cards, which are issued by the Government to the poorest group below the poverty line. It is found that 17.1% of the village population are below the poverty line.

The major sources of livelihood for the village are agriculture and animal husbandry. The main crops grown are maize, rice, wheat and pulses. The village livestock constitutes mainly of buffaloes and goats. The SC community, which is landless, is mostly dependent on the forest for its livelihood.

The forest area under the village panchayat used for grazing is degraded. The village is therefore, more dependent on the protected forest for fodder, fuelwood and NTFPs. The major vegetation of the forest comprises *Acacia katechu, Acacia nilotica, Anogysis latifolia, Cassia fistula, Dalbergia sisso, Linea grandis, Dendrocalamus stictus, Gililiopsis biloteata.*

4. Methodology of SAM

In order to bring out the interrelations among different sub-sectors of the village economic system and to project its production and distribution channels, the study uses the technique of social accounting matrix (SAM). SAM is based on the principle that for every income there is a corresponding outlay or expenditure and is presented in the form of a square matrix. It records all the transactions that take place among various production and consumption sectors. Besides providing a consistent data framework for a village level analysis, the SAM captures the interrelationships between forest resource use, the structure of production, distribution of income and ultimately poverty alleviation.

SAM has been widely used to analyze the direct and indirect impacts of diverse policy issues and village level studies have been undertaken to assess the distributional impact of income generation.

An examination of poverty reduction impact through such a technique, therefore, is likely provide better insight. The present study develops a modified SAM, which integrates environmental concerns at the village level and analyses the forestry-poverty link.

The SAM records the transactions that take place among various production and consumption sectors during a year. The inputs used in carrying out the production activities in a sector are given by the columns in the matrix, while the rows indicate the distribution of the output of a particular sector to be used as inputs by different sectors and final demand for consumption by the households.

For the villages under consideration the study covers four broad production viz., agricultural commodities, non-agricultural commodities, forest products and services.

Four commodity accounts comprising agricultural items, non-agricultural items, forest products and services in SAM indicate the amount of income spent on the purchase of different commodities and services.

The factor account gives the inputs used in the production process and includes hired and family labor, seed, fertilizer, manure, pesticides, tractors and other machineries, draught animals, electricity and water charges, and rent of agricultural land.

The capital account of the SAM includes stock of natural capital along with cash savings and investment. Natural capital includes land and forests whereas finance capital consists of institutional savings and investment.

There is an external cost account, which accounts for the loss of natural capital base along with loss of soil due to agricultural activity. This account also includes health cost incurred due to indoor air pollution caused by use of biofuels.

The institution account of the SAM includes household and the government.

Based on the rate of daily wages which is taken as a benchmark by the local government for identifying poors in the village household with a monthly income of Rs 2000 is categorized as poor; those in the income category of Rs. 5000 to Rs. 2000 per month are also poor though not as poor as the above category. They are classified in the study as low-income group; the middle-income group and the high-income group of the villages have incomes ranging between Rs. 5000 to Rs. 10,000 and above Rs.10,000 respectively.

The final accounts in the SAM table pertain to rest of the villages and rest of the world. The trade of the village with the region and rest of India are analyzed here.

An inclusion of forest sector into the village SAM helps capture the sector's linkages with the village economic system. Forests resources enter into the village SAM as activity, commodity, factors of production and capital including natural capital accounts.

To analyse the effects of exogenous change on the village economic system, the transactions between the sectors in the SAM are classified as endogenous and exogenous. In the present study production activity, commodities, factors of production, forest, environment and households are considered endogenous to the system while the remaining accounts viz., government, rest of villages, rest of the world and financial savings are exogenous.

Using the SAM multipliers, the study captures the strength of linkages among different sectors of the village economy. The linkages are shown in the form of change in the incomes of different accounts due to an injection of a rupee in any one account.

The study considers three sets of multipliers, accounting, fixed price and mixed, to assess the impact of exogenous changes on the village economy. Accounting multipliers assume that the average expenditure behaviour prevails in the margin whereas other two consider the propensities to be different.

The fixed price multipliers are based on the assumption that there exists excess capacity in the endogenous sectors. Thus as long as the excess capacity prevails any exogenous change in demand can be satisfied through a corresponding increase in output without having any effect on prices. However, this assumption is unrealistic when applied to agriculture and forest sector. In such a situation, the fixed price multipliers will provide output and income multiplier estimates that are unrealistically high owning to overtly optimistic expectations regarding supply response. So it is posited that supply of the agricultural and forestry output is inelastic.To address such concerns mixed multipliers are estimated.

An important task of the present study is to assess the impact that different production activities have on poverty alleviation. Fixed price multipliers are decomposed into interdependency and distributional effects in order to estimate the contribution that different production activities make towards poverty alleviation.

The distributional effects include incomes received by a given household group from factors such as labour and land provided by that group and used as primary inputs in the production of the commodity under consideration. It also includes the indirect factor incomes received by the same group from the intermediate inputs required in the production of that commodity and incomes accruing to that group from transfers and remittances from other socio-economic household groups. The interdependency effects capture the indirect spending and re-spending effects by the groups that benefited, income-wise, from an initial increase in output.

Household survey was carried out in two selected villages to get the requisite data to construct the SAMs. Transaction matrix is then constructed separately for the two villages, Pauti and Damdama-Bhogpur.

5. Village SAMs

The transaction matrix of Pauti shows that the village is predominantly agriculture-based. Cultivation of mustard, wheat and cotton is the most important agricultural activity. The village also cultivates oilseeds and pulses, vegetables and fodder. A substantial portion of the expenditure on inputs is incurred on account of land preparation and fertilizer. The livestock and poultry sector also contributes to income of the village. The services sector generates more income as compared to forest and non-agricultural sectors.

The commodity account gives the consumption pattern of different income classes of the village. It is seen in Pauti that the poor households are relatively more dependent on forest products.

The capital account, which includes land and forest, captures the impact on the environment due to soil erosion caused by agricultural activity of the village. It also includes the savings and investment of different groups of households. More than 75% of the savings of the village comes from the high-income group while the poorest group saves only 1.4% of the total.

The health cost associated with indoor air pollution caused by fuelwood used for cooking, has been accounted with the forest product as an external cost. The total health cost due to indoor air pollution of the whole village works out to be Rs. 0.18 million of which 20 % is incurred by the high income households, 8.5 % by the middle income, 57 % by the low income and 13 % by the poor. The cost of soil erosion amounts to Rs.0.64 million.

The government provides water, electricity, education and infrastructure service to the village. Moreover, it is also the owner of village forests and hence gains in natural capital stock are recorded as its income. Revenue from commodity taxation in the village constitutes a major source of receipt for the government whereas subsidies on account of fertilizer, water charges, kerosene and LPG are major expenditures borne by it.

Transaction of the village with rest of the villages and rest of the world indicates that rice and nonagricultural goods are the main imports of the village while agricultural commodities and labour are the major exports.

In Pauti the higher-income classes draw most from the forest as compared to the poor.

In Damdama-Bhogpur cultivation of wheat, maize and paddy are the most important agricultural activities. The village also cultivates oilseeds and pulses, vegetables and fodder. A substantial portion of the expenditure on inputs is incurred on account of manure and fertilizer in the cultivation of wheat, maize and vegetables. Among the agricultural crops, value addition is high in wheat, maize, paddy and cultivated fodder. Paddy, maize and vegetables are the main export crops of the village.

The consumption pattern of different household groups shows that the poor households are relatively more dependent on the forest products.

The health cost associated with indoor air pollution caused by fuelwood is more than Rs.0.29 million.

The capital account, which includes land and forest, captures the impact on the environment due to soil erosion caused by agricultural activities. More than 54% of the savings comes from the high-income group while only 1% comes from the poorest group.

The government provides water, electricity, education and infrastructure service to the village. It also taxes commodities and gives subsidy to fertilizer, water charges, kerosene and LPG.

Rice is the main export of the village while wheat and vegetables are the main imports. It was found that the village is highly dependent on forest for its consumption of fuelwood and fodder.

6. Multiplier Based Analysis

In Pauti, compared to agricultural production forest sector activity generates a higher production multiplier. The household income multiplier for forest products is also the highest in the village. Although the poor household groups also benefit from such increased income, most of the benefits accrue to the richest group in the village. The transfer of income to low-income group in the villages induces the highest production and income multipliers. Thus any social transfer programme and intervention will have the strongest effect on inducing local production and incomes if directed to the low-income group which consumes more of locally produced goods as its income increases.

In Damdama-Bhogpur the total production multiplier is the highest in case of mustard. Next to agricultural production the forest sector activity generates a high production multiplier. Like Pauti, here also the household income multiplier is the highest for forest products. Although the poor household group benefits from such a transfer, most of the benefits accrue to the middle- and high-income classes.

In addition to the accounting multipliers, fixed price and mixed multipliers are calculated for both the villages of Pauti and Damdama-Bhogpur to examine the intersectoral linkages and to analyse the income generation impacts of production and expenditure. From the multiplier analysis it is seen that in both the villages the forest sector has the highest value added generation potential.

In Pauti the poor household groups (comprising low and poor income classes) has the most desirable expenditure pattern in generating economic growth of the village. But the pattern changes in case of Damdama-Bhogpur where the rich households comprising the high and middle-income classes hold the key for a greater growth potential.

In both the villages the induced effects of consumption linkages explain only a very small portion of the value of the income multiplier. When the exogenous effect is eliminated from the total effects, the explanatory capacity of consumption linkages improves.

In Damdama-Bhogpur the total multiplier effect originating from the retail trade is the highest followed by paddy, mustard and forest products. Such a finding indicates that these activities make relatively higher contributions towards poverty alleviation in the village.

In Pauti the total multipliers originating from forest and village services are the highest implying their higher contribution towards poverty alleviation in the village.

The distributional effect of forest as compared to other activities on the poor household groups is higher in both the villages. Thus there is a considerable potential of the forest for poverty alleviation.

Both for Pauti and Damdama-Bhogpur the multiplier analysis establishes the linkages between the forest sector and the village economy. Although the poor in the village do benefit from increased household incomes, the major share of it accrues to the richest household groups.

The injection of resources in the forest sector also results in an increase in fuelwood collection activity. Burning of fuelwood for cooking, which is one of the major sources of indoor air pollution, has an increased adverse effect on the health of the households.

7. Policy Implications of the Study

Two forms of exogenous interventions in the forestry sector can be made for the benefit of the poorer sections:

a) Intervention of social forestry type, where the forests are grown over panchayat lands and the stock of trees remain the property of the village panchayat. Consequently the income from such a scheme accrues to the village panchayat. Benefits of this scheme are reaped by the villagers indirectly.

b) Direct intervention to increase the forest resources. This route includes increase of forest resources regeneration of degraded forests.

In view of the supply constrains faced by the poor households with respect to fuelwood, fodder and non timber forest product consumption, an afforestation program should be helpful to augment the quantity of forest resources that would be required to ease the supply constraints.

The villages depend on forest mostly for meeting their fuel requirements although dung cakes also constitute an important alternative source. The cattle dung being a good fertilizer and a bad fuel can therefore be recommended for replacement by fuelwood.

For Rewari the total fuelwood demand is estimated to be 298,200.8 tons per year and the sustainable supply from the forest in the district is estimated to be 50,906 tons. To meet the demand, an additional 14,088 hectares of land needs to be brought under forests.

In Rewari the estimated annual fodder consumption by the total livestock amounts to 2,015,334 tons. To meet this demand it would require 18,791 hectares of forestland.

The district has 19,000 hectares of available fallow and wasteland which can be utilized for plantation of fuelwood and fodder species.

For Panchkula the total fuelwood demand of the district is estimated to be 159770.7 tons per year while the sustainable annual supply is estimated to be 103,094 tons. Thus there is a shortfall of 149,461.3 tons. To meet the deficit an additional 1,044 hectares of forestland would be required.

In Panchkula the estimated total yearly consumption of fodder by the livestocks in the district amounts to 159,770 tons and it would require 913 hactares of forestland to supply the fodder leaves.

The available fallow and wasteland in the district, estimate of which are not available at present, may have to be brought under forest cover. In case the augmented forestland fails to provide the above requirement of fuelwood and fodder, the option of increasing the density of forest will have to be exercised.

Taking into account the ground realities of the two districts the study suggests for an increased supply of fuelwood from the forests could only be a short-term solution.

8. Summary and Conclusion

Intervention in the forest sector with the objective of poverty reduction has been a focal point of many developmental agencies.

Poverty-forestry link remains controversial issue. While poor people's role in forest degradation due to over-exploitation of its resources does not enjoy consensus, the poverty reduction potential of forest products on which the poor depend most is not yet established. The intervention strategy of most of the practitioners therefore is based on case specific micro-level analysis.

As the dependence of rural poor on each category of forest resource differs, the correspondence between resource-type and category of rural poor is to be examined through a framework capable of comprehensively capturing the interdependence between forest and the economy functioning in its fringe area. A social accounting matrix (SAM) framework seems appropriate for analyzing such micro-level inter sectoral linkages.

The present study generates a set of empirical results on the extent and nature of economic linkages between the village economy and forest resources in two villages of the state of Haryana, India. The analysis is based on the income generating multipliers derived from a village level social accounting matrix framework.

Making use of the SAM technique, an attempt is made to capture both indirect and direct effects of exogenous policy-induced changes on forest resources. Findings of the study can be used as the basis for intervention in the forest sector for poverty reduction. By selecting two villages located in different climatic zones, the study enlarges the scope of extending the results to other villages of the state with similar economic conditions.

The framework developed in the exercise is based on an extended SAM and incorporates the effects of forest related environmental services like soil degradation, carbon sequestration and biofuel use. Thus the impact of income generation by households when resource degradation process is resorted to is addressed.

The study aims at assessing (a) the potential of forest based production activities in the generation value addition, (b) the inducement provided by various household groups' expenditure patterns in increasing the village income, (c) the strength of forest production and consumption linkages in stimulating the overall income growth of the village and (d) the poverty reduction features of production activities in the forest through generation of distributive effects. Two sets of exercises assuming non-constraint and constraint supply capacities of forest and agriculture sectors have been undertaken.

When an assumption of supply constraints in the forestry sector is brought in, the magnitude of the impact due to an exogenous shock transmitted through various production activities or household groups diminishes. If complete excess capacity in the village forest is assumed, stimulating demand is sufficient to encourage increases in output and income. Under such an assumption, the agricultural sector, which is also supply constrained does not increase output production. So policy has to intervene from the supply side.

The present analysis finds that forest activities have an advantage over agricultural ones in generating income. However, the extent of income augmentation from forest activities is likely to be affected by supply elasticities of its products. Value-added multiplier under assumptions of perfectly inelastic supply in forest is only 44% of the level under assumptions of perfectly elastic supply.

At the household level, forest based activities perform better than agricultural activities in income generation. Relatively richer categories of households gain more than the poorer group from such a process.

Without the imposition of supply constraints among sectors of the village economy, the expenditure of two poorer households inducing a higher income growth can be projected.

Results of the study indicate the relative strength of production over consumption linkages in generating village economy's growth.

On the basis of results obtained from multiplier analysis the study proposes two forms of exogenous intervention in the forestry sector for the benefit of the poorer sections.

Notwithstanding the findings some of the important limitations of SAM from the underlying assumptions of linear, fixed proportion technology cannot be overlooked. The fixed price multipliers are based on demand driven system. The presence of market imperfections is likely to cause prices not to be exogenous and constant. Moreover, the substitution responses, which may emerge from production and consumption sides, have remained beyond the purview of the analysis.

List of Abbreviations

FAO	**Food and Agriculture Organization**
NTFP	**Non-Timber Forest Product**
SAM	**Social Accounting Matrix**
FSI	**Forest Survey of India**
Ha.	**Hectare**
Km	**Kilometers**
Sq. Kms.	**Square Kilometers**
JFM	**Joint Forest Management**
HRMS	**Hill Resource Management Society**
FPC	**Forest Protection Committees**
HFD	**Haryana Forest Department**
HCFP	**Haryana Community Forest Project**
VRMC	**Village Resource Management Committees**
FFA	**Farm Forest Association**
Mm.	**millimeter**
Mts.	**miters**
Cum.	**Cubic Meter**
CIME	**Centre for Monitoring of Indian Economy**
NABARD	**National Bank for Agricultural Development**
JLNC	**Jawaharlal Nehru Canal**
Ft.	**feet**
SC	**Schedule Caste**
VFC	**Village Forest Committee**
TERI	**Tata Energy and Resource Institute**
SNA	**System of National Accounting**
SEEA	**System of Integrated Economic and Environmental Accounting**
Rs.	**Rupees**
ROV	**Rest of villages**
ROW	**Rest of World**
Re.	**Rupees**
USLE	**Universal Soil Loss Equation**
Yr.	**Year**
CSWCRTI	**Central Soil and Water Conservation Research and Training Institute**
/year	**per year**

1. Introduction

Notwithstanding the recent finding on the impact of sectoral pattern of growth on poverty alleviation (see, for example, Lipton and Ravallion, 1993), specific basic needs programmes remain important options for many government and international intervention through organisations. Therefore, working in selective sector such as forest, that has the features of externality and implications for sustainability clause, is not uncommon (see World Bank 2001; FAO 2001) and policy for using the forest resource base for poverty reduction has been a focal point among a number of developmental agencies.

1.1 Forestry Poverty Link

Forest-poverty link is often evaluated through the benefits derived from the forest by the rural poor (see, Kaimowitz, 2002; FAO 2001; Oksanen and Mersmann, 2002; Campbell, 2002). For that purpose, the major categories of forest resources considered are non-timber forest products (NTFPs), timber and environmental services. Some of the important insights offered by such analyses are noted in the following:

Non-Timber Forest Products:

- the poorest segments of the societies around the world are engaged in NTFP extraction and these products serve as safety net or perform gap filling functions in their livelihood strategies,
- NTFPs used by poor, in general, have lower economic returns and usually offer poor potential for value generation.

Due to overexploitation and habitat destruction, NTFPs and other extractive forest products face declining yield. In specific cases important resources such as fuelwood and fodder are also becoming scarce which has a serious ramification for the rural population in many developing nations. Thus, maintaining their supply to retain the role of safety net is a challenging task. Pro-poor institutions, skills, marketing channels and reduction of middlemen profits are pointed out as important factors for retaining the existing level of supply (Arnold 2001).

Timber:

Timber extraction benefits poor, albeit indirectly, through employment opportunities. However, seen in terms of a broader definition of forest where trees outside the traditionally defined forest are included, other benefits accruing to the poor may also be considered. In such a scenario, some of the pro-poor characteristics of timber are flexible harvesting time, a form of on-farm savings and multiple use. So local access to and management of natural forest is suggested as an option for poverty reduction

(World Bank 2001). In such a context, it is pointed out that the emerging trends in markets, technologies and institutions hold good potential for raising small scale timber production, both from natural forests, small scale plantations and a multitude of intermediate systems producing tress.

Ecological Services:

Forest dwellers role in the perspective of benefits emanating from carbon storage and sequestration, biodiversity conservation, hydrological services and tourism have gained global acceptance. Therefore, introduction of payments by the beneficiaries i.e., the non-forest dwellers to forest dwellers as incentive to conserve forests remains an important international agenda. Despite the problems of land tenure associated with forest dwellers, transaction costs of making agreement with them, the emerging markets for forest services are expected to provide new opportunities for poor forest stewards (for example, see Smith and Scherr, 2002 for carbon sequestration and storage schemes; Pagiola, 2001 for benefits from hydrological services; and Gurung and Coursey, 1994, The Zimbabwe Trust et al, 1994, for benefits to local population from tourism operations).

While the link from forest to poverty alleviation is tried to be understood better recently and areas of intervention in NTFPs, timber and ecological services have been demarcated, it is necessary to point out that the rural poor, even the poorest households, are a heterogeneous group. Consequently, they have a differentiated demand for forest resources. Therefore any plan for intervention in the forest sector for the purpose of poverty reduction have to be seen in the context local peculiarities and the action plan may have to be drawn on a case by case basis.

Since the forest-poverty link remains a controversial issue - one strand of thought holding poverty responsible for forest loss (WCED, 1987) while another de-emphasizing its general validity (Wunder, 2001) - the recent programmes attempt to define the role of forestry in poverty alleviation. It is usually assumed that the causality runs from forest to rural poverty and to operationalise the intervention programmes the definitions adopted for poverty and forest are broadened. Thus, forest comes to encompass sources of forest products outside as well as inside forests which poor people draw upon (Arnold, 2001) whereas the concept of poverty includes, along with the traditional definition of lack of income and material possessions, aspects of human well being such as health, education, nutrition and empowerment (Angelsen and Wunder, 2003).

Seen from the practitioners' perspective the forest-poverty link is better evaluated by identifying the poverty-reducing role of forest resources such as non-timber forest products (NTFPs), timber and ecological services. As the dependence of rural poor on each category of these varies, it is imperative to consider the correspondence between resource-type and category of rural poor such as landless labour and

smallholder. So the platform from which above-mentioned link may be properly examined is a disaggregated analysis.

A major problem with the forest-poverty relationship concerned with the identification of effective intervention channels is the absence of inputs provided by a conceptual framework capable of comprehensively capturing the interdependence and intra- and intersectoral linkages prevailing in a given project area. In particular, incorporating forest as a resource sector of a village level economic set up, the interrelationship among structure of production, the factorial income distribution, and the income distribution by socioeconomic household groups are not examined by the experts working in forestry-poverty related issues.

It may be useful to point out that in a typical village of India, the main activity, agriculture, functions by generating a series of sub-sectors like labour market, material input and agricultural-implement-supply. Each sub-sector gets linked to the others so as to function as an integrated whole where production and distribution flows circulate giving it a self-sustaining character. In such a system, the forest resources perform the role of capital as well as consumption goods. Hence their poverty reduction features can be evaluated better only when this sector is considered as an integral part of the economic system of surrounding area. While taking their production and consumption decisions the participants of the system must endogenise the forest sector and realize the distributional impact of changes in demand and supply of forest products.

1.2 Village Level Poverty Alleviation Studies

The above studies have dealt with forestry poverty linkages, i.e., how forest sector contributes to the reduction of poverty. However, the quantification of poverty reduction has not been taken up by these as a focal point. There are studies, which have looked at the issue of poverty by taking into account the distribution of income among the poorer sections of the village economy. These studies are Parikh and Thorbecke (1996), Subramanian and Sadoulet (1990), and Adelman and others (1989). An important aspect of these studies is an examination of the structural linkages between production, consumption, trade and income distribution at the village level by adopting the framework of Social Accounting Matrix (SAM).

The study by Adelman, Taylor and Vogel (1989) has used the SAM model to analyze the economic structure of a village in Central Mexico. Their analysis indicates that migration helps in poverty reduction in a significant way. The landless, whose average per capita income including migration remittances just meet their subsistence needs, would starve if all migration possibilities were cut off. This highlights the vulnerability of the landless to external shocks and the relatively small trickle down effect

to this group resulting from several income generating policies. At the same time the policy experiments indicate that policies targeted at landless would generate the highest production and income multipliers in the village, induce the maximum growth in the rest of Mexico, lead to greatest reduction in poverty and have most egalitarian distributional consequences. Subramanian and Sadoulet (1990) have on the other hand studied an Indian village to see how technical change, output fluctuations and government policy affect income distribution and poverty. Their study demarcates the village economy from its surroundings and separates internal and external linkages. The internal linkages show how secondary effects like the effects of increased agricultural production or increased consumption expenditure influence income distribution, whereas, the external linkages show how changes in external flows such as transfers and wages affect the distribution of income in the village economy. They observed that the yearly variations in agricultural output have a major impact on income distribution, especially among the small and marginal farmers and landless labourers. The study by Parikh and Thorbecke (1996) analyses the impact of rural industrialization on village life and economy. In order to do so the authors compare two relatively similar Indian villages, one close to a factory and another located in a remote area. They observed that in the village, which was located in the vicinity of the factory, the incomes of the poorest household group (i.e., the landless) are most favourably affected by the changes in hired labour's account. In other words the provision of non-farm work for the casual labourers has improved the incomes of the landless considerably.

It may be noted from the above discussion that there are two broad groups of studies, which have addressed the issue of poverty reduction. One group looks into the forest-poverty link by postulating that the causation runs from forest resources to poverty alleviation. However, the limitation of such studies is that they fail to capture the intricate process of distributional mechanism, which percolates through the intersectoral linkages to benefit the poor. The second group of studies, on the other hand, captures the quantum of direct and indirect gains accruing to the poorer sections of the economy due to an exogenous or policy intervention. While such a framework seems to be useful to analyze the differentiated impacts of exogenous intervention in the village economy, it has not yet been employed to assess the impact of forest resources on poverty reduction. Keeping in view such a gap, the present study will proceed by adopting a SAM framework that will incorporate the forest as a distinct sector in the village economic system and will trace its distributional impact on poorer sections.

1.3 Objective of the study

The major task of the present study is to construct village level social accounting matrices (SAM) by taking two villages - one located in the Aravalli Range in the southern part and another in the Shivalik Ranges in the northern part of Haryana. A total of 305 households and 13 shops have been covered which

has formed the basis of preparing the village SAMs. The study analyzes the impact on poverty reduction and environmental improvement through the intervention of forestry sector and also takes into consideration the effects of external factors like policy changes which would assist in the process of implementation of the JBIC project on integrated natural resource development and poverty reduction.

2. State of Forestry in Haryana and Policy Intervention

2.1 Introduction

The situation of forests in India is precarious. As per an assessment of the Government of India, 67.55 million ha constituting 20.55% of the geographic area of the country has forest. Out of this 41.68 million ha (12.688%) is dense forest, 25.87 million ha (7.87%) open forest and 0.45 million ha (0.14%) mangroves. As against the world average of 0.64 hectare of forests per human, an Indian has only 0.06 ha. Such a per capita forest figure stands out to be less than that of the Europeans (1.3 ha) and the Chinese (0.1 ha). In India, a whopping 147 million people live in 170,000 villages in the proximity of forest areas. A majority of these being poor, their survival depends on forest produce. They need fuelwood and fodder from the forest at the very minimum. Often they also look for marketable forest produce to meet their cash needs. In spite of the enormous pressure exerted by a large population, there has been a net increase in the forest cover by 3,896 sq.km between the forest area assessment held in 1997 and 1999 and a further increase of 38,245 sq.km. between 1999 and 2001. The dense forest has increased by 10,098 sq.km, between 1997 and 1999 assessment and 34580 sq.km. between 1999 and 2001. It is to be noted that the period during which the change in forest cover has occurred is not uniform in all the states but varies between 2-5 years. The main reasons for gains in forest cover are the inclusion of established large block plantations, improvement in the density of forest due to Joint Forest Management and natural regeneration. On the contrary the major reasons for losses are shifting cultivation, encroachment and tree felling (FSI, 2001,1999).

2.2 Forests of Haryana

Haryana, an agriculture rich state, lying in the northwest part of the country (refer to the map in Appendix 1), has a geographic area of 44,212 sq.km. which is 1.3% of the country's geographic area. The population of the State is 21.08 million (2.1% of India's) of which 71% live in rural area. There is no tribal population in the state and its average population density is 477 persons per sq.km. Known for its high quality cattle, especially buffaloes, the state has a livestock population of 9.14 million (1.9% of India's). The state, which ranks 7th among all the Indian states and UTs in respect of percentage of geographic area under tree cover, is divided into two natural zones, the Shivaliks and the Aravallis hills and the Indo-Gangetic plains. Two rivers, Yamuna and Ghaggar, are the lifeline of the state. It is an intensively cultivated state and is deficient in natural forests. It has a recorded forest area of 175,400 ha which is 3.96% of its total geographic area. The coverage of dense forest in the state is 1,139 sq.km. (2.57 %) and that of open forest is 615 sq.km. (1.39 %). Forests are mainly distributed in the northeastern and southeastern districts of state. There are three forest types, the Tropical Dry Deciduous in the eastern part,

Tropical Dry Deciduous in the Shivalik region and Tropical Thorn Forests in the western part of the state. The number of villages in the state is 6759 of which 90% use forest for cultivable land. In these villages, 7,967 ha are classified as forest. Population inhabiting in these villages is 0.13 million. The villages having less than 100 ha, between 100-500 ha and more than 500 ha forest area in each, constitute 79%, 17% and 4% of the total villages, respectively. District wise distribution of dense forest, open forest and scrubs are given in Table 2.1.

Table 2.1: District-wise Forest Cover in Haryana

		Forest Cover				
District	**Geographic Area**	**Dense Forest**	**Open Forest**	**Total**	**Percent**	**Scrub**
Ambala	1,574	46	2	48	3.05	0
Bhiwani	4,778	90	66	156	3.26	8
Faridabad	2,151	19	46	65	3.02	16
Fathehabad	2,538	46	5	51	2.01	0
Gurgaon	2,766	21	173	194	7.01	31
Hisar	3,983	64	2	66	1.66	0
Jind	2,702	8	5	13	0.48	0
Jhhajjar	1,834	11	5	16	0.87	0
Karnal	2,520	63	18	81	3.21	0
Kaithal	2,317	80	7	87	3.75	1
Kurukshetra	1,530	109	1	110	7.19	0
Mahendragarh	1,859	22	40	62	3.34	14
Panipat	1,268	170	152	322	25.39	16
Panchkula	898	15	4	19	2.12	0
Rohtak	1,745	11	15	26	1.49	0
Rewari	1,582	19	10	29	1.83	0
Sirsa	4,277	178	2	180	4.21	0
Sonipat	2,122	3	2	5	0.24	1
Yamunanagar	1,768	164	60	224	12.67	1
Total	**44,212**	**1,139**	**615**	**1,754**	**3.97**	**88**

Source: Forest Survey of India, 2001

2.3 Joint Forest Management (JFM) in Haryana

Indian response to the problem of sustainable use forest is the programme of joint forest management. Its major emphasis is on the involvement of stakeholders in the maintenance and use of forest. Since the nature of dependence on forest of the people residing in its fringe area differs from place to place, the operational strategy of implementing JFM programme varies among the states of Indian Union and there are instances of its success in achieving its major objective of regenerating degraded forests (see Damodaran, 2003). The framework of JFM has been evolved with the help of a series of legislative measures like Forest Conservation Act, 1980, National Forest Policy, 1988, Joint Forest Management resolution 1990 and Joint forest Management Guidelines, 2000 and 2002. To understand the

niceties involved we briefly touch upon the JFM implementation process in the state of Haryana and point out the important issues that need to be tackled for improving the efficiency of the programme.

In Haryana, JFM was started as early as 1972 though a Government notification in this regard was issued in 1990. It may be worthwhile to note that the joint management policy received a big boost as a result of successful experiments in the 1970s in Haryana (Sukhomajri) along with that of West Bengal (Arabari). Being a pioneer role model, the JFM in Haryana has also come to be implemented in a larger segment of its land resources including the non-degraded forests and a number of policy measures in addition to the legislation of federal government have been introduced. Thus the introduction of Haryana Joint Forest Management Policy, 1990, Haryana Joint Management of Forest Areas Executive Instructions, 1998 and Ch. Devi Lal Social Forestry Scheme, 2002 provide the basic features of the operational schemes of JFM in the state.

The basic philosophy of JFM programme of Haryana seems to be improvement of the economic interests of villagers living in fringe areas of the forests as well as to increase land under forest cover. The agricultural communities get water, fodder and related biomass at a concessional rate from the regenerated forest areas with the Hill Resource Management Society (HRMS) participating in the planning process. Moreover, the Forest Protection Committees (FPCs) in the state are empowered with the functions of punishment, imposition of fines, framing of rules and distribution of benefits. There are, at present, 350 Hill Resource Management Societies (HRMSs), managing 60,734 ha of forestland. The net income is to be apportioned between the Government and the HRMS as 25% and 75% respectively. The HRMS shall contribute 30% of its share towards plough back fund for further improvement of management area and another 10% towards *Kalyan Kosh* (Welfare Fund).

In the light of the experiences gained in various JFM-related projects, some of the issues identified by the JBIC report (2003) for a closer look are:

1. Provisions of benefit sharing from timber management of responsibilities
2. Village institution building including financial sustainability
3. Benefit sharing system of bhabbar, fodder grass, bamboo and other NTFPs
4. Linkages between village Sarpanch (headman of the panchayat, which is the local self government of the village) and the forest committees
5. Guidelines on the roles of the stakeholders

In its attempt to improve the forest resource base, Haryana Forest Department (HFD) implemented the Aravalli Project during 1990-1999 and also the Haryana Community Forest Project (HCFP) in 1998.

Overall objectives of these projects are to:

a) improve the natural environment,

b) preserve land fertility,

c) achieve sustainable management of natural resources.

Large-scale plantations were carried out under Aravalli Project since 1992. Plantations have been raised mostly on panchayat lands, along the roads, canals, railway lines, water courses, on the available institutional land and on the farm lands. The area of plantation for different species is given in Table 2.2. below.

Table 2.2: Species-wise Plantations upto 1998

Species	Area in '000 ha	Percent-age
Acacia nilotica	125.68	22.0
Eucalyptus spp.	119.96	21.0
Prosopis cineraria	85.69	15.0
Dalbergia sissoo	68.55	12.0
Salvadora spp.	17.14	3.0
Populus spp.	11.43	2.0
Acacia tortilis	11.43	2.0
Azadirachta indica	11.43	2.0
Mangifera indica	11.43	2.0
Others	108.54	19.0
Total	**571.28**	**100.0**

Source: FSI Estimate

It can be seen from the table that plantations of *Prosopis juliflora*, *Acacia nilotica*, *Acacia tortilis*, *Ailanthus spp.*, *Euphorbia spp.*, *Dalbergia sissoo*, *Acacia catechu* etc. have been raised.

JBIC under took a field survey of these projects to (a) assess the effectiveness in terms of the economic, social, environmental and institutional impact and (b) suggest strategies to ensure the institutional and financial sustainability of the project and alleviate poverty.

Two villages of Aravalli and five of HCFP have been covered by the survey indicate that agriculture and animal husbandry are major sources of income. Some of the important findings of the exercise in the post-intervention phase are:

- poor and deprived sections of the village are better equipped to participate in the decision making processes concerning development activities,
- village organisations such as Village Resource Management Committees (VRMCs) and Farm Foresting Associations (FFAs) are constituted to enable sustainable management of village/rural

forest resources, improvement in regeneration of degraded forest and increased forest resources for community use.

It is not difficult to see that finding of JBIC survey point to the requirement of strengthening the benefit sharing provisions and institutional building capacity of the village communities for an effective operation of the JFM. Pending the resolution of such problems, the working of JFM often seems to be conditioned upon exogenous interventions.

3. Description of Study Area

Two villages selected for the construction of the SAM belong to Rewari and Panchkula districts of Haryana (see the map in Appendix 2). The geographic and socio-economic profiles of these districts are discussed in the following before describing economic characteristics of the villages under study.

3.1 *Rewari District*

The present district of Rewari was part of Gurgaon district. In 1972 areas of Rewari *tehsil* (subdivision) comprising of 305 villages and two towns, Rewari and Bawal, were transferred to Mahendragarh district from that of Gurgaon. In 1989 the district of Rewari was created carving out a portion from Mahendragarh district. In 1997 a new *tehsil* of Bawal was created from the Rewari tehsil. Presently the district comprises three *tehsils,* namely, Kosli, Rewari and Bawal. It is located in the southwestern part of Haryana, bordering the arid regions of Rajasthan. The geographic area of the district is approximately 1559 sq.km.

Population: As per the latest Census carried out in 2001, the total population of the district is 765,351 out of which 629,177 is rural and 136,174 urban (refer to Table 3.1). The district has a population density of 400-persons per sq.km.

Table 3.1: Population of Scheduled Caste (SC) in Rewari District in 2001

	Total	Rural	Urban	% of Rural SC to the total rural population
Total Population	765351	629177	136174	
SC Population	144452	121789	22663	19.35

Source: Census of India –2001, Final Population Totals

Poverty: As there is no explicit data available pertaining to the number of poor people in the district, some social aspects may be taken into account as an indicator of the number of poor in the district. The Scheduled Caste[1] (SC) population in the district are mostly landless and does not have permanent employment. The number of SC in rural area is 121,789 in the district, which is 19.35 % of the total rural population (see Table 3.1). Another indicator of poverty is the number of agricultural labourers. Agriculture works require large number of labourers in sowing and harvesting seasons only. These labourers remain unemployed rest of the year. The number of agricultural labourers in the district is 42,995 accounting for about 14.68 % of the total rural workers (refer to Table 3.2 below).

Table 3.2: Agricultural Labourers in Rewari District in 2001

Total Rural Workers	Rural Agricultural Labourer	Percentage of Rural Agricultural Laborer to the Total Rural Workers
292963	42995	14.68

Source: Census of India –2001, Provisional Population Totals

Census of Below Poverty Line (BPL) Population: This measure of poverty is based on the money equivalent of calorific requirement per person. Those with per capita income below this money equivalent are considered poor. The results of BPL census carried out in 1990-91 and 1996-97 are given Table 3.2 below.

Table3.3: Estimates of Population Below Poverty Line

	Percentage of BPL population		Percentage Change	Deviation from State Average
	(1990-91)	(1996-97)		
Rewari	40	37	7.50	-6.79

Source: Rural Development Department, Government of Haryana, 2002,BPL Census

Social indicators: The overall literacy rate in Haryana is 68.59 % according to the 2001 Census. Rewari registered a reasonably good literacy rate of 82.76 % in urban and 74.19 % in rural areas as can be seen from Table 3.5 below.

Table 3.4: Literacy Rate in Rewari District (2001)

District	Urban	Rural	Male (Rural)	Females (Rural)	Literate SC as a Percentage Of the Total (1991)
Rewari	82.76	74.19	88.67	58.64	55.41

Source: Director of Census Operation, 2001, Provisional Population Totals

As we have considered the scheduled caste people as poor, it is important to know the socio-economic condition of poor people. Population of SCs constitutes 19.3 % of the total population of the district (refer to Table 3.5 below).

Table 3.5 Socio-economic Status of Scheduled Caste and Women

District	Total Population	SC of Total Population (%)	Female to Male Ratio (per 1,000)	Crimes against Woman (per 1,000)	Female Working Participation (%)	
					(1991)	(2001)
Rewari	144,452	19.3	901	0.22	11.61	36.81

Source: Director of Census Operation, 2001, Provisional Population Totals

[1] This definition is based on Article 341 of the Indian Constitution, it consist of a list of socially disadvantaged groups.

Climate: The climate of the area is mostly hot and dry except, during the winters, which is cold. The region has four distinct seasons viz., summer, monsoon (rainy), post monsoon (autumn) and winter. Average nominal rainfall of the district was 454.6 mm in 1991. The rainfall in the district increases from west to east and about 76% of the annual rainfall is received during the southwest monsoon months, July to September. The variation in the annual rainfall from year to year is appreciable in a 50-year period (1950 - 2000), the highest rainfall was 693.7mm in 1970, while the minimum was 393.0mm in 1985 (Government of Haryana 1997). On an average there are 32 rainy days in Rewari.

Day temperature begins to rise from the month of March. May and June are the hottest months when the mean daily temperature is about 41°C and the mean minimum temperature is about 27°C. While days are a little hotter in May than in June, nights are warmer in June than in May. From April onwards hot, scorching and dust laden winds blow and these add to discomfort. With the onset of the monsoon by the end of June, there is an appreciable drop in the day temperature. After October, there is a decrease in both day and night temperatures, the decrease being more rapid after the middle of November. January is the coldest month in the region, the mean daily maximum temperature being about 22°C.

Winds: The district is subjected to high velocity of winds from March to August. Such winds are responsible for serious wind erosion as well as formation of Aeolian deposits. The period from April to June has the highest incidence of dust storms and thunderstorms. The mean wind velocity varies from 0.2 km/hour to 8.1 km/hour.

Topography: The district is bordering Rajasthan and represents dry land topography throughout. Presence of inland streams, sandy plains, shifting sand dunes devoid of vegetation, fixed or fossil dunes, dissected upland tract and often barren, denuded rocky hill ranges and their outcrop provide an ensemble of terrain features truly associated with semi arid to arid environment.

The major portion of Rewari district is located in the east of Aravalli hills. The region is impregnated with sand dunes of variable dimensions. Fixed dunes reach up to 3-6 meters from the ground level. It may be inferred that the sand composing the plain was probably transported across the low relief of Aravalli ranges or through the gaps in the hills where it settled due to loss of wind speed. The area of shifting sand is locally known as *bagar*. The discontinuous and worn-down ridge flanks give the impression of a huge U-shaped dune or depression. Area within the dunal tract possesses good potential for ground water utilization.

The hills are long and wide, forming roughly parallel series of ridges. They constitute the outliners of scattered older rocks occurring in newer formations or sedimentary deposits. Geologically,

these rocky outcrops in the district consist of two distinct series. The *purana* rock in Rewari belong to Ajabgarh series of the Delhi systems. They are upper pre-cambrian in age. The hillocks and discontinuous ranges are locally called *khols* and the outliners are locally called as *tillas*. The *khols* and *tillas* are continuation of the Aravalli systems of Rajasthan. They abruptly rise from the surrounding undulatory terrain and traverse as discontinuous long linear ridges and are elliptical, semicircular to circular mounds of generally bare rocky outcrops. *Khols* are prominent features west of Rewari town. The numerous isolated, but roughly parallel ranges maintaining a northeast to southwest alignment, rise abruptly from the level land at about 190 meters above mean sea level. Hills vary in height from about 345 to 470 mts. A notable feature of the *khols* is a higher degree of dissection by short, very steep gullies and seasonal torrents on the west facing slopes than the east facing slopes, which probably are in the rain shadow of the south west monsoon winds. The *tillas* likewise run in parallel series of discontinuous and isolated rock outcrops.

Natural Drainage: There is no perennial river in this region. The most important seasonal river in Rewari district is Sahibi, which originates in the Jaipur district of Rajsthan and passes through the Rewari district. The riverbed near the village Pauti (which is one of the villages selected for carrying out the household survey) is about 1 km wide. The river, which once had the flowing water, has now dried up. High rate of evaporation and excessive percolation in sandy soil structure may have been responsible for the disappearance of the water steam.

Ground water: The streams in the district are non-perennial and carry water during the southwest monsoon period only. The water moves along a gradient from southwest to northeast. In the district, 87 % of the area is having fresh to marginal quality of ground water. According to an assessment approved by NABARD, the total useable recharge rate of ground water was 370 m.cu.m in 1978. However, the same assessment pointed out, the rate of withdrawal was much higher at 451.78 m.cu.m. Since the streams in the district have all dried up in the last decade, the water level continues shrink further down. It is reported that in the Bawal *tehsil* of the Rewari district the ground water level which in 1998 was 9.21 - 9.6 mts has gone down to 12 - 13.5 mts in 2002. The drilling depth for pumpset or handpump is 60 mts at present as against 24 - 30 mts in 1998 and 54 mts in 2002 in Bawal *tehsil* (from a discussion with experts in Haryana Agricultural University, Bawal).

Geology: The Rewari district has not been geologically investigated. However, the rocks exposed in the earlier district of Mahendergarh have been broadly divided into Alwar and Ajabgarh group. The Alwar group of rock constitutes predominantly of arenaceous sediments and is represented by massive quartzite, usually felspatic in nature, micacious quartzite with subordinate bands of mica schist and carbonaceous

phyllite. In the Ajabgarh group, the area is characterized predominantly by argillaceous sediments, which include shale, slate, phyllite, crystalline and impure limestone, marble and calcschist with intercalations of quartzite. Both these groups of rocks are intruded by amphibolite granite, aplite, pegmatite, calcite and vein quartz. Alkaline earth occurs as efflorescence on the surface and contains predominantly carbonate and bicarbonate of sodium. Their presence on the surface makes the land infertile. On the other hand, these can be economical source for sodium carbonate when the concentration of each salt is high.

Forest: The area under the forest in Rewari district was 40.0 sq.km. i.e., 4000 hectares in 1992-93 (CMIE, 1993) and it decreased to 30.0 sq.km. i.e., 3000 hectares in the year 1995-96 (Government of Haryana, 1997). The area under forest is classified according to the ownership i.e., private and state. Forest owned by corporate bodies and private individuals are included under the first category. The state's forests are categorized as reserved, protected and unclassified. Most of the forest areas are situated along the railway lines, canals, roads and bunds in the form of linear strips. These strips mainly pass through agricultural fields or wastelands and were created upon acquired land through plantations. Therefore, these strips are devoid of natural vegetation. Prior to the ownership of forest department over these strips, respective departments owning the patches had planted shade-giving trees such as shisham, neem, siris etc. After the management of the strips was taken over by the forest department, it raised plantations of more useful species over the years. At present most of these constitute a part of forest plantations and have trees like Kikar (*Acacia nilotica*), Safeda (*Eucalyptus* sp) Sisham (*Dalbergia sissoo*) Israeli kikar (*Acacia tortolis*), Vilayati Kikar (*Prosopis juliflora*) Siris (*Albizia procera*) Neem (*Azadarachta indica*) and Bakain (*Melia azadarach*).

An area of about 4,000 hectares in the district is affected by active sand dunes in the district. The advancement of accumulated sand renders the cultivated lands infertile. Containment of these sand dunes in the district is one of the main activities of the forest department, which is being tackled by the plantation of Kana (*Saccharum munja*) and Israeli Kikar (*Acacia tortilis*). Plants are also raised under farm forestry scheme on the southwestern boundaries of cultivated fields to create winds breaks so that the crops are protected from desiccating winds. Pasture restoration is also an effort to manage the wasteland and barren lands in drought prone areas to meet the acute shortage of fodder during the lean season. Wasteland where course and unpalatable grasses were growing, are proposed by the Forest department to be converted into good quality pasture lands of nutritious and palatable grasses such as Anjan (*Anchrus setigarls*). Forest produce is divided into two categories i.e., major and minor. Major forest produce includes timber and fuelwood such as jand (*Prosopis cineraria*) Shisham (*Dalbergia sissoo*), Kikar (*Acacia nilotica*), Israeli kikar *(Acacia tortolis)*, Siris (*Albizia lebek*), Neem (*Azadarachta indica*), Bahain (*Melia azadarach*) and Vilayati Kikar (*Prosopis juliflora*). The minor forest produce

consists of Sarkanda or Kana (*Saccharum munja*), which is used for making "muddha" (a kind of sitting stool made up of stick of kana).

Soil: The soil of the district can be subdivided into sandy, loamy-sand, sandy-loam and light loam and are highly deficient in organic matter requireing heavy doses of manure for improving the fertility. But such a method of farming is not possible without abundant supply of water, which is not available. Wind erosion is most the common feature in the district. At many places the soil is embedded with lime, kankar stone and other rocks. In the eastern and western part of Rewari, low fertility sandy soil is predominant and is locally known as "bhur". A big block of sandy loam with a tendency towards the light loam locally known as "Magda" is found in the center of the district.

Agriculture: Crops grown in the district are divided into two main categories viz., *Kharif* and *Rabi* locally called "Sawani" and "Sadhi". The former is sown at the onset of the rainy season while the latter is sown in winter. Any crop which does not strictly fall in timing within these two harvests is known as zaid crops, and their harvest is called zaid *rabi* and zaid *kharif*. Toria, an oilseed, is cultivated as zaid *kharif* Major *kharif* crop of the district is bajra (Spiked Millet, *Pennisetum glaucum*), which occupies about 28.2 % of the total cropped area along with jowar (*sorghum bicolor*), groundnut and gwara (fodder crop). The major *rabi* crops are mustard and wheat which occupy about 33.86 % and 22.2 % of the total cropped area respectively. Other *rabi* crops are gram, barley, and vegetables. Bajra *(Pennisetum glaucum)*, gwara (fodder crop) and pulses (during *kharif* season) are comparatively drought resistant crops and grow well in light soil of the district.

The gross cropped area of the district was 196000 hectares in the year 1995-96, with a net irrigated area of 101000 hectares (Government of Haryana 1997). Fertilizer consumption in the district was 93.32 kg/hectare (Government of Haryana 1997), while the average consumption at the national level was at a tons level of 74.37 kg/hectare during the year 1995-96. There has been a considerable decline in the bajra *(Pennisetum glaucum)* cultivation from 1977-78 to 1995-96 presumably due to a shift in cropping pattern when increased area of the district was brought under irrigation. The total area under bajra *(Pennisetum glaucum)* crop, which in 1978 was 50 % of the gross cropped area, declined to 28.2 % in 1995-96. The cropped area under wheat and mustard, which have better yield potentials has increased significantly. The main fodder crop is jowar (*sorghum bicolor*), which is grown during the *kharif* season. Presently farmers also grow kasni (*Cichorium intybus*) as green fodder. The main crops under irrigation are wheat and mustard. With the availability of irrigation facilities the area under vegetables is also increasing in the district.

Irrigation: A huge area of land in the district bordering Rajasthan is almost completely arid. The rainfall in this desert like portion is irregular and uncertain both in time and space. In some parts of the district agriculture is dependent upon the mercy of nature. But areas like Rewari and Bawal *tehsil* where agriculture with irrigation is widespread, is mainly dependent on ground water which is available at a much lower depth as compared to the rest of the district. On account of the peculiar topography i.e., rise in the country's slope from north towards south, the district could not be included in the network of canals before 1975-76. The government has introduced the schemes of lift irrigation for this area. As a part of the above scheme the work on the Jawaharlal Nehru Canal (JLN) was started in 1974-75. These channels have not become functional due to non-availability of water from the Satluj-Yamuna link canal.

Livestock: The district is fairly rich in livestock, which include cattle, buffaloes, sheep, goats, pigs and camels. It has been a practice of the past that in the bad rainfall years, cattle being mobile, were taken to areas, which were rich in fodder. According to the quinical livestock census 1997 conducted by the Director of Land Records, Haryana, there were about 28,000 cows, 87,000 buffaloes, 4000 horses and ponies, 28,000 sheep, 39,000 goats, 5000 camels, 8000 pigs and 20,000 other animals in the district. Rewari district and some parts of Mahendergarh district are known for the *Murrah* breed of buffalo[2] and Haryana breed of cow. Haryana cow was reared generally for its male produce, the bullock, which fetches a premium price. The Murrah buffalo is famous for high yield of milk and is the main milch animal of the district.

3.2 Panchkula District

The present study area of the village Damdama-Bhogpur village belongs to the Panchkula district. In 1995 Panchkula became separate, after being carved out from the district of Ambala. The Shivalik range of Solan and Sirmaur district of Himachal Pradesh bound it in the north and northeast. The district consists of two tehsils, namely, Kalka and Panchkula, and has a population of 469210 persons (2001 Census).

The Panchkula district can be divided into three physiographic units namely,

a) the outer Himalayan hill tract,
b) the Shiwalik hill tract, and
c) the Pinjore Doon

[2] *Murrah* breed of buffalo is a local breed of buffalo

Physiography:

The Outer Himalayan Hill Tract: It encompasses the northern most *tahsil* and is divided into three distinct physiographic units, viz.,

(i) Parallel strips running in the north-west, south-east directions

(ii) The central strip which is structural valley bounded by the narrow strips of hilly tracts.

(iii) A narrow valley of Ghagghar river which separates the tract from the Morni hill tracts in the south. The highest point in the extreme south on this ridge is only 884 meters above mean sea level.

The Chandigarh Shivalik Hill Tract: This tract is a narrow strip in the Shivalik hills north of Chandigarh and flanks the southern side of Pinjore in Kalka tehsil. The strip, which is only 2-5 km wide, encloses the northern slopes. The Shiwalik range north of Chandigarh represents typical Shivalik hill topography. There are hogback ridges, formed on gently dipping alternating beds of clay, silt, loam and gravel. The tract is badly dissected and gives the appearance of bad land topography. Numerous rills, gullies and choes are continuously transforming the face of the area at a very fast rate. Due to unconsolidated nature of the bed rocks, the rate of landslides and mass wasting is high. The highest point in this ridge is Kala Tiba, which is 625 meters above mean sea level.

Morni Hill Tract: The continuity of the Shivalik range further east is broken by the trans current fault north of Panchkula township. Due to this fault a narrow water gap has been created through which river Ghagghar finds its way to the Punjab plains. This narrow water gap, which has a wall like vertical eastern banks and terraced western banks, separates the Chandigarh Shivalik range tract in the west from the Morni hill tract.

Pinjore Doon: It is a structural valley, of about 5-8 km wide, sandwiched between the outer Himalayas in the north and the Shivalik range in the south. It extends from the river Ghagghar in the south east to Badli river, a distance of about 25 km. This zone is flanked in the north by alluvial fans at its contact zone with the Himalayas and the seasonal streams in the south along the Shivalik hills. The major slope of the area is from the northeast to southwest with an average gradient of about 40-50 m per kilometer. The minor slope of the area, which is perpendicular to the major slope, divides the area into three different segments. Two segments east and west of the Koshallia river, which flows from north to south, dips inwards towards the river. The third segment, west of the imaginary line joining the village of Khera at the foot of the Shivalik range with the Tagra Kaliram in the northeast near Kalka station dips towards northwest.

Drainage: The drainage density of the area is very high as a number of seasonal streams descend from the ridges and spurs, flanking to the northern side of the valley. The drainage lines form very closely spaced sub-parallel drainage pattern. The streams flow from north-east to south-west direction across the entire

width of the valley and then join the major streams like Sirsa river, Jhajra river of Ghagghar which flow at the foot of the Shivalik range in a direction perpendicular to these streams. The streams are generally entrenched and have wall like vertical banks. At places these banks are as high as 25 m. The average spacing between the streams is about 500 meters. Almost all the streams are seasonal and carry water only during the rains. Streambeds are strewn with gravel and boulders.

Climate: The climate of the district is characterized by very hot and dry summer, followed by monsoon and winter seasons. The southwest monsoon commences late in June and continues up to middle of September. The rainfall in the district is received during June to September. The variation in the annual rainfall in the area is appreciable. On an average there are 46 rainy days in the district. From March temperatures increases rapidly. May and June are generally the hottest months in a year with mean daily maximum temperature at about 41°C and mean minimum temperature at 25 °C to 27 °C. January is generally the coldest with mean daily maximum temperature of 21 °C and corresponding minimum temperature of 7 °C.

Population: The population of the district is 469210 according to 2001 census out of which 257380 are males and 211830 are females. The population density is 523 persons per sq.km. There are a total of 236 villages in the district.

Poverty: As there is no explicit data available pertaining to the numbers of poor people in the district, some social aspect has been taken into account as indicator of the poverty. The Scheduled Caste people in the district are landless and at the same time it has been observed that only a small number of rural SC population have permanent employment. Hence they are considered to be poor. The number of SC in rural area is 49911 in the district, which is 19.19 % of the rural population as can be seen from Table 3.6 below.

Table 3.6: Scheduled Caste (SC) Population in District Panchkula in 2001

	Total	Rural	Urban	% of Rural SC to the total rural population
Total Population	468411	260016	208395	
SC	72637	49911	22726	19.19

Source: Census of India –2001, Final Population Totals

Another indicator of poverty is the number of agricultural labourer. Agriculture work requires large number of labourers in sowing and harvesting season only, and incidence of unemployed throughout the year is considerable. The number of rural agricultural labourer is 10,435, which is 9.57 % of total rural workers as is illustrated in Table 3.7 below.

Table 3.7: Agricultural Labour in Panchkula District, 2001

Total Rural Workers	Rural Agricultural Labourer	Percentage of Rural Ag. Labourer to the Total Rural Workers
109092	10435	9.57

Source: Census of India –2001, Provisional Population Totals

People who belong to BPL in the district is 30 % of the total population. Decline in BPL in the district is only 1 % during the period of six years between 1990-91 and 1996-97, which is below the state average as is seen from Table 3.8.

Table 3.8: BPL Trends

	Percentage of BPL		Percentage Change	Deviation from State Average
	(1990-91)	(1996-97)		
Panchkula	31	30	3.23	-11.06

Source: Rural Development Department, Government of Haryana, 2002,BPL Census

Social indicator: The overall literacy rate in Haryana is 68.59 % according to the 2001 census (Table 3.9).

Table 3.9: Literacy Rate in District Panchkula (2001)

District	Urban	Rural	Male (Rural)	Females (Rural)
Panchkula	85.97	88.95	77.50	58.11

Source: Director of Census Operation, 2001, Provisional Population Totals

Population of SCs constitute 17.52 % of the total population of the district as can be seen from Table 3.10 below.

Table 3.10: Socio-economic Status of Scheduled Caste and Women

District	Total Population	SC of Total Population (%)	Female to Male Ratio (per 1,000)	Crimes against Woman (per 1,000)	Female Working Participation (%)	
					(1991)	(1992)
Panchkula	55,965	17.52	823	0.41	6.14	17.92

Source: Director of Census Operation, 2001, Provisional Population Totals

River system and water resources: There are two major areas of concentration of streams, Pinjore and the foothill zone. In Pinjore, these streams form a closely spaced sub parallel drainage pattern. Their beds are strewn with boulders and pebbles. Sirsa is an important stream in the area, which flows towards the Sathy river. Despite the large number of drainage lines passing through the district the area suffers from severe water scarcity.

Geology: The northern part of the district constitutes tertiary rocks, including limestone, sandstone shale, and boulder conglomerates and these form low lying hilly ranges known as Shivalik foothills.

Shivalik formations in Pinjore range: Soft sandstone with clay, the pretertiaty tundspathar series of rocks crop out in the Morni Hills extending from Malla to Sherla and form an important limestone bearing horizon with cement grade limestone occurring as tentoid bodies, having thickness between 6-30 meters. Massive sandstone in Kasaul occurring near Kalka is a good source of building material and also for manufacture of stone bowls. Some good quality potters clay has been reported from Pinjore. Red clay bands, measuring in thickness from 1 to 5 meters, are exposed in the lower horizon of Pinjore stage of Kalka tehsil.

Ground water: The groundwater level in the district, immediately to the south of Shivalik Hills, occurs under confined and semi-confined conditions and varies greatly. The District Gazetteer of Ambala (1984) mentions that groundwater in Pinjore used to occur at a depth ranging between 2-47 meters during that period. The depth was more towards the hilly region. The water level in the area further south ranged between 1.5 and 12 meters, but generally it varied between 4-8 meters during the early eighties. Over the years the water level of the area has drastically fallen down. The present water level in the year 2004 at the village Damdama-Bhogpur as found in a recently dug tubewell is at a depth of 157 mts (525 ft).

Forest: The forest types occurring in these areas are "Northern tropical dry Deciduous forest" and the "Sub tropical forest". The forests in the Morni Pinjore division can be broadly divided into three categories, viz.,

(a) Block forest with a total area of 11028.33 hectares.
(b) Strip forest along the various roads passing the area with a total area of 874.82 hectares.
(c) Block forest of Raipur rani range of 80.94 hectares.

Out of the total area of the block forest, reserved forest is 8523.3 ha, demarcated protected forest is 2140.3 ha and protected forest of 364.73 ha.

The forest contains a number of miscellaneous hard wood species like Chal (*Annogensus latifolius*), Khair (*Acacia catechu*), Jhingan (*Lannea coromandelica*) and Amaltas (*Cassia fistula*) and is seral in character. They constitute the proclimax stage. The progress of plant succession has been checked by the interference of natural factors such as excessive soil erosion, landslips and biotic factors such as excessive grazing, lopping and fires. These species have maintained a stable stage by the interference of the regressing factors. On the outer hills where the incidence of grazing and biotic interference is considerable, the dry deciduous type degenerates into scrubland. Except bamboo, none of the species of these forests fulfil the characteristic of the climate.

Agriculture: Total area of the district Ambala in 1993 (before the separation of district Panchkula) was 2385.0 sq.km. out of which cultivated land was 1390 sq.km., forest area 420 sq.km., and uncultivated land 90,062 hectares.

The *Kharif* Crop: Paddy and Maize are the two major *Kharif* crop. In 1950-51 the area under paddy cultivation was 26,000 hectares which rose to 52,000 hectares in 1977-78. Popular varieties of rice are IP-8, IR-106, Pusa-2-21 and Jaya. Maize was grown in 16600 hectares in 1950-51 which rose to 44000 hectares in 1977-78 (i.e., 166.7 % increase)

Rabi crop: The principal *rabi* crop is wheat. The area under wheat cultivation in 1950-51 was 51,000 hectares, which rose to 54,000 hectares in 1965-66 and to 97,000 hectares in 1977-78. The chief varieties of wheat cultivated are Kalyan, Sona and Sonalika.

Irrigation: The average annual rainfall in the district is 985.1mm. The depth of the ground water in Kalka tehsil varies from 100 ft (30.48 mts) in areas just below the hills to 30 ft (9.14m) in others. In 1923-24 the total irrigated area in Ambala district was insignificant (1%). The source of irrigation was limited to masonry or temporary kucha wells and to some occational irrigation from kutcha tanks, Kuhls or ducts in Morni hill portion. Due to construction of Bhakra canal system there have been considerable increase in irrigated areas of plains regions of Ambala district. However, the irrigation is locally dependent on the rains in the hilly areas of Panchkula district.

Kuhl or duct Irrigation: Kuhl irrigation is prevalent in hilly areas of the district. The sources of water supply to the kuhls are perennial and non-perennial springs and small streams. In 1977-78, 2421 hectares of land was under Kuhl irrigation in Ambala district. The foodgrain production which was only 169,000 tonnes in 1966-67 increased to 385000 tonnes in 1977-78 (128%) increase.

Animal Husbandry: Livestock contributes significantly in the village economy in terms of products and services. In most of the villages dairy is supplemented with the agricultural produce for the livelihood. With intensive agriculture practiced in the area, tractors have taken place of bullocks for ploughing and cart pulling but in some poor families the traditional practice is still prevalent. The livestock population in the district has increased sharply and so has the products. According to 1997 census, there were 35,000 cows, 34,000 buffaloes, 1000 horses and ponies, 5000 sheep, 19,000 goats, 5000 pigs and 9000 other animals. The total quantity of milk produced daily was estimated to be 5,057.22 quintals in 1977 as compared to 2733.17 in 1966.

The main activities of the districts as apparent from the above discussion are agriculture, animal husbandry and forestry. While agriculture is the most preferred occupation forestry enters as a supplementary option for many people. Such a scenario emerges because of low value added potential inherent in the forest resources available in the district. It is however important to note that these activities are interrelated as inputs from forest are required by both agriculture and animal husbandry in the form of satisfaction of fuelwood and fodder demand. Thus any poverty reduction programme has to take into account such interdependencies between these sectors.

3.3 Description of Two Villages Covered for the Study

In order to capture the forest poverty relationship the selection of the villages was undertaken after carefully looking into the economic conditions of the area. Major emphasis was put to assess the extent of poverty and peoples dependence on forest resources for their livelihood. As the SC population is usually landless and often identified by the government as the poorest group in the villages the present study attached greater weightage to their composition in the village. The ultimate choice of selection of the village, therefore, was based on the percentage of SC population, landless households along with a minimum 10 hectares of forest coverage of the village.

3.3.1 Village Pauti

This village is located in the periphery of Aravalli region in the southern part of Haryana and has vegetation, which is predominantly of dry deciduous scrub. The village has 143 households and a population of 955. Some of the important locational attributes of the village are:

District/Block	Total Households	SC Households	SC % in total Population	Yellow Cards*	Pink Cards*[3]	Panchayat Forest
Rewari/Bawal	143	18	14 %	7	2	136 ha

* The government issues these cards to the poorest groups who are below the poverty line.

The major activities in the village in relation to livelihood are agriculture and animal husbandry. The important crops grown are wheat, mustard, and millet. Most of the agricultural output is consumed by the villagers themselves and only a handful of household who have a surplus of wheat and mustard sell these in the market. Some of the households also sell milk to the local co-operative dairy. Many people in

[3] Pink and Yellow Cards are issued by the government to those households who are below the poverty line (BPL). Yellow Cards are issued to households who do not have any fixed source of income while the Pink Cards are issued to those who have some source of income but are below the poverty line. The holders of these cards are entitled to double the amount of ration vis-à-vis the other cardholders from the Fair Price Shop. They also get priority in some of the employment generation schemes of the government.

the village migrate to nearby towns to earn their livelihood. The landless households work either as farm labourers or wage earners in road construction/repair activities. There are around 32 landless households in this village, which became the criteria for selecting it for the study even though there are only 14 % SC population.

The forest around the village is located in the dry riverbed (Sahibi River) and consists predominantly of bushes and scrubs (refer to Appendix 3 for the village map). However, plantation by the Forest Department in the early 1980s and thereafter, under the Social Forestry Scheme has also helped to establish a plantation of *Acacia sp* and *Prosopis julifera.* This forest ranges from 0.5 – 1.0 km in breadth and stretches from Rajasthan to Haryana. The soil in this forest is sandy and not suitable for agriculture.

The villagers utilise the forest for grazing, collection of fodder and fuelwood. The timber from the forest is of low quality and is predominantly used by the poor for fuelwood and construction of their huts. Being a degraded scrub and plantation based forest, not much variety of NTFPs is available to the villagers from it. However to meet the basic needs such as fuelwood and fodder the poorer section of the village rely on such a forest. Especially the women of the village have the tradition of collecting these products. The village livestock mainly consists of buffaloes and camels, which grazes in the forest area. This forest has also become a habitat for the traditional variety of cows abandoned by the villagers in 1980s, which compete with the village livestock for fodder. Some of the villagers earn their livelihood by making ropes and baskets.

Village Forest Committee, Pauti

In accordance with the provisions of JFM, Haryana, Pauti has a village forest committee (VFC). Being formed recently, it is yet to become functional. Since the whole forest land of the village belongs to the Panchayat, its management is done by the panchayat office with the help of the forest department. Income generated through auctioning of forest products accrues to it. For auctioning the products (mainly timber and fuelwood), the Panchayat seeks permission of the forest department and requests the Block Development Officer (BDO) to publish a notification about the auction. In 2003 the Panchayat earned Rs. 375000 from forest product auction.

At present, access to the forest has been granted to the village people for collection of fodder and dried up fuelwoods only. People can also take branches from the forest for the purpose of fencing their agricultural fields by taking permission of the Panchayat.

3.3.2 Village Damdama-Bhogpur

It is situated at a distance of about 5 km from the Pinjore town, along a seasonal river Kaushalya and at the foothills of the Shivalik range. The village Damdama-Bhogpur comprises twin villages

Damdama and Bhogpur, which are adjacent to each other, constituting a single revenue unit and sharing the resources of the same forestland adjacent to them (refer to Appendix 4 for the village map). It has a population of 869 consisting of 163 households. The village has a sizeable Schedule Caste population and a large number of households in the village have Yellow and Pink Cards, issued by the Government to the poorest groups below the poverty line. The choice of the concerned village was made on the basis of the above mentioned SC population as well as poverty criteria. Details of the locational attributes of the village are given below:

District /Block	Total Households	SC Households	SC % in total Population	Yellow Cards+	Pink Cards+	Panchayat Forest	Protected Forest
Panchkula / Pinjore	163	42	25.8	55	8	20 ha	417 ha

+ The government issues these cards to the poorest groups who are below the poverty line.

The major sources of livelihood for the village are agriculture and animal husbandry. The main crops grown are maize, rice, wheat and pulses. The villagers also grow seasonal vegetables like tomato and cucumber. Most of the agricultural output is consumed locally and only pulses and vegetables are sold in the Pinjore market. The village livestock constitutes mainly of buffaloes and few goats. The milk obtained from the buffaloes is sold to the local dairy. Few people in the village have also secured government jobs (H.M.T., Pinjore). The Scheduled Caste community, which is landless, is mostly dependent on the forest for their livelihood.

The forest area under the village panchayat is mainly used for grazing, and consists mostly of grasses and shrubs of *Lantana camara.* The village is therefore, more dependent on the Protected forest for fodder, fuelwood and NTFPs like bamboo and *khair.*

The SC community of Banjara utilises the Bhabbar grass (*Gililiopsis biloteata*) for making ropes and the Bhanjda community utilises bamboo sticks (*Dendrocalamus stictus*) for making baskets. The major vegetation in the forest comprises of *Acacia katechu, Acacia nilotica, Anogysis latifolia, Cassia fistula, Dalbergia sisso, Linea grandis, Dendrocalamus stictus, Gililiopsis biloteata.*

The only form of intervention for sustainable forestry in this village has been through the various schemes such as Social Forestry, Joint Forest Management and HRMS (Hill Resource Management Society). The last form of the above needs some explanation, which is given below:

Hill Resource Management Society (HRMS): It is a village-level resource management institution formulated by the Tata Energy and Resources Institute (TERI) as a part of their (JFM) programme. The HRMS is involved in diverse activities like sustainable utilisation of NTFPs, building of small check

dams, water harvesting, providing small loans to the poor and marginal sections of village population, training and mobilising the people. It was formed by TERI in July 1990 in collaboration with the Haryana Forest Department (HFD) and with the financial support from the Ford Foundation. For the smooth functioning of the HRMS, three separate working groups at the range, division, and state levels have been set up, chaired by the Range Forest Officer, Divisional Forest Officer and Principal Chief Conservator of forest respectively. While the range and divisional level groups facilitate and monitor the programme, the state level group is the apex body that primarily recommends and proposes policy guidelines for the JFM programme. Elections are conducted in each village to elect the HRMS Pradhan and its members by the HFD. Till July 2000, there were 55 villages in which HRMS was formed and this number has increased now with its success and popularity in the region.

The HRMS bridges the gap between people living near the forest and HFD. It also helps in getting permits of forest products to the poor and marginal communities at concessional and affordable rates, which were earlier, issued to contractors for commercial purpose. At present the HRMS is a self-funding body and mobilises its resources and is at present not financially supported by TERI or any other organisation.

From the above discussion it is seen that people of both the villages, Pauti and Damdama-Bhogpur, depend on forest resources for their livelihood. Fuelwood and fodder collections are the two important forest resources that satisfy the basic requirements of the villagers.

As the poorer sections of the villages depend more on such forest products, their increased supply is likely to result in a reduction of collection time which can be used for other income earning like casual labour. A differentiated wage rate between male and female workers is not a common feature in the villages under study. Only in case of paddy cultivation in Damdama-Bhogpur female workers are given less than the males. Thus poverty reduction potential for female workers can be expected from an improved supply of forest resources as these activities are undertaken by womenfolk of the village. Moreover, it is important to note that the prevailing social norms in these villages demarcate the category of activities, which are forbidden for the female workers. For example, ploughing fields for cultivation of any crop is done by the male members only. Such a cultural setting of the village is responsible for limited options for women in the process of earning a livelihood in agriculture.

4. Methodology of SAM

4.1 Introduction

A major task before the present exercise is to bring out the interrelations among the sub-sectors of the village economic system with a view to project its production and distribution channels when a sustainable forest sector is included as its integral part. For that purpose the study draws upon the insight offered by the technique of social accounting matrix (SAM). The technique of SAM rests on the underlying principle that for every income there is a corresponding outlay or expenditure. It is presented in the form of a square matrix and records the transactions that take place among various production and consumption sectors. The sectors of the economy are identically ordered in the rows and columns. The inputs used in carrying out the production activities in a sector are given by the columns in the matrix. On the other hand, the rows indicate the distribution of the output of a particular sector to be used as inputs by different sectors and final demand for consumption by the households.

Besides providing consistent data framework for a village level analysis, the SAM would capture the interrelationships between pattern forest resource use, the structure of production, distribution of income and ultimately poverty alleviation, and would establish the actual as well as potential links among them.

It may be useful to note that this technique has been widely used to analyze the direct and indirect impacts of diverse policy issues (see, for example, Adelman and Robinson 1978; Ahluwalia and Lysy 1979; Pyatt and Rounds 1985; Pyatt et. al. 1972; Thorbecke and Sengupta 1972). Particularly, the inter-relationship among sub-sectors in a village economy has been used in analyzing the problems of poverty alleviation (Subramanian and Sadoulet 1990), rural industrialisation (Parikh and Thorbecke 1996), migration (Taylor and Adelman 1996), and district level planning (Lewis and Thorbecke 1992). Although attempts have been made to bring in environmental accounting into the system of national accounting (SNA) framework (Markandya and Costanza 1993), village level studies that include such concerns are yet to come up presumably because of the demanding data requirements.

It is not difficult to see that SAM helps delineate the

- interactions among different sectors,
- structure and level of production in each sector,
- distribution of sectoral value added among household groups,
- distribution of factorial income among households according the latter's resource base, and
- demand for production activities given the consumption pattern of households.

In order to understand the linkage between the village economic system and the forest sector, the present study considers the functioning of the former before bringing in the relationship with the latter. For that purpose the exercise develops a modified SAM, which integrates environmental concerns at the village level.

4.2 Framework of SAM

Description of the village economic system:

The production activity account is fundamental to the construction of a village SAM. The study considers four broad production activities within the village economy viz., agricultural commodities, non-agricultural commodities, forest products and services. These production activities are outlined in the activities account of Table 5.1A for Pauti and Table 5.2A for Damdama-Bhogpur. The agricultural sector is further disaggregated in Tables 5.1 and 5.2 for the villages of Pauti and Damdama-Bhogpur respectively into its constituent sectors like wheat, mustard, cotton, maize, paddy, pulses, fruits and vegetables and cultivated fodder livestock and poultry products (milk, egg and meat). Manure and dung cakes, which have been accounted as separate livestock activities in the disaggregated format are also included with agriculture in the aggregate format. The non-agricultural sector has been disaggregated into village production (rural industries like basket making). Forest products include collection of timber, fuelwood, leaves and grass and other non-timber forest products. The forest account is disaggregated into fuelwood, timber, fodder leaf, bamboo and other non-timber forest products. The services account has been disaggregated into retail trade, village services (like hair cutting), education, health and infrastructure.

Households own some of these factors and derive income by their utilization. Moreover, the households spend their income on goods and services produced within the economy or on imported items and thus generate demand for goods and services. The commodity account indicates the amount of income spent on the purchase of different commodities. The agricultural commodities in this account in Tables 5.1A and 5.2A have been disaggregated into their constituents, to include cereals, pulses and oilseeds, fruits, vegetables, cultivated fodder and agricultural residues. The aggregate commodity account for agriculture also includes livestock products. Non agricultural items in the commodity sector include food and non-food items along with industrial/imported goods. Forest products include timber, fuelwood, fodder and non-timber forest products. Services, like travelling etc., too have been included in the commodity account.

The factor account gives the inputs used in the production process. The inputs are classified as land, labor and "other factors". Of these, labor is divided into two sub-categories, hired and family labor. The 'other factors' in the agricultural production process would include seed, fertilizer, manure, pesticides, tractors and other machineries, draught animals, electricity and water charges and rent of agricultural land. The factor account for livestock includes inputs like fodder and family labour. Construction materials (like cement, etc.) are used as inputs in building village infrastructure such as roads and buildings. Cost incurred in transporting construction material has been recorded as "transportation cost" in the factor account. Stationaries used in schools have been categorized as input in the education activities. The aggregated factor account is given in Table 5.1A and 5.2A for the two villages, while the more disaggregated figures are outlined in Tables 5.1 and 5.2.

The capital account includes stock of natural capital along with cash savings and investment. Natural capital includes land and forests whereas finance capital would be constituted of institutional savings and investment. It is important to note that activity of the village economy draws the services of natural capital leading to the shrinkage of its base. To account for such an eventuality the study considers the state of natural capital stock and estimates the addition or depletion of the carbon stock in the forests to evaluate the base of natural capital in both the villages. Cost imposed on the natural capital stock by soil erosion due to agricultural activity, which reduces natural fertility of the soil, has been accounted as external cost. The other component of external cost is the health cost incurred due to indoor air pollution caused by use of biofuels.

The institution account of the SAM table includes households (by income categories) and the government. The present study does not distinguish between layers of government and takes it as a single entity in order to simplify the linkages.

In order to arrive at a classification structure that would focus on the income distribution and consequently on the poorer group of the villagers, we divide all the households on the basis of net monthly income from all production activities that he/she may be engaged in as either hired labour or family labour during the year. Since family labour does not receive wages the net income or profit from the activity has been accounted as payment to family labour.

The rate of daily wages is taken as a benchmark by the local government for identifying poors in the village who would qualify for certain food subsidies, others who are not engaged as daily wage earning laborers but earn as much are also considered for receiving food subsidies. A daily wage earners income would work out to Rs. 2000 per month if he is engaged for 25 days a month at an average. Thus, a monthly income of Rs. 2000 is taken as the benchmark for categorizing the poors. However, those in the

income category of Rs. 5000 to Rs. 2000 per month are also poor though not as poor as the above category. This group has been classified as low-income group. The middle income group in the context of the villages surveyed would constitute the monthly income range of Rs. 5000 to Rs. 10,000 and those earning above Rs. 10,000 have been categorized as the rich income group in the relative context of the villages. The household classification scheme according to monthly income makes space for four categories viz., high income (Rs. 10,000 and above), middle income (Rs. 10,000 to Rs. 5,000), low income (Rs. 5,000 to Rs. 2,000) and poors (less than Rs. 2,000). It is expected that the last two categories in this classificatory scheme would form the bulk of poor people. It should be noted that the landless households and the marginal farmers in the village fall under poor and low-income class, while the large and medium landowners belong to the middle and high-income class. While the high-income class invariably owns large tracts of land the poorer group are landless. Since agriculture remains the major activity for majority of these people the process of development emanating from such an activity is expected to have a significant role in poverty alleviation. However, many of the villagers also depend on other activities such as forest, retail trade, livestock, accrual of income from which also contributes to poverty alleviation. These activities are, therefore, essential components of providing the supplementary role to the main activity of agriculture in reducing poverty.

The final accounts in the SAM table pertain to rest of the villages and rest of the world. The trade of the village with the region and rest of India are analyzed here.

It is not difficult to see that the major accounts of SAM include forest sectors resources that would help capture its interaction with the household groups. In the activity account the linkages of the forest resources like fodder, fuelwood, timber and non-timber forest product with other activities of the village (agriculture, non-agriculture and services) will be explicitly established. Similarly, inclusion of forest goods in the commodity account will initiate the process of linkages through income generation and income distribution along with other commodities.

Forest sector and its linkages:

An attempt is made to list the important forest resources that enter into the production activities of agriculture, non agriculture and service sectors of the village. Making use of the extended asset boundary offered by SEEA (UN 1993), the SAM is developed to account for (i) non-produced natural economic assets (e.g., mineral extraction and timber harvest etc.) and (ii) non-produced natural non-economic assets (e.g., firewood collection, fodder collection, logs and timber and non-timber minor forest products including those of medicinal plants) while establishing the linkage between forest sector and village economic system in the context of production activities. The forest sector is taken to cater two broad types

of demand, viz., i) non-produced natural economic assets such as mineral extraction, timber harvest (sold by auction) etc., undertaken by the government. These activities are apportioned in the capital account of the government; and ii) non-produced natural other economic assets such firewood, fodder, logs and non-timber forest products, collected by the households[4] have been accounted as forest products in the commodity account of the forestry sector. Inputs from the forests to village industries are accounted in the factor account as forest resources. The capital account of the forest sector captures the value of net annual change in the stock of carbon and earnings from the sale / auctioning of timber. Since the government is the owner of the forest and receives income from the sale of timber, the change in the value of annual net carbon stock has been apportioned to it.

The resultant relationship to be captured through the SAM schema is given below and the basic interdependent links of the village economy are envisaged to run as follows:

Production activities → Factorial income distribution → Household income distribution → Household expenditure on goods and services → Household expenditures on commodities and final demand → Production activities.

Essentially the approach helps in deriving the income distribution and expenditure pattern by socioeconomic groups following, say, a change in structure of production resulting from either a developmental agency or a government actions by distinguishing between the determination of primary and secondary income distribution. It may be seen that the primary income distribution is determined through the triangular interrelationship linking production activities, factors and households. The value added by production accounts is translated into incomes of different types of households and other institutions. On the other hand, consumption patterns of different socioeconomic groups reveal the value of commodities consumed by these groups and help provide the information of living standards of various groups and the extent to which they are able to satisfy their basic needs.

4.3 SAM Multiplier Analysis

To analyse the effects of exogenous change on the economic system, the transactions between sectors in the core SAM (Table 5.1 and 5.2) are put in two groups, viz., endogenous and exogenous. In the present study production activity, commodities, factors of production, forest, environment and households are considered endogenous to the system while the remaining accounts viz., government, rest

[4] It is presumed that forest resources used by the production sector and rest of world are purchased from the households, which encroach into forest.

of villages, rest of the world and financial savings are exogenous. Such a presentation helps in projecting a consistent set of output and prices for the endogenous sectors given the level of exogenous demand.

Making use of SAM multipliers, the strength of the linkages among the different sectors of the economy is tried to be captured. The linkages are shown in the form of change in the incomes of different accounts due to injection of a rupee in one account. Such multipliers are used to compare the effect of a change in exogenous factors on the production, consumption, forest and environment accounts of the village economy. For the estimation of the sectoral outputs in the endogenous accounts, one needs to find out the average expenditure propensities by dividing each element in the endogenous transactions sub-matrix by the respective column totals. This provides us with the accounting identity

$$y_n = A_n y_n + x \qquad \ldots(1)$$

where y_n is the vector of endogenous variables, A_n is the endogenous transactions sub-matrix and x represents exogenous variables such as exports, government expenditure and capital transactions. From (1) we obtain what is called the accounting multiplier matrix (M_a) (Lewis and Thorbecke 1992) which is as follows:

$$y_n = (I - A_n)^{-1} x = M_a x \qquad \ldots(2)$$

In equation (2) the elements of A_n represent the average expenditure propensities of the endogenous sectors. One important limitation of the accounting multiplier M_a is the assumption that various average expenditure propensities in A_n hold for the incremental demand generated by some exogenous change i.e., average expenditure behaviour is assumed to prevail in the margin. In other words, it assumes that the marginal and average expenditure propensities are same. As the marginal expenditure propensities (C_n) may differ from average expenditure propensities, use of the former in (1) would provide us with a more realistic estimate of y_n for x, which represents exogenous variables such as exports, government expenditure and capital transactions in the system under consideration. Accordingly, the increments in the endogenous accounts for given change in exogenous accounts are obtained from

$$dy_n = (I - C_n)^{-1} x = M_c \, dx \qquad \ldots(3)$$

where M_c is the fixed price multiplier matrix. In this formulation, the marginal expenditure propensities, in C_n are estimated for the different household groups by using the linear expenditure system.

In the derivation of M_c in equation (3) it is implicitly assumed that the excess capacity exists in the endogenous sectors. That is, it is assumed that the supply is perfectly elastic and an increase in demand is sufficient to stimulate increases in output and incomes. Thus as long as the excess capacity prevails any exogenous change in demand can be satisfied through a corresponding increase in output without having any effect on prices. However, this assumption of excess capacity is unrealistic when

applied to agriculture and forest sectors in the developing countries. It is posited that supply of the agricultural and forestry output is inelastic and that demand increases alone are inadequate to encourage production in these activities. In such situation, the fixed price multipliers will provide output and income multiplier estimates that are unrealistically high owning to overly optimistic expectations regarding supply response. To address such concerns, a modified SAM multiplier methodology has been developed that allows for limited or even no supply response in output constrained sectors while maintaining the assumption of excess capacity in all other non-supply constraint sectors.

A model with mixed endogenous/exogenous variables based on the SAM can be derived to address the issue of limited supply elasticities in some of the production activities. Assuming that the identification of the supply-constrained sectors has been done, it can be shown that

$$d\begin{bmatrix} y_{nc} \\ x_c \end{bmatrix} = \left[\begin{array}{c|c} (I-C_n) & 0 \\ \hline -R & -I \end{array}\right]^{-1} \left[\begin{array}{c|c} I & Q \\ \hline 0 & -(I-C_c) \end{array}\right] d\begin{bmatrix} x_{nc} \\ y_c \end{bmatrix} \qquad (4)$$

$$= M_m \, d\begin{bmatrix} x_{nc} \\ y_c \end{bmatrix}$$

where y_{nc} is a vector of total endogenous incomes of factors of production and institutions and total output of non-supply constrained sectors; x_c is the vector of endogenous final demand for supply-constrained sectors; C_{nc} is the matrix of marginal expenditure propensities among factor, institutions, and non-supply constrained sectors; R is a matrix of expenditure propensities of factors, institutions, and non-supply constrained sectors on supply constrained sector output; C_c is a matrix of marginal expenditure propensities among supply constrained sectors; x_{nc} is a vector of exogenous final demand for factor, institutions, and non-supply constrained sector output; y_c is a vector of total exogenous output of supply constrained sectors; and I and 0 are respectively identity and null matrices of appropriate order. M_m, the new multiplier matrix obtained as the product of the first two terms on the right hand side of equation (4) is the mixed multiplier and it incorporates the assumption of supply constrained output in certain sectors of the village economy. The mixed multiplier matrix has been calculated for the villages of Pauti and Damdama-Bhogpur based on the assumption that all agricultural and forest sectors are supply constrained.

4.4 Multiplier Decomposition for Distributional and Interdependency Effects

It may be recalled that a major task before the present study is an assessment of the impact that different production activities have on poverty alleviation. Depending on the technology used, the factor

endowment of the poor socioeconomic household groups and the extent of inter-linkages on the demand and supply sides (i.e., the degree of integration of the economy), certain production activities contribute more to poverty alleviation than others. So following Thorbecke and Jung (1996), we define the fixed price multiplier matrix (M_C) as

$$dy_n = C_n dy_n + dx$$
$$= (I - C_n)^{-1} dx$$
$$= M_c\, dx$$

where, C_n is the matrix of marginal expenditure propensities and M_c is the fixed price multiplier matrix. In order to decompose the fixed price multiplier into interdependency and distributional effects the C_n matrix is partitioned as

$$C_n = \begin{bmatrix} O & O & C_{13} \\ C_{21} & C_{22} & O \\ O & C_{32} & C_{33} \end{bmatrix} \qquad (2)$$

Our objective is to estimate the contribution that different production activities make towards poverty alleviation. Thus starting with an exogenous change in demand for a given production activity $(dx_3\ above)$ we want to know the ultimate impact on the incomes of the different household groups $(dy_2\ above)$. More specifically, the impact on the additional incomes accruing to the poor household groups (a subset of the vector dy_2) is tried to be seen. Thus, we would concentrate on that part of the fixed price multiplier matrix that links production activities to household groups (i.e., M_{C23}). Let m_{ij} be an element of this matrix. It shows the total direct and indirect effects of an increase of one unit in the demand for (and the output of) production activity j on the incremental incomes received by socioeconomic household group i.

We now decompose M_{c23} into two different matrices, which represent what we call the distributional (D) and interdependency (R) effects. Thus,

$$M_{c23} = RD \qquad (3)$$

where the dimensions of the matrices M_{C23}, R and D are (household groups x production activities), (household groups x household groups) and (household groups x production activities), respectively.

Our purpose is to compare the impacts of different production activities on household groups, especially the poor households, which requires identification of each effect by each production activity

and each household group. Fixed price multipliers and distributional effects corresponding to each pair of production activity and household group can be obtained directly from the matrices M_{c23} and D. The interdependency effects r_{ij} of production activity j on household group i can be derived as

$$r_{ij} = m_{ij} / d_{ij}$$

where, m_{ij} is an element of M_{c23} and d_{ij} is a corresponding element of D. The distributional effects (d_{ij}) represent the initial effects of a change in output of a production activity on the income of a socioeconomic group. The strength of the distributional effects depends mainly on the technology in use (e.g., how labor intensive it is, how much it relies on the factors of production possessed by the household groups), and the factor endowment of the households (e.g., how much unskilled labor and land they possess). In turn, the interdependency effects (r_{ij}) capture the direct and indirect effects of spending and re-spending by the particular household group under consideration and other groups that benefited, income-wise, from the exogenous output injection. The interdependency effect reflects the extent of integration within the economy on both the demand and supply sides. The more consumers spend on domestic goods and services, the more diversified is their consumption pattern, the larger these effects. Likewise, the greater the intersectoral linkages on the production side, the higher is the interdependency effects. Next we define and discuss in greater details distributional and interdependency effects.

4.4.1 Distributional Effects:

Distributional effects originate with an exogenous change in the output of a given production activity (dx_3). In order to produce an additional unit of output, intermediate inputs are required. Such input effects are captured by the matrix $(I - C_{33})^{-1}$. In addition to the intermediate inputs, primary factor inputs such as labor, land, and capital are needed. The demand for such factors of production is given by matrix C_{13}. In turn, additional income generated from the production activity will flow to the household groups depending on their factor endowment. This transformation is represented by C_{21}. When factors owned mostly by a poor household group are used intensively by a specific production activity, the distributional effects will be large. Finally, income transfers that occur between and among different socioeconomic groups are captured by $(I - C_{22})^{-1}$.

Thus, the total distributional effect (D) is derived as

$$D = (I - C_{22})^{-1} C_{21} C_{13} (I - C_{33})^{-1} \qquad (4)$$

4.4.2 Interdependency Effects

While the distributional effects capture the initial impact on a change in sectoral output on income, the interdependency effects capture the spending and re-spending effects. The incremental incomes received by the household groups are, in turn, spent on food, clothing and other commodities. To satisfy the additional demand, a commensurate output has to be produced. Such a process requires intermediate and primary inputs that ultimately generate an additional indirect flow of incomes for the factors. Thus, interdependency effects aggregate the impact of the initial, first round of spending and subsequent rounds of re-spending by the household groups and reflect the degree of integration in the socioeconomic system on the production and expenditure sides. These interdependency effects are equivalent to the closed loop effects that have been identified by Pyatt and Round (1979) in their alternative multiplier decomposition method. The interdependency effects are derived as,

$$R = \left(I - \left(I - C_{22}\right)^{-1} C_{21} C_{13} \left(I - C_{33}\right)^{-1} C_{32}\right)^{-1}$$

Alternatively,

$$R = \left(I - DE\right)^{-1}$$

where the marginal expenditure matrix $\left(C_{32}\right)$ is denoted by E $\left(i.e.,\ E = C_{32}\right)$. In other words, the interdependency effects can be fully expressed as function of the distributional effects (D) and the marginal expenditure propensities matrix (E).

Thus, the matrix of fixed price multipliers linking production activities to household groups M_{C23} can now be expressed as follows:

$$M_{C23} = RD = \left(I - DE\right)^{-1} D$$

If m_{ij} is an element of M_{C23}, then, in turn, it can be decomposed multiplicatively into two components

$$m_{ij} = r_{ij}\, d_{ij} \qquad (6)$$

where d_{ij} is an element of D, and r_{ij} is calculated as $r_{ij} = m_{ij} / d_{ij}$.

Therefore, the multiplier m_{ij} can be decomposed as,

$$m_{ij} = r_{ij}\, d_{ij}$$

In equation (1), $dy_2 = M_{c23}\, dx_3$, let dy_{2i} be can element of vector dy_2, and dx_{3_j} be an element of vector dx_3. Then,

$$dy_{2i} = m_{ij}\ dx_{3_j} = r_{ij}\, d_{ij}\, dx_{3_j}$$

Now, suppose we are interested in the overall impact of a change in the demand for the output of sector j (say, wheat) on the incomes of the poor household group i (say, poor in our SAM table), then the magnitude on m_{ij} gives us this estimate.

To compute the impact of a change in output of sector j on overall poverty alleviation (PA_j^m) m_{ij} has to be aggregated across the various poor socio-economic groups, i.e.,

$$PA\frac{m}{j} = \sum_{i=1}^{q} m_{ij}$$

where the poor household groups $i = 1, 2, ..., q$ and PA = poverty alleviation.
In the household classification of the present study the poor groups consists of low income class and poor income class.

We compute the total contribution to poverty alleviation of the distributional effects through the following procedure. If PA_j^d stands for the contribution to overall poverty alleviation of a change in output of production activity j due to distributional effects, then,

$$PA_j^d = \sum_{i=1}^{q} d_{ij}$$

To derive interdependency effects, we define $PA_j^r = PA_j^m / PA_j^d$ which results in

$$PA_j^m = PA_j^r \, PA_j^d$$

It may be apparent from the above discussion that the methodology of SAM has the flexibility of analyzing the micro level problems with a consistent database. That possibly is the reason for which it has been applied to analyze poverty alleviation, rural industrialization, district level planning, impact of migration etc. The present exercise extends its application to assess the poverty-forestry linkages. Basically an attempt is made to capture the direct and indirect impact of forest sector on the village economy. The distribution of income generated from the forest resources among the poorer group is captured explicitly through this model which is expected to shed better light on the poverty alleviation capacity of the forest resources. Moreover, given the data dimension of the SAM the methodology can be replicated in diverse village level conditions and would serve as a useful tool for assessing the poverty forestry linkages. Seen in terms of its applicability to village level problems its appropriateness remains valid in situations of interlinkages among the different sectors.

4.5 Database

The data requirement for estimation of a village level SAM is elaborate and demanding as it encompasses all economic transactions. Specifically, the variables to be included in the analysis are on the following aspects:

- members of households and their employment status
- ownership of land and other assets such as machinery, draught animal, etc.
- factor input, output and revenue from production activities related to livestock forestry and village services.
- annual sale and expenditure of traded goods and the retail market
- household earnings – factor income, transfers and subsidies
- household expenditure composition including expenditure on health
- other economic transactions- savings, investment, construction activities, etc.
- location, slope, rainfall and farming practices coefficients associated with every plot of land for calculation of external cost associated with soil erosion. A more detailed methodology has been incorporated in the Annexure (see Annexure 1)
- mapping of forest resources in accordance with SNA classification of economic and non-economic non-produced natural assets including net change in annual carbon stock. This required mapping forest resource by species, their annual increment / yield, density and prices of relevant products. A more detailed methodology has been incorporated in the Annexure. (see Annexure 2)
- disease profile and treatment cost to identify relevant diseases associated with indoor air pollution
- income and expenditure in the public accounts of the villages, this would include the sources of earnings like tax and non tax revenue and item of expenditure in the health, education, infrastructure, subsidy of food, fuel, and electricity
- record of spatial attributes of transaction in inputs and outputs, wherever relevant, according to source and destination which may be local ie within the village, or may involve rest of the villages / rest of the world

As village level data on the above aspects are not published, the study undertook a survey (refer to the Questionnaire attached in Annexure 3). Keeping in view forest degradation as the central problem, two villages in the state of Haryana (one located in the Aravalli and another in Shivalik forest areas) are selected that form the sample of the study. A total of 305 households and 13 business establishments are covered that has formed the basis of preparing village SAMs. The selection of the village is on the basis of (i) population of poor household in a proportion which is representative of the region (ii) presence of forests which are used as a source of livelihood.

5. Village SAMs

Tables 5.1 and 5.2 give the disaggregated transaction matrix constructed for the villages of Pauti and Damdama-Bhogpur while Tables 5.1A and 5.2A provide aggregated transaction matrix for the two villages respectively. Following the usual convention, the cell ***ij*** in the table depicts payment from account ***j*** to account ***i***. A reading of the tables indicate the following features of the village economies under study.

5.1 SAM for Pauti

Cultivation of mustard, wheat and cotton are the most important agricultural activities in Pauti. The village also cultivates oilseeds and pulses, vegetables and fodder. Vegetable is cultivated entirely from family labour, while the other crops use both family and hired labour. A substantial portion of the expenditure on inputs is incurred on account of land preparation and fertilizer. Among the agricultural crop value addition is the highest in mustard which is the main export crop of the village. The village is predominantly agriculture dependent whose contribution to the domestic product of the village is the highest. The livestock and poultry sector also contribute significantly to the income of the village. The services sector generates more income as compared to the forest and non-agricultural sector. This is mainly due to government expenditure on education and infrastructure.

The commodity account gives the relative consumption pattern of the different income classes of the village. The high-income class consisting of 33 households i.e., 23% of the total household in the village consumes 38% of the commodities in value term. The middle income group consisting of 32 households or 22% of the total households consumes 24% of total consumption of the village while the low income group consisting of 56 households or 39% of the total households consumes 31% of total commodities consumed in the villages. The last group i.e., the poor households, numbering 22 and comprising 15% of the total households consumes only 6% of the commodities. The consumption of forest products by high-income group is 24%, that of the middle income is 27 % and low-income group is 33%. In contrast to these, the poorest group of the village consumes only 17% of the total forest product. Comparing the consumption patterns of the different household groups, it can be seen that the poor households are relatively more dependent on forest products as compared to relative consumption of all commodities by different household groups. The health cost associated with indoor air pollution caused by fuelwood used for cooking, has been accounted with the forest product as external cost.

The capital account, which includes land and forest, tries to capture the impact on the environment due to soil erosion caused by agricultural activity of the village. This enters as an external cost associated with agricultural land in the capital account. Thus the two items of external cost are health cost associated with fuelwood use (in the commodity account) and the cost associated with soil erosion from agricultural land (in the capital account). The net addition to the carbon stock valued to be Rs. 1.06 million due to sequestering has been accounted to the Government in the forest sector. (Details of computation of soil erosion and carbon sequestration are given in Annexure 2). The capital account also includes the savings and investment of different groups of households. More than 75% of the savings of the village comes from the high-income group. The middle income group contributes 13% and the low-income group 10% of the savings. In contrast to these, the poorest group's share is only 1.4% in the total savings of the village.

It may be noted that the external cost from fuelwood use has entered as negative entry associated with forest products. Thus the net impact of fuelwood use causes a net outflow of money from all groups of household and also reduces net output of the village by Rs.36, 955. The total health cost due to indoor air pollution of the whole village works out to be Rs. 0.18 million of which 20 % is incurred by the high income households, 8.5 % by the middle income, 57 % by the low income and 13 % by the poor households.

The negative entries associated with soil erosion amount to Rs.0.64 million. The total external cost of the village amounts to Rs. 0.83 million.

The government plays a very important role in the village as it provides water, electricity, education and infrastructure services. Moreover, it is also the owner of village forests and hence gains in natural capital stock are recorded as its income. The government rents out land under its ownership and has earned Rs. 77.21 during 2003. Revenue from commodity taxation in the village constitutes the major sources of receipt for the government whereas subsidies on account of fertilizer, water charges, kerosene and LPG are major expenditures borne by it. Other spending activities of the government in the village comprise the fund allocated to it under various developmental schemes on education and infrastructure.

Transaction of the village with rest of the villages and rest of the world are recorded in the SAM table under ROV and ROW. Rice and nonagricultural goods are the main imports of the village. Payment to teachers in the village schools has been recorded as an import of services. The village exports agricultural commodities and labour. The institutional savings and investment are done in financial institutions located outside the village and hence gets recorded as export of savings and investment.

Forest Sector's Link with Households

The dependence of various group of households defined according to income on forest products is outlined below. These are disaggregated account of the forest products appearing in the commodity account of the SAM.

Table 5.3: Consumption of Forest Products in Pauti

(in Rs)

Forest Product	Household Groups			
	10001 and above	5001-10000	2001-5000	Below 2000
Fuelwood total	17187.50	19922.50	31422.50	6395.00
Fuelwood Per Household	520.83	622.58	561.12	290.68
Fodder (leaves)	0.00	0.00	0.00	15000.00
Fodder (Leaves) Per Household	0.00	0.00	0.00	681.82
Fodder(Grass)	1600.00	0.00	0.00	0.00
Fodder (Grass) Per Household	48.48	0.00	0.00	0.00
Timber	1650.00	375.00	825.00	187.50
Timber Per Household	50.00	11.72	14.73	8.52
Branches	4100.00	8800.00	8537.50	1450.00
Branches Per Household	124.24	275.00	152.46	65.91
Wood for fencing	0.00	450.00	0.00	0.00
Wood for fencing Per Household	0.00	14.06	0.00	0.00

Table 5.3 shows that the household consumption of fuelwood by the poor class is much lower than the three higher income groups. Only the poor group draws leaf-fodder for its livestock from the forest. Grass-fodder is collected by the high-income group. The timber extraction has a distinct bias towards high-income group, consuming at least three times more than the other groups. The higher income groups extract more branches and wood per household for fencing.

5.2 SAM for Damdama-Bhogpur

Cultivation of wheat, maize and paddy are the most important agricultural activities in Damdama-Bhogpur village. The village also cultivates oilseeds and pulses, vegetables and fodder. Hired labour is extensively used in the cultivation of paddy and to a lesser extent in the cultivation of wheat, maize and fodder. A substantial portion of the expenditure on inputs is incurred on account of manure and fertilizer in the cultivation of wheat, maize and vegetable. Among the agricultural crop value addition is high in the cultivation of wheat, maize, paddy and cultivated fodder. Paddy, maize and vegetables are the main export crops of the village. The village is predominantly livestock, poultry and agriculture dependent

which make significant contribution to the village domestic product. The services sector generates more income as compared to the forest and non-agricultural sector. This is mainly due to government expenditure on health, education and infrastructure.

The commodity account gives the relative consumption pattern of the different income class of the village. The high-income class consisting of 16 households i.e., 10 % of the total households consume 18 % of the commodities in value term, the middle income group consisting of 44 households or 27 % of the total households and consumes 39% of total consumption of the village. The low-income group consisting of 67 households or 41% of the total households consumes 32% of total commodities consumed in the villages and the poor households, numbering 36 i.e., 22 % of the total households consume only 12%. The consumption of forest products by high income group is 25 %, that of the middle income 32 %, the low income group 29 % and the poor is 14%. Comparing the consumption pattern of the different household groups, it can be seen the poor households are relatively more dependent on forest products as compared to relative consumption of all commodities by different household groups.

The health cost associated with indoor air pollution caused by fuelwood, a commonly used product has been accounted with the forest product as external cost. The village incurs a cost of more than Rs.0.29 million on account of indoor air pollution from fuelwood use.

The capital account, which includes land and forest, tries to capture the impact on the environment due to soil erosion caused by agricultural activity. It works out to be more that Rs.0.30 million for the whole village. This enters as an external cost associated with agricultural land in the capital account. Thus the two items of external cost are health cost associated fuelwood use (in the commodity account) and the cost associated with soil erosion from agricultural land (in the capital account). The net addition to the carbon stock, Rs. 12.29 million, due to sequestering has been accounted to the Government in the forest sector. (Details of computation of soil erosion and carbon sequestration are given in the Appendix). The capital account also includes the savings and investment of different groups of households. More than 54 % of the savings come from the high-income group, while the middle income group contributes 36 %, the low income group 8 % and the poorest group saves only 1 % of the total savings of the village. The total savings of the village works out to Rs.1.65 million

It may be noted that the external cost from fuelwood use has entered as negative entries associated with forest products. Thus the impact of fuelwood use causes a outflow of money from all groups of household and also reduces net output of the village. The total value of forest products consumed by the village amounts to Rs.715176. The total health cost due to indoor air pollution of the whole village caused by fuelwood burning works put to Rs. 296524 of which 3 % is incurred by the high

income household, 36 % by the middle income, 42 % by the low income and 20 % by the poor households.

The negative entries associated with soil erosion amount to Rs.304849. The total external cost of the village amounts to Rs. 0.906 million.

The government plays a very important role in the village as it provides water, electricity, education and infrastructure services. It is also the owner of village forests and hence gains in capital stock is recorded as its income. The government also taxes commodities and gives subsidy on account of fertilizer, water charges, kerosene and LPG. The government also spends Rs.1.53 million allocated to it under various developmental schemes on health, education and infrastructure in the village.

Transaction of the village with rest of the villages and rest of the world are recorded in ROV and ROW accounts. Rice, vegetables and fruits are the main exports of the village. A total of Rs 0.41 million is earned by villagers through employment outside the village. This gets recorded as income of hired labour from rest of the world.

Forest Sector's Link with Households

The dependence of various groups of household defined according to income on forest products is outlined below (refer to Table 5.4). These are disaggregated account of the forest products appearing in the commodity account of the SAM.

Table 5.4: Consumption of Forest Products in Damdama - Bhogpur

(in Rs.)

Forest Product	Household Groups			
	10001 and Above	5001-10000	2001-5000	Below 2000
Fuelwood	24757.00	113008.50	197397.50	100248.00
Fuelwood Per Household	1547.31	2568.38	2946.23	2784.67
Fodder (leaves)	16260.00	51044.00	89340.00	50270.00
Fodder (Leaves) Per Household	1016.25	1160.09	1333.43	1396.39
Fodder(Grass)	26500.00	62400.00	72360.00	14180.00
Fodder (Grass) Per Household	1656.25	1418.18	1080.00	393.89
Timber	12100.00	4600.00	4800.00	1500.00
Timber Per Household	756.25	104.55	71.64	41.67
Branches	60.00	0.00	120.00	0.00
Branches Per Household	3.75	0.00	1.79	0.00
Bamboo	60.00	600.00	700.00	720.00
Bamboo Per Household	3.75	13.64	10.45	20.00

The above Table 5.4 shows that the household consumption of fuelwood by the middle income, low income and poor groups is high. The consumption of the high-income group is lower than the other groups. Hence, not only the poor but also the relatively well off in this village are dependent on fuelwood for cooking and heating. The high-income group, which has only 16 households, may be using non-bio fuels (kerosene, LPG) for cooking. Being a colder region, located in the Shivalik foothills of the Himalayas the consumption of fuelwood is relatively high per household in this village. The village is highly dependent on the forest for supply of fodder across income groups. The timber extraction has a distinct bias towards high-income group, consuming at least twenty times more than the poor group. The higher income groups extract more branches and wood per household for fencing. The bamboo collection is more for poorer households of the village.

The SAM of both the villages shows that their economic structure is such that its is largely dominated by the agricultural activities. Animal husbandry is another important activity in these villages. Forest sector plays a supplementary role to the above activities in both the villages. The main differences in the economic structure however, can be noticed in terms of the degree of openness of the villages. Pauti is more integrated to the outside world and a greater proportion of its income comes from outside the village in the form of salary and wages. However, Damdama-Bhogpur has an advantage over Pauti in having a more favourable climatic condition which generates higher income through a wider variety of forest resources.

Despite the above differences notices in the economic structure of the villages it should be noted that agriculture remains the main activity. Therefore, any strategy of poverty reduction through intervention in the forestry has to take into account the supplementary character of the sector in income augmentation.

Table 5.1A: SAM Table for Pauti (Rs.)

			Activities				Commodities				Factors		
			Agricultural	Non Agricultural	Forest	Services	Agricultural	Non Agricultural	Services (incl travel expd.)	Forest	Land	Labour	Others
			1	2	3	4	1	2	3	4	1	2	3
Activities	1	Agricultural					2499502	2664723					79266
	2	Non agricultural						42915					
	3	Forest								94565			
	4	Services							1560	24727			
Commoditites	1	Agricultural											3351
	2	Non-agricultural items											178716
	3	Services											
	4	Forest											1705
Factors	1	Land	234280										
	2	Labour	7674469	46815	94565	631302							
	3	Others Factor	2313203	1705		694174							
Capital	1	Forest											
	2	Agricultural land											
	3	Investment & Savings											
External cost	1	Household1								-188112			
Institution	1	Household1									157070	9210724	806806
	2	Government									77210		1898548
ROV		Rest of the villages											
ROW		Rest of the world				384750	2370026	11286	213380	31865			1934647
		Total	10221953	48520	94565	1710226	4869528	2718924	214940	-36955	234280	9210724	4903040

Table 5.1A: SAM Table for Pauti (Contd.)

			Capital			Ext. costs	Institution		ROV	ROW	Total
			Forest	Land	Saving	Households	Households	Government	Rest of the villages	Rest of the world	
			1	2	3	1	1	2			
Activities	1	Agricultural							183944	4794517	10221952
	2	Non agricultral							5605		48520
	3	Forest									94565
	4	Services						1683939			1710226
Commodities	1	Agricultural					4622692			243485	4869528
	2	Non-agricultural items					623994	11286		1904929	2718924
	3	Services					119262	95678			214940
	4	Forest				-188112	149452				-36955
Factors	1	Land									234280
	2	Labour								763573	9210724
	3	Others Factor						1893958			4903040
Capital	1	Forest						1064614			1064614
	2	Agricultural land				-642947					-642947
	3	Investment & Savings					2322156			1208028	3530184
External Cost	1	Household1	0	-642947							-831058
Institution	1	Household1	0	0	3530184			2413896		4291978	20410659
	2	Government	1064614				109237		309760	3704002	7163372
ROV		Rest of the villages				0	499309				499309
ROW		Rest of the world				0	11964556				16910511
		Total	1064614	-642947	3530184	-831058	20410658	7163372	499309	16910512	

Table 5.2A: SAM Table for Damdama-Bhogpur (Rs.)

			Activities				Commodities				Factor		
			Agriculture	Non Agriculture	Forest	Services	Agricultural	Non Agriculture	Services	Forest	Land	Labour	Other Factor
			1	2	3	4	1	2	3	4	1	2	3
Activities	1	Agricultural					677022	1977556		122800			25038
	2	Non-agricultural						400					
	3	Forest								302242			
	4	Services				15445							
Commodities	1	Agricultural											
	2	Non-agricultural items											45829
	3	Services (incl travel expd. etc.)											
	4	Forest											
Factor	1	Land	258196			43140							
	2	Labour	2513870	10400	302242	763045							
	3	Other Factor	183296			378896							
Capital	1	Forest											
	2	Agricultural land											
	3	Investment & Savings											
External cost	1	Households								-296524			
Institution	1	Households				4220					258196	3826620	36523
	2	Government											
ROV		Rest of the villages									43140		56953
ROW		Rest of the world				1083233	814967	802264	636081	290135		181200	430244
Total			**2955362**	**10400**	**302242**	**2287979**	**1491989**	**2780220**	**636081**	**418652**	**301336**	**4007820**	**594586**

Table 5.2A: SAM Table for Damdama-Bhogpur (Contd.)

			Capital			External Cost	Institution		ROV	ROW	Total
			Forest	Agricultural land	Investment & Savings	Households	Households	Government	Rest of the villages	Rest of the world	
			1	2	3	1	1	2			
Activities	1	Agricultural							27750	125196	2955362
	2	Non-agricultural								10000	10400
	3	Forest									302242
	4	Services						1521106		751428	2287979
Commodities	1	Agricultural					1491989				1491989
	2	Non-agricultural items					2708915	25476			2780220
	3	Services (incl travel expd. etc.)					451070	185011			636081
	4	Forest				-296524	715176				418652
Factor	1	Land									301336
	2	Labour								418264	4007820
	3	Other Factor						32394			594586
Capital	1	Forest						12292248			12292248
	2	Agricultural land				-304849					-304849
	3	Investment & Savings					1656633				1656633
External Cost	1	Households		-304849							-601374
Institution	1	Households			1656633			1560336		4358507	11701036
	2	Government	12292248				186915		1101375	2036033	15616571
ROV		Rest of the villages					1029032				1129125
ROW		Rest of the world					3461305				7699429
Total			**12292248**	**-304849**	**1656633**	**-601374**	**11701036**	**15616571**	**1129125**	**7699429**	

Table 5.1 SAM Table for Village Pauti (Rs.)

			Activities										
			wheat	wheat - fodder	mustard	mustard - fodder	mustard - fuelwood	cotton	cotton - fuelwood	other cereals	other - fodder	oilseeds and pulses	pulses - fodder
			1	2	3	4	5	6	7	8	9	10	11
Activities	1	Wheat											
	2	Wheat - fodder											
	3	Mustard											
	4	Mustard - fodder											
	5	Mustard - fuelwood											
	6	Cotton											
	7	Cotton - fuelwood											
	8	Other cereals											
	9	Other - fodder											
	10	Oilseeds and pulses											
	11	Pulses - fodder											
	12	Pulses - fuelwood											
	13	Vegetables and fruits											
	14	Cultivated fodder											
	15	Village production											
	16	Livestock & poultry											
	17	Livestock - dung cakes											
	18	Livestock - manure											
	19	Timber collection											
	20	Fuelwood collection											
	21	Leaves & grass collection											
	22	Other ntfp collection											
	23	Village services											
	24	Education											
	25	Infrastructure											
		All Activities	0	0	0	0	0	0	0	0	0	0	0
Commodities	26	Agricultural											
	27	non-agricultural items											
	28	Services											
	29	Forest products											
		All Commodities	0	0	0	0	0	0	0	0	0	0	0
Factors	30	Renting land (for share cropping)	92997		48346			63444		19213		234	
	31	Family labour	533658	368065	1923487	81012	74790	652510	34750	117687	26868	7004	500
	32	Hired labour	89820		190010			45840		68040		3920	
	33	Seeds	83261		35545			14175		36729		1780	
	34	Fertiliser	129280		277518			18686		46331			
	35	Manure	79420		70886			5950		18960			
	36	Pesticides & medicines	5053		2137			36230				200	
	37	Tractor / draught animals	191669		394508			34421		126205		7501	
	38	Electricity charges	91737		99524			28057		9489		59	
	39	Water charges	132120		167974			20572		7466		2000	
	40	Forest Resources											
	41	Fodder											
	42	Construction material											
	43	Stationary											
	44	Transportation cost											
		All Factors	1429013	368065	3209935	81012	74790	919884	34750	450119	26868	22699	500
Capital	45	Forest stock											
	46	Agricultural land											
	47	Investment & Savings											
		All Capital	0	0	0	0	0	0	0	0	0	0	0
Ext. costs	48	High Income (Rs. 10,000 & above)											
	49	Middle Income (Rs. 5,000 -10,000)											
	50	Low Income (Rs. 2,000-5,000)											
	51	Poor (Below Rs. 2000)											
		All Ext. Costs	0	0	0	0	0	0	0	0	0	0	0
Institutions	52	High Income (Rs. 10,000 & above)											
	53	Middle Income (Rs. 5,000 -10,000)											
	54	Low Income (Rs. 2,000-5,000)											
	55	Poor (Below Rs. 2000)											
		All Households	0	0	0	0	0	0	0	0	0	0	0
	56	Government											
ROV	57	rest of the villages											
ROW	58	rest of the world											
		Total	1429013	368065	3209935	81012	74790	919884	34750	450119	26868	22699	500

PAUTI SAM Table (Contd;)

			Activities										
			pulses - fuelwood	vegetables and fruits	Cultivated fodder	village production	livestock & poultry	livestock - dung cakes	livestock - manure	timber collection	fuelwood collection	leaves & grass collection	other ntfp collection
			12	13	14	15	16	17	18	19	20	21	22
Activities	1	Wheat											
	2	Wheat – fodder											
	3	Mustard											
	4	Mustard – fodder											
	5	Mustard – fuelwood											
	6	Cotton											
	7	Cotton – fuelwood											
	8	Other cereals											
	9	Other – fodder											
	10	Oilseeds and pulses											
	11	Pulses – fodder											
	12	Pulses – fuelwood											
	13	Vegetables and fruits											
	14	Cultivated fodder											
	15	Village production											
	16	Livestock & poultry											
	17	Livestock – dung cakes											
	18	Livestock – manure											
	19	Timber collection											
	20	Fuelwood collection											
	21	Leaves & grass collection											
	22	Other ntfp collection											
	23	Village services											
	24	Education											
	25	Infrastructure											
		All Activities	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Commodities	26	Agricultural											
	27	Non-agricultural items											
	28	Services											
	29	Forest products											
		All Commodities	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Factors	30	Renting land (for share cropping)			10046								
	31	Family labour	700	15515	344228	46815	2821781	174404	80421	3038	74928	16600	24727
	32	Hired labour			19460								
	33	Seeds		3097	23909								
	34	Fertiliser		383	23105								
	35	Manure			3500								
	36	Pesticides & medicines		3100	90								
	37	Tractor / draught animals		2960	51454								
	38	Electricity charges		807	11629								
	39	Water charges		2407	7971								
	40	Forest Resources				1705							
	41	Fodder					3351						
	42	Construction material											
	43	Stationary											
	44	Transportation cost											
		All Factors	**700**	**28269**	**495391**	**48520**	**2825132**	**174404**	**80421**	**3038**	**74928**	**16600**	**24727**
Capital	45	Forest stock											
	46	Agricultural land											
	47	Investment & Savings											
		All Capital	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Ext. costs	48	High Income (Rs. 10,000 & above)											
	49	Middle Income (Rs. 5,000 -10,000)											
	50	Low Income (Rs. 2,000-5,000)											
	51	Poor (Below Rs. 2000)											
		All Ext. Costs	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Institutions	52	High Income (Rs. 10,000 & above)											
	53	Middle Income (Rs. 5,000 -10,000)											
	54	Low Income (Rs. 2,000-5,000)											
	55	Poor (Below Rs. 2000)											
		All Households	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	56	Government											
ROV	57	Rest of the villages											
ROW	58	Rest of the world											
		Total	**700**	**28269**	**495391**	**48520**	**2825132**	**174404**	**80421**	**3038**	**74928**	**16600**	**24727**

PAUTI SAM Table (Contd.)

			Activities			Commodities				Factors		
			village services	education	infrastructure	Agricultural	Non Agricultural items	services (incl travel expd.)	Forest products	renting land (share cropping)	family labour	hired labour
			23	24	25	26	27	28	29	30	31	32
Activities	1	Wheat				1122434						
	2	Wheat – fodder				358690						
	3	Mustard				242725						
	4	Mustard – fodder				76812						
	5	Mustard – fuelwood				74790						
	6	Cotton				0						
	7	Cotton – fuelwood				34750						
	8	Other cereals				255907						
	9	Other – fodder				17268						
	10	Oilseeds and pulses				7199						
	11	Pulses – fodder				500						
	12	Pulses – fuelwood				700						
	13	Vegetables and fruits				11769						
	14	Cultivated fodder				295958						
	15	Village production					42915					
	16	Livestock & poultry					2418338					
	17	Livestock – dung cakes					165964					
	18	Livestock – manure					80421					
	19	Timber collection							3038			
	20	Fuelwood collection							74928			
	21	Leaves & grass collection							16600			
	22	Other ntfp collection							24727			
	23	Village services						1560				
	24	Education										
	25	Infrastructure										
		All Activities	**0**	**0**	**0**	**2499502**	**2707638**	**1560**	**119292**	**0**	**0**	**0**
Commodities	26	Agricultural										
	27	Non-agricultural items										
	28	Services										
	29	Forest products										
		All Commodities	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Factors	30	Renting land (for share cropping)										
	31	Family labour	1560	353802								
	32	Hired labour			251213							
	33	Seeds										
	34	Fertiliser										
	35	Manure										
	36	Pesticides & medicines										
	37	Tractor / draught animals										
	38	Electricity charges										
	39	Water charges										
	40	Forest Resources										
	41	Fodder										
	42	Construction material		183500	404042							
	43	Stationary		12590								
	44	Transportation cost			94042							
		All Factors	**1560**	**549892**	**749297**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Capital	45	Forest stock										
	46	Agricultural land										
	47	Investment & Savings										
		All Capital	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Ext. costs	48	High Income (Rs. 10,000 & above)							-38659			
	49	Middle Income (Rs. 5,000 -10,000)							-15920			
	50	Low Income (Rs. 2,000-5,000)							-108618			
	51	Poor (Below Rs. 2000)							-24915			
		All Ext. Costs	**0**	**0**	**0**	**0**	**0**	**0**	**-188112**	**0**	**0**	**0**
Institutions	52	High Income (Rs. 10,000 & above)								136200	3550755	236715
	53	Middle Income (Rs. 5,000 -10,000)								12500	1942604	104204
	54	Low Income (Rs. 2,000-5,000)									1988064	296075
	55	Poor (Below Rs. 2000)								8370	297425	794882
		All Households	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**157070**	**7778848**	**1431876**
	56	Government								77210		
ROV	57	Rest of the villages										
ROW	58	Rest of the world		384750		2370026	11286	213380	31865			
		Total	**1560**	**934642**	**749297**	**4869528**	**2718924**	**214940**	**-36955**	**234280**	**7778848**	**1431876**

PAUTI SAM Table (Contd.)

			Factors										
			seeds	fertiliser	manure	pesticides & medicines	tractor / draught animals	electricity charges	water charges	forest resources	fodder	construction material	stationary
			33	34	35	36	37	38	39	40	41	42	43
Activities	1	Wheat	2646										
	2	Wheat - fodder											
	3	Mustard	3720										
	4	Mustard - fodder											
	5	Mustard - fuelwood											
	6	Cotton											
	7	Cotton - fuelwood											
	8	Other cereals											
	9	Other - fodder											
	10	Oilseeds and pulses											
	11	Pulses - fodder											
	12	Pulses - fuelwood											
	13	Vegetables and fruits											
	14	Cultivated fodder	72900										
	15	Village production											
	16	Livestock & poultry											
	17	Livestock - dung cakes											
	18	Livestock - manure											
	19	Timber collection											
	20	Fuelwood collection											
	21	Leaves & grass collection											
	22	Other ntfp collection											
	23	Village services											
	24	Education											
	25	Infrastructure											
		All Activities	**79266**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Commodities	26	Agricultural									3351		
	27	Non-agricultural items			178716								
	28	Services											
	29	Forest products								1705			
		All Commodities	**0**	**0**	**178716**	**0**	**0**	**0**	**0**	**1705**	**3351**	**0**	**0**
Factors	30	Renting land (for share cropping)											
	31	Family labour											
	32	Hired labour											
	33	Seeds											
	34	Fertiliser											
	35	Manure											
	36	Pesticides & medicines											
	37	Tractor / draught animals											
	38	Electricity charges											
	39	Water charges											
	40	Forest Resources											
	41	Fodder											
	42	Construction material											
	43	Stationary											
	44	Transportation cost											
		All Factors	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Capital	45	Foreststock											
	46	Agricultural land											
	47	Investment & Savings											
		All Capital	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Ext. costs	48	High Income (Rs. 10,000 & above)											
	49	Middle Income (Rs. 5,000 -10,000)											
	50	Low Income (Rs. 2,000-5,000)											
	51	Poor (Below Rs. 2000)											
		All Ext. Costs	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Institutions	52	High Income (Rs. 10,000 & above)					468379		162544				
	53	Middle Income (Rs. 5,000 -10,000)					62890		21825				
	54	Low Income (Rs. 2,000-5,000)					25156		8730				
	55	Poor (Below Rs. 2000)					42525		14758				
		All Households	**0**	**0**	**0**	**0**	**598950**	**0**	**207856**	**0**	**0**	**0**	**0**
	56	Government						1898548					
ROV	57	Rest of the villages											
ROW	58	Rest of the world	119230	732013		46810	209767		132654			587542	12590
		Total	**198496**	**732013**	**178716**	**46810**	**808717**	**1898548**	**340510**	**1705**	**3351**	**587542**	**12590**

PAUTI SAM Table (Contd.)

			Factors	Capital			External Costs				Institutions	
			transportation cost	Forest stock	agricultural land	Investment & Savings	High Income	Middle Income	Low Income	Poor	High Income	Middle Income
			44	45	46	47	48	49	50	51	52	53
Activities	1	Wheat										
	2	Wheat - fodder										
	3	Mustard										
	4	Mustard - fodder										
	5	Mustard - fuelwood										
	6	Cotton										
	7	Cotton - fuelwood										
	8	Other cereals										
	9	Other - fodder										
	10	Oilseeds and pulses										
	11	Pulses - fodder										
	12	Pulses - fuelwood										
	13	Vegetables and fruits										
	14	Cultivated fodder										
	15	Village production										
	16	Livestock & poultry										
	17	Livestock - dung cakes										
	18	Livestock - manure										
	19	Timber collection										
	20	Fuelwood collection										
	21	Leaves & grass collection										
	22	Other ntfp collection										
	23	Village services										
	24	Education										
	25	Infrastructure										
		All Activities	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Commodities	26	Agricultural									1707976	1202639
	27	Non-agricultural items									328449	89734
	28	Services									24692	35400
	29	Forest products					-38659	-15920	-108618	-24915	35338	39733
		All Commodities	**0**	**0**	**0**	**0**	**-38659**	**-15920**	**-108618**	**-24915**	**2096455**	**1367505**
Factors	30	Renting land (for share cropping)										
	31	Family labour										
	32	Hired labour										
	33	Seeds										
	34	Fertiliser										
	35	Manure										
	36	Pesticides & medicines										
	37	Tractor / draught animals										
	38	Electricity charges										
	39	Water charges										
	40	Forest Resources										
	41	Fodder										
	42	Construction material										
	43	Stationary										
	44	Transportation cost										
		All Factors	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Capital	45	Forest stock										
	46	Agricultural land					-340814	-129407	-144771	-27954		
	47	Investment & Savings									1753829	297300
		All Capital	**0**	**0**	**0**	**0**	**-340814**	**-129407**	**-144771**	**-27954**	**1753829**	**297300**
Ext. costs	48	High Income (Rs. 10,000 & above)			-340814							
	49	Middle Income (Rs. 5,000 -10,000)			-129407							
	50	Low Income (Rs. 2,000-5,000)			-144771							
	51	Poor (Below Rs. 2000)			-27954							
		All Ext. Costs	**0**	**0**	**-642947**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Institutions	52	High Income (Rs. 10,000 & above)				2161767						
	53	Middle Income (Rs. 5,000 -10,000)				612730						
	54	Low Income (Rs. 2,000-5,000)				418747						
	55	Poor (Below Rs. 2000)				336940						
		All Households	**0**	**0**	**0**	**3530184**	**0**	**0**	**0**	**0**	**0**	**0**
	56	Government		1064614							69905	18187
ROV	57	Rest of the villages									300080	62937
ROW	58	Rest of the world	94042								5440939	2170743
		Total	**94042**	**1064614**	**-642947**	**3530184**	**-379473**	**-145327**	**-253389**	**-52869**	**9661208**	**3916673**

PAUTI SAM Table (Contd.)

			Institutions			ROV	ROW	
			Low Income	Poor	government	rest of the villages	rest of the world	Total
			54	55	56	57	58	
Activities	1	Wheat				18600	285333	1429013
	2	Wheat - fodder					9375	368065
	3	Mustard				78480	2885010	3209935
	4	Mustard - fodder				4200		81012
	5	Mustard - fuelwood						74790
	6	Cotton				36000	883884	919884
	7	Cotton - fuelwood						34750
	8	Other cereals					194212	450119
	9	Other - fodder					9600	26868
	10	Oilseeds and pulses					15500	22699
	11	Pulses - fodder						500
	12	Pulses - fuelwood						700
	13	Vegetables and fruits					16500	28269
	14	Cultivated fodder				20000	106533	495391
	15	Village production				5605		48520
	16	Livestock & poultry				26664	380130	2825132
	17	Livestock - dung cakes					8440	174404
	18	Livestock - manure						80421
	19	Timber collection						3038
	20	Fuelwood collection						74928
	21	Leaves & grass collection						16600
	22	Other ntfp collection						24727
	23	Village services						1560
	24	Education			934642			934642
	25	Infrastructure			749297			749297
		All Activities	0	0	1683939	189549	4794517	12075263
Commodities	26	Agricultural	1481230	230847			243485	4869528
	27	Non-agricultural items	135963	69848	11286		1904929	2718924
	28	Services	37710	21460	95678			214940
	29	Forest products	49592	24791				-36955
		All Commodities	1704494	346945	106964	0	2148414	7766438
Factors	30	Renting land (for share cropping)						234280
	31	Family labour						7778848
	32	Hired labour					763573	1431876
	33	Seeds						198496
	34	Fertiliser			236712			732013
	35	Manure						178716
	36	Pesticides & medicines						46810
	37	Tractor / draught animals						808717
	38	Electricity charges			1657246			1898548
	39	Water charges						340510
	40	Forest Resources						1705
	41	Fodder						3351
	42	Construction material						587542
	43	Stationary						12590
	44	Transportation cost						94042
		All Factors	0	0	1893958	0	763573	14348045
Capital	45	Forest stock			1064614			1064614
	46	Agricultural land						-642947
	47	Investment & Savings	238117	32910			1208028	3530184
		All Capital	238117	32910	1064614	0	1208028	3951852
Ext. costs	48	High Income (Rs. 10,000 & above)						-379473
	49	Middle Income (Rs. 5,000 -10,000)						-145327
	50	Low Income (Rs. 2,000-5,000)						-253389
	51	Poor (Below Rs. 2000)						-52869
		All Ext. Costs	0	0	0	0	0	-831058
Institutions	52	High Income (Rs. 10,000 & above)			1740925		1203923	9661208
	53	Middle Income (Rs. 5,000 -10,000)			458169		701751	3916673
	54	Low Income (Rs. 2,000-5,000)			166215		1362198	4265184
	55	Poor (Below Rs. 2000)			48587		1024106	2567593
		All Households	0	0	2413896	0	4291978	20410659
	56	Government	17547	3598		309760	3704002	7163372
ROV	57	Rest of the villages	109457	26835				499309
ROW	58	Rest of the world	2195569	2157306				16910511
		Total	4265184	2567593	7163372	499309	16910512	

Table 5.2: SAM Table for Village Damdama-Bhogpur (Rs.)

			Activities										
			wheat	wheat – fodder	mustard	mustard - fodder	mustard - fuelwood	maize	maize - fodder	paddy	paddy - fodder	other cereals	Other – fodder
			1	2	3	4	5	6	7	8	9	10	11
Activities	1	Wheat											
	2	Wheat - fodder											
	3	Mustard											
	4	Mustard - fodder											
	5	Mustard - fuelwood											
	6	Maize											
	7	Maize - fodder											
	8	Paddy											
	9	Paddy - fodder											
	10	Other cereals											
	11	Other - fodder											
	12	Oilseeds and pulses											
	13	Vegetables and fruits											
	14	Cultivated fodder											
	15	Village production											
	16	Livestock & poultry											
	17	Livestock - dung cakes											
	18	Livestock - manure											
	19	Timber collection											
	20	Fuelwood collection											
	21	Leaves & grass collection											
	22	Retail trade											
	23	Education											
	24	Health											
	25	Infrastructure											
		All Activities	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Commodities	26	Agricultural											
	27	Non-agricultural items											
	28	Services (incl travel expd. etc.)											
	29	Forest products											
		All Commodities	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Factors	30	Renting land (for share cropping)	101541					91021.64		65633.73			
	31	Rent-agri (imputed) & shops											
	32	Family labour	22294	62380	4031.6	7.5	450	26537.6	27248	27090.27	9892	16262	2014
	33	Hired labour	7540		765			7300		25240			
	34	Seeds	11235		350			4621		2803			
	35	Fertiliser	19562		119			2999		2470			
	36	Manure	11254		1250			32000		575			
	37	Pesticides	2533					4280		1960			
	38	Tractor / draught animals	22625		360			9252		2588			
	39	Fodder											
	40	Construction material											
	41	Stationary											
	42	Transportation cost											
	43	Livestock products											
		All Factors	**198583**	**62380**	**6876**	**8**	**450**	**178011**	**27248**	**128360**	**9892**	**16262**	**2014**
Capital	44	Forest stock											
	45	Agricultural land											
	46	Investment & Savings											
		All Capital											
External Cost	47	High Income (Rs. 10,000 & above)											
	48	Middle Income (Rs. 5,000 -10,000)											
	49	Low Income (Rs. 2,000-5,000)											
	50	Poor (Below Rs. 2000)											
		All External Costs											
Institutions	51	High Income (Rs. 10,000 & above)											
	52	Middle Income (Rs. 5,000 -10,000)											
	53	Low Income (Rs. 2,000-5,000)											
	54	Poor (Below Rs. 2000)											
		All Households											
	55	Government											
ROV	56	rest of the villages											
ROW	57	rest of the world											
Total			**198583**	**62380**	**6876**	**8**	**450**	**178011**	**27248**	**128360**	**9892**	**16262**	**2014**

SAM Table Damdama-Bhogpur (Contd.)

			Activities										
			oilseeds and pulses	vegetables and fruits	Cultivated fodder	village production	livestock & poultry	livestock - dung cakes	livestock - manure	timber collection	fuelwood collection	leaves & grass collection	retail trade
			12	13	14	15	16	17	18	19	20	21	22
Activities	1	Wheat											
	2	Wheat - fodder											
	3	Mustard											
	4	Mustard - fodder											
	5	Mustard - fuelwood											
	6	Maize											
	7	Maize - fodder											
	8	Paddy											
	9	Paddy - fodder											
	10	Other cereals											
	11	Other - fodder											
	12	Oilseeds and pulses											
	13	Vegetables and fruits											
	14	Cultivated fodder											
	15	Village production											
	16	Livestock & poultry											
	17	Livestock - dung cakes											
	18	Livestock - manure											
	19	Timber collection											
	20	Fuelwood collection											
	21	Leaves & grass collection											
	22	Retail trade											
	23	Education											
	24	Health											
	25	Infrastructure											
		All Activities	0	0	0	0	0	0	0	0	0	0	0
Commodities	26	Agricultural											
	27	Non-agricultural items											
	28	Services (incl travel expd. etc.)											
	29	Forest products											
		All Commodities	0	0	0	0	0	0	0	0	0	0	0
Factors	30	Renting land (for share cropping)											
	31	Rent-agri (imputed) & shops											43140.0
	32	Family labour	2275	108719	108004	10400.0	1884359	89811	76550	3100	26767	272374.5	513948.0
	33	Hired labour		910	4190								181200.0
	34	Seeds	1156	4781	4760								
	35	Fertiliser		11292	2349								
	36	Manure	1500		500								
	37	Pesticides		1990	486								
	38	Tractor / draught animals	1060		500								
	39	Fodder					20086						
	40	Construction material											
	41	Stationary											
	42	Transportation cost											
	43	Livestock products											13140.0
		All Factors	5991	127692	120789	10400	1904445	89811	76550	3100	26767	272375	751428
Capital	44	Forest stock											
	45	Agricultural land											
	46	Investment & Savings											
		All Capital	0	0	0	0	0	0	0	0	0	0	0
External Cost	47	High Income (Rs. 10,000 & above)											
	48	Middle Income (Rs. 5,000 -10,000)											
	49	Low Income (Rs. 2,000-5,000)											
	50	Poor (Below Rs. 2000)											
		All External Costs	0	0	0	0	0	0	0	0	0	0	0
Institutions	51	High Income (Rs. 10,000 & above)											
	52	Middle Income (Rs. 5,000 -10,000)											
	53	Low Income (Rs. 2,000-5,000)											
	54	Poor (Below Rs. 2000)											
		All Households	0	0	0	0	0	0	0	0	0	0	0
	55	Government											
ROV	56	Rest of the villages											
ROW	57	Rest of the world											
Total			5991	127692	120789	10400	1904445	89811	76550	3100	26767	272375	751428

SAM Table for Damdama-Bhogpur (Contd.)

			Activities			Commodities				Factors			
			education	health	Infrastructure	Agricultural	Non-agricultural items	Services (inc travel expd, etc.)	Forest products	Renting land (for share crop.	Rent-agri (imputed) & shops	family labour	hired labour
			23	24	25	26	27	28	29	30	31	32	33
Activities	1	Wheat				185454							
	2	Wheat - fodder				62380							
	3	Mustard				6740							
	4	Mustard - fodder				8							
	5	Mustard - fuelwood				450							
	6	Maize				160787							
	7	Maize - fodder				27248							
	8	Paddy				113284							
	9	Paddy - fodder				9892							
	10	Other cereals				15262							
	11	Other - fodder							2014				
	12	Oilseeds and pulses											
	13	Vegetables and fruits				95517							
	14	Cultivated fodder							120786				
	15	Village production					400						
	16	Livestock & poultry					1812445						
	17	Livestock - dung cakes					89811						
	18	Livestock - manure					75300						
	19	Timber collection							3100				
	20	Fuelwood collection							26767				
	21	Leaves & grass collection							272375				
	22	Retail trade											
	23	Education											
	24	Health											
	25	Infrastructure	15445										
		All Activities	**15445**	**0**	**0**	**677022**	**1977956**	**0**	**425042**	**0**	**0**	**0**	**0**
Commodities	26	Agricultural											
	27	Non-agricultural items											
	28	Services (incl travel expd. etc.)											
	29	Forest products											
		All Commodities	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Factors	30	Renting land (for share cropping)											
	31	Rent-agri (imputed) & shops											
	32	Family labour											
	33	Hired labour			67897								
	34	Seeds											
	35	Fertiliser											
	36	Manure											
	37	Pesticides											
	38	Tractor / draught animals											
	39	Fodder											
	40	Construction material	12000		309806.4								
	41	Stationary	7617										
	42	Transportation cost			36333.12								
	43	Livestock products											
		All Factors	**19617**	**0**	**414036**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Capital	44	Forest stock											
	45	Agricultural land											
	46	Investment & Savings											
		All Capital	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
External Cost	47	High Income (Rs. 10,000 & above)							-8335				
	48	Middle Income (Rs. 5,000 -10,000)							-105728				
	49	Low Income (Rs. 2,000-5,000)							-123577				
	50	Poor (Below Rs. 2000)							-58885				
		All External Costs	**0**	**0**	**0**	**0**	**0**	**0**	**-296524**	**0**	**0**	**0**	**0**
Institutions	51	High Income (Rs. 10,000 & above)	1055							93410		911165	16520
	52	Middle Income (Rs. 5,000 -10,000)	1055							88190		1375049	28364
	53	Low Income (Rs. 2,000-5,000)	1055							37850		571605	404492
	54	Poor (Below Rs. 2000)	1055							38746		436695	82731
		All Households	**4220**	**0**	**0**	**0**	**0**	**0**	**0**	**258196**	**0**	**3294514**	**532106**
	55	Government											
ROV	56	Rest of the villages									43140		
ROW	57	Rest of the world	**788319**	**294914**		**814967**	**802264**	**636081**	**290135**				**181200**
Total			**827601**	**294914**	**414036**	**1491989**	**2780220**	**636081**	**418652**	**258196**	**43140**	**3294514**	**713306**

SAM Table for Damdama-Bhogpur (Contd.)

			Factors										Capital
			seeds	fertiliser	manure	pesticides	tractor / draught animals	Fodder	construction material	stationary	transportation cost	Livestock Products	Forest stock
			34	35	36	37	38	39	40	41	42	43	44
Activities	1	Wheat	13129										
	2	Wheat – fodder											
	3	Mustard	136										
	4	Mustard – fodder											
	5	Mustard – fuelwood											
	6	Maize	7344										
	7	Maize – fodder											
	8	Paddy	1076										
	9	Paddy – fodder											
	10	Other cereals	1000										
	11	Other – fodder											
	12	Oilseeds and pulses											
	13	Vegetables and fruits	1100										
	14	Cultivated fodder	3										
	15	Village production											
	16	Livestock & poultry											
	17	Livestock – dung cakes											
	18	Livestock - manure			1250								
	19	Timber collection											
	20	Fuelwood collection											
	21	Leaves & grass collection											
	22	Retail trade											
	23	Education											
	24	Health											
	25	Infrastructure											
		All Activities	**23788**	**0**	**1250**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Commodities	26	Agricultural											
	27	Non-agricultural items			45829								
	28	Services (incl travel expd. etc.)											
	29	Forest products											
		All Commodities	**0**	**0**	**45829**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Factors	30	Renting land (for share cropping)											
	31	Rent-agri (imputed) & shops											
	32	Family labour											
	33	Hired labour											
	34	Seeds											
	35	Fertiliser											
	36	Manure											
	37	Pesticides											
	38	Tractor / draught animals											
	39	Fodder											
	40	Construction material											
	41	Stationary											
	42	Transportation cost											
	43	Livestock products											
		All Factors	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Capital	44	Forest stock											
	45	Agricultural land											
	46	Investment & Savings											
		All Capital	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
External Cost	47	High Income (Rs. 10,000 & above)											
	48	Middle Income (Rs. 5,000 -10,000)											
	49	Low Income (Rs. 2,000-5,000)											
	50	Poor (Below Rs. 2000)											
		All External Costs	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Institutions	51	High Income (Rs. 10,000 & above)					15620						
	52	Middle Income (Rs. 5,000 -10,000)					1300					3000	
	53	Low Income (Rs. 2,000-5,000)					6463					1100	
	54	Poor (Below Rs. 2000)										9040	
		All Households	**0**	**0**	**0**	**0**	**23383**	**0**	**0**	**0**	**0**	**13140**	**0**
	55	Government											12292248
ROV	56	Rest of the villages					13003			7617	36333		
ROW	57	Rest of the world	5918	71185		11249		20086	321806				
Total			**29706**	**71185**	**47079**	**11249**	**36385**	**20086**	**321806**	**7617**	**36333**	**13140**	**12292248**

SAM Table for Damdama-Bhogpur (Contd.)

			Capital		External Cost				Institutions			
			agricultural land	Investment & Savings	High Income	Middle Income	Low Income	Poor	High Income	Middle Income	Low Income	Poor
			45	46	47	48	49	50	51	52	53	54
Activities	1	Wheat										
	2	Wheat - fodder										
	3	Mustard										
	4	Mustard - fodder										
	5	Mustard - fuelwood										
	6	Maize										
	7	Maize - fodder										
	8	Paddy										
	9	Paddy - fodder										
	10	Other cereals										
	11	Other - fodder										
	12	Oilseeds and pulses										
	13	Vegetables and fruits										
	14	Cultivated fodder										
	15	Village production										
	16	Livestock & poultry										
	17	Livestock - dung cakes										
	18	Livestock - manure										
	19	Timber collection										
	20	Fuelwood collection										
	21	Leaves & grass collection										
	22	Retail trade										
	23	Education										
	24	Health										
	25	Infrastructure										
		All Activities	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Commodities	26	Agricultural							263101.5	602302.5	508515.1	118069.6
	27	Non-agricultural items							427627.2	1115104.7	836736.94	329446.6
	28	Services (incl travel expd. etc.)							78800	132707	172123	67440
	29	Forest products			-8334.97	-105728	-123577	-58884.7	178758	227803.04	205023.85	103591.4
		All Commodities	**0**	**0**	**-8335**	**-105728**	**-123577**	**-58885**	**948287**	**2077917**	**1722399**	**618548**
Factors	30	Renting land (for share cropping)										
	31	Rent-agri (imputed) & shops										
	32	Family labour										
	33	Hired labour										
	34	Seeds										
	35	Fertiliser										
	36	Manure										
	37	Pesticides										
	38	Tractor / draught animals										
	39	Fodder										
	40	Construction material										
	41	Stationary										
	42	Transportation cost										
	43	Livestock products										
		All Factors	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Capital	44	Forest stock										
	45	Agricultural land			-49678	-118753	-97788	-38629				
	46	Investment & Savings							900031	602966	132979	20657
		All Capital	**0**	**0**	**-49678**	**-118753**	**-97788**	**-38629**	**900031**	**602966**	**132979**	**20657**
External Cost	47	High Income (Rs. 10,000 & above)	-49678									
	48	Middle Income (Rs. 5,000 -10,000)	-118753									
	49	Low Income (Rs. 2,000-5,000)	-97788									
	50	Poor (Below Rs. 2000)	-38629									
		All External Costs	**-304849**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Institutions	51	High Income (Rs. 10,000 & above)		900031								
	52	Middle Income (Rs. 5,000 -10,000)		602966								
	53	Low Income (Rs. 2,000-5,000)		132979								
	54	Poor (Below Rs. 2000)		20657								
		All Households	**0**	**1656633**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	55	Government							108820	34835	31391	11869
ROV	56	Rest of the villages							**283828**	**243400**	**372999**	**128805**
ROW	57	Rest of the world							**1558935**	**558942**	**892218**	**451210**
Total			-304849	1656633	-58013	-224481	-221365	-97514	3799901	3518060	3151986	1231089

SAM Table for Damdama-Bhogpur (Contd.)

			Institutions	ROV	ROW	Total
			government	rest of the villages	rest of the world	
			55	56	57	
Activities	1	Wheat				198583
	2	Wheat – fodder				62380
	3	Mustard				6876
	4	Mustard – fodder				8
	5	Mustard – fuelwood				450
	6	Maize		9750	130	178011
	7	Maize – fodder				27248
	8	Paddy			14000	128360
	9	Paddy – fodder				9892
	10	Other cereals				16262
	11	Other – fodder				2014
	12	Oilseeds and pulses			5991	5991
	13	Vegetables and fruits			31075	127692
	14	Cultivated fodder				120789
	15	Village production			10000	10400
	16	Livestock & poultry		18000	74000	1904445
	17	Livestock – dung cakes				89811
	18	Livestock – manure				76550
	19	Timber collection				3100
	20	Fuelwood collection				26767
	21	Leaves & grass collection				272375
	22	Retail trade			751428	751428
	23	Education	827601			827601
	24	Health	294914			294914
	25	Infrastructure	398591			414036
		All Activities	1521106	27750	886624	5555982
Commodities	26	Agricultural				1491988.7
	27	Non-agricultural items	25476			2780220.3
	28	Services (incl travel expd. etc.)	185011			636081
	29	Forest products				418652.06
		All Commodities	210486.9	0	0	5326941.9
Factors	30	Renting land (for share cropping)				258196
	31	Rent-agri (imputed) & shops				43140
	32	Family labour				3294514
	33	Hired labour			418264	713306
	34	Seeds				29706
	35	Fertiliser	32394			71185
	36	Manure				47079
	37	Pesticides				11249
	38	Tractor / draught animals				36385
	39	Fodder				20086
	40	Construction material				321806
	41	Stationary				7617
	42	Transportation cost				36333
	43	Livestock products				13140
		All Factors	32394	0	418264	4903743
Capital	44	Forest stock	12292248			12292248
	45	Agricultural land				-304849
	46	Investment & Savings				1656633
		All Capital	12292248	0	0	13644032
External Cost	47	High Income (Rs. 10,000 & above)				-58013
	48	Middle Income (Rs. 5,000 -10,000)				-224481
	49	Low Income (Rs. 2,000-5,000)				-221365
	50	Poor (Below Rs. 2000)				-97514
		All External Costs	0	0	0	-601374
Institutions	51	High Income (Rs. 10,000 & above)	491400		1370700	3799901
	52	Middle Income (Rs. 5,000 -10,000)	820136		598000	3518060
	53	Low Income (Rs. 2,000-5,000)	218800		1777642	3151986
	54	Poor (Below Rs. 2000)	30000		612165	1231089
		All Households	1560336	0	4358507	11701036
	55	Government		1101375	2036033	15616571
ROV	56	Rest of the villages				1129125
ROW	57	Rest of the world				7699429
Total			15616571	1129125	7699429	

6. Multiplier-based Analysis

The transaction matrices of estimated SAMs for the two villages of Pauti and Damdama-Bhogpur presented in the previous chapter give the structure of the village economy. These transaction matrices are used to examine the intersectoral linkages in the village economy in terms of multipliers that will be generated from a flow of resources into each of the endogenous elements of the SAM. It may be recalled that the multiplier gives the total direct and indirect effects of any exogenous injections on the endogenous accounts of the SAM.

6.1 Accounting Multipliers:

The accounting multipliers are an indicator of the income generating capacity, i.e., they give the change in income in other sectors of the economy due to a unit injection in a given sector. Thus, the multipliers are a good measure of linkages of a sector with the rest of the economy. For deriving the accounting multipliers the transaction matrix is converted into a matrix of average expenditure propensities by dividing each element in the endogenous transaction sub-matrix by its respective column total. The accounting multiplier thus calculated assumes that the various average expenditure propensities hold for incremental increases in demand generated by some exogenous change. That is, it assumes that the average expenditure behaviour will prevail at the margin and consequently all household income and expenditure elasticities of demand for goods are identical and equal to one[5]. Tables 6.1 and 6.2 give a shortened version of the accounting multipliers derived from the transaction matrices for the two villages Pauti and Damdama-Bhogpur respectively.

The multipliers recorded in the wheat column in Table 6.1, for Pauti, indicate that an injection of one unit of resource to the sector (i.e., the what sector) generates 1.044 units in the sector itself, 0.035 in cultivated fodder sector and 0.075 in livestock & poultry sector. This one unit injection in the wheat sector also results in an increase in 0.003 units of output of fuelwood collection sector. The entire village production registers an increase of 1.209 units due to one unit resource injection in the wheat sector. This transfer also generates household income of 0.817 units, but most of this increase in income accrues to the High-Income class. Thus the richest group of household comprising high-income class and middle-income class benefits the most from wheat production. The own sector multiplier of wheat sector is the highest (1.044) among the activities of the village.

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[5] The income elasticity of demand of socio-economic group h for product i (E_{hi}) is equal to the ratio of corresponding marginal expenditure propensity (MEP_{hi}) to the corresponding average expenditure propensity (AEP_{hi}). That is, $E_{hi}=MEP_{hi}/AEP_{hi}$ and therefore $E_{hi}=1$ if $MEP_{hi}=AEP_{hi}$.

Compared to many agricultural production activities of the village, forest sector activity generates a higher production multiplier of 1.197 in the village economy. Despite having a lower own multiplier, the forest sector's linkage with the other activities of the village is high as compared to most of the agricultural activities.

In Pauti we see (refer to Table 6.1) that the household income multipliers are lower for agricultural activities ranging between 0.817 (for wheat) and 0.992 (for cultivated fodder). But for activities like village production, village services, forest products and livestock & poultry the household multipliers are relatively higher vis-à-vis those for agricultural activities. In fact for forest products and village services they are the highest in the village (1.161 for both these activities). Thus a transfer of one unit in the forest product sector generates household income of 1.161 units. Although the poor household groups also benefit from such an increased income, most of the benefits accrue to the richest group in the village.

Considering the income linkages generated from the transfer of resources to each of the household groups in the village we see from Table 6.1 that the transfer to low-income group in the villages induces the highest production and income multipliers in the village economy. This is mainly due to the structure of demand among the household groups in the village. The low-income group spends a large part of its income on locally produced agricultural goods as compared to the other three household groups in the village which spend a relatively higher proportion of their income on non-agricultural goods with higher import content. This is indicative of the fact that any social transfer programme and intervention will have the strongest effect on inducing local production and incomes if directed to the low-income group which consume more of locally produced goods as their income increases.

The accounting multiplier for Damdama-Bhogpur village is given in Table 6.2. From the table it is evident that the total production multiplier is the highest in case of mustard (1.497). Thus an injection of one unit of resource to this sector generates 1.497 units in the entire village production of which 1.001 unit is generated in the mustard sector itself while the remaining 0.496 units are generated in other sectors. Despite having a very low own sector multiplier, mustard cultivation activity has the highest total production multiplier because of its high linkages with other sectors. Even maize which is one of the major crops in the village has a high total production multiplier along with a similar own sector multiplier. Its linkage with the other village activities is also high (0.438). One unit injection in the maize production will generate household income of 1.164 units, but most of the increase in income will accrue to the high-income class and middle-income class in the village. Thus the richest two household groups, high-income class and middle-income class, will benefit the most from maize cultivation, although the poorer two groups will also have their incomes increased due to this injection into the maize activity.

As compared to agricultural production activities exception being maize and mustard production of the village, forest sector activity generates a higher production multiplier of 1.372. Despite having the lowest own sector multiplier, the forest sector's linkage with the other activities of the village is also quite high.

Just as in Pauti, the household income multipliers in Damdama-Bhogpur as can be seen from Table 6.2 are lower for agricultural activities ranging between 1.069 (for wheat) and 1.289 (for cultivated fodder). The exception to such a feature is the other cereals group which has the highest household income multiplier. Other village activities such as village production, forest products and livestock & poultry have household income multipliers that are relativeiy higher vis-à-vis those for agricultural activities. In fact for forest products, village production and other cereals the household income multipliers are the highest in the village (1.354 for these three activities). Thus a transfer of one unit in the forest product sector generates household income of 1.354 units. Although the poor household group do benefit from this transfer, most of the benefits accrue to the middle-income and high-income class in this village.

While considering the income linkages generated from the transfer of resources to each of the household groups in the village it is evident from Table 6.2 that any transfer to the middle and low-income groups in the village would induce high production and income multipliers in the village economy. This is mainly due to the structure of demand among the household groups in the village. The middle and low-income groups spend a large part of their incomes on locally produced agricultural goods as compared to the other two household groups in the village. Such a result indicates that any social transfer programmes and interventions will have the strongest effect on inducing local production and incomes if directed to the middle and low-income groups which consume more of locally produced goods as their income increases.

Table 6.1: Accounting Multipliers for Pauti

		Wheat	Mustard	Cotton	Other cereals	Vegtable & fruits	Cultivated Fodder	Village Production	Livestock & poultry	Forest Products	Village Services	High income	Middle income	Low income	Poor Income
Activities	Wheat	1.044	0.051	0.055	0.043	0.047	0.055	0.066	0.067	0.066	0.066	0.048	0.081	0.092	0.025
	Mustard	0.010	1.011	0.012	0.011	0.012	0.013	0.014	0.015	0.014	0.014	0.010	0.018	0.020	0.006
	Cotton	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	other cereals	0.010	0.012	0.012	1.009	0.010	0.012	0.015	0.015	0.015	0.015	0.011	0.018	0.021	0.006
	Vegetables and fruits	0.000	0.001	0.001	0.000	1.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000
	Cultivated fodder	0.035	0.019	0.022	0.043	0.055	1.034	0.020	0.020	0.020	0.020	0.014	0.024	0.027	0.008
	village production	0.001	0.001	0.001	0.001	0.000	0.001	1.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000
	livestock & poultry	0.075	0.049	0.036	0.063	0.026	0.037	0.035	1.036	0.036	0.036	0.037	0.031	0.040	0.028
	fuelwood collection	0.003	0.003	0.004	0.003	0.003	0.004	0.022	0.004	1.004	0.004	0.002	0.006	0.007	0.005
	village service	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Commodities	Agricultural	0.186	0.222	0.237	0.180	0.197	0.237	0.286	0.289	0.288	0.288	0.207	0.350	0.398	0.110
	non-agricultural items	0.084	0.055	0.041	0.071	0.029	0.042	0.040	0.040	0.040	0.040	0.041	0.034	0.045	0.032
	services (incl travel expd. etc.)	0.005	0.005	0.006	0.005	0.005	0.006	0.007	0.007	0.007	0.007	0.003	0.010	0.010	0.009
	Forest	-0.001	-0.002	-0.002	-0.001	-0.001	-0.002	-0.011	-0.002	-0.002	-0.002	-0.001	-0.003	-0.003	-0.003
Factor	renting land (for share cropping)	0.069	0.019	0.074	0.047	0.005	0.025	0.006	0.006	0.006	0.006	0.004	0.007	0.008	0.002
	family labour	0.533	0.728	0.830	0.413	0.671	0.825	1.124	1.131	1.132	1.132	0.106	0.147	0.173	0.072
	hired labour	0.069	0.066	0.057	0.158	0.007	0.047	0.008	0.008	0.008	0.008	0.006	0.010	0.011	0.003
	seeds	0.063	0.016	0.021	0.087	0.116	0.054	0.006	0.006	0.006	0.006	0.005	0.008	0.009	0.002
	fertiliser	0.098	0.094	0.029	0.111	0.022	0.056	0.010	0.010	0.010	0.010	0.007	0.012	0.013	0.004
	manure	0.059	0.026	0.010	0.045	0.004	0.011	0.005	0.005	0.005	0.005	0.003	0.006	0.007	0.002
	pesticides	0.004	0.001	0.040	0.000	0.110	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	tractor / draught animals	0.148	0.137	0.052	0.295	0.121	0.120	0.017	0.017	0.017	0.017	0.012	0.021	0.024	0.007
	Electricity charges	0.068	0.035	0.035	0.025	0.033	0.029	0.005	0.006	0.006	0.006	0.004	0.007	0.008	0.002
	water charges	0.098	0.058	0.029	0.022	0.091	0.023	0.008	0.008	0.008	0.008	0.005	0.009	0.010	0.003
	Forest Resource	0.000	0.000	0.000	0.000	0.000	0.000	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Capital	Forest	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Agricultural land	-0.025	-0.029	-0.031	-0.025	-0.025	-0.031	-0.186	-0.037	-0.037	-0.037	-0.020	-0.049	-0.056	-0.044
External cost	High Income (Rs. 10,000 and above)	-0.014	-0.017	-0.018	-0.015	-0.015	-0.018	-0.110	-0.022	-0.022	-0.022	-0.012	-0.029	-0.033	-0.026
	Middle Income (Rs. 5,000 -10,000)	-0.006	-0.007	-0.007	-0.006	-0.006	-0.007	-0.042	-0.008	-0.008	-0.008	-0.004	-0.011	-0.013	-0.010
	Low Income (Rs. 2,000-5,000)	-0.010	-0.012	-0.012	-0.010	-0.010	-0.012	-0.073	-0.015	-0.015	-0.015	-0.008	-0.019	-0.022	-0.017
	Poor (Below Rs. 2000)	-0.002	-0.002	-0.003	-0.002	-0.002	-0.003	-0.015	-0.003	-0.003	-0.003	-0.002	-0.004	-0.005	-0.004
Institution	High Income (Rs. 10,000 and above)	0.427	0.461	0.475	0.423	0.424	0.480	0.531	0.535	0.535	0.535	1.061	0.089	0.104	0.040
	Middle Income (Rs. 5,000 -10,000)	0.159	0.202	0.221	0.141	0.184	0.222	0.283	0.285	0.285	0.285	0.028	1.040	0.047	0.019
	Low Income (Rs. 2,000-5,000)	0.158	0.205	0.226	0.148	0.179	0.225	0.290	0.291	0.292	0.292	0.029	0.040	1.048	0.019
	Poor (Below Rs. 2000)	0.073	0.075	0.070	0.121	0.040	0.066	0.049	0.049	0.049	0.049	0.008	0.013	0.015	1.005
	Total Production	**1.209**	**1.180**	**1.176**	**1.203**	**1.181**	**1.190**	**1.224**	**1.198**	**1.197**	**1.197**	**0.153**	**0.226**	**0.263**	**0.097**
	Own Sector Multiplier	**1.044**	**1.011**	**1.000**	**1.009**	**1.000**	**1.034**	**1.001**	**1.036**	**1.004**	**1.000**	**1.061**	**1.040**	**1.048**	**1.005**
	Linkage with other	**0.165**	**0.169**	**0.176**	**0.194**	**0.181**	**0.156**	**0.223**	**0.162**	**0.193**	**0.197**				
	Induced hh income	**0.817**	**0.943**	**0.992**	**0.833**	**0.827**	**0.992**	**1.153**	**1.160**	**1.161**	**1.161**	**1.127**	**1.182**	**1.213**	**1.083**

Table 6.2: Accounting Multipliers for Damdama-Bhogpur

		Wheat	mustard	Maize	paddy	Other Cereals	vegetable	Cultivated fodder	Village Production	Livestock poultry	Forest Products	High Income	Middle Income	Low Income	Poor Income
Activities	Wheat	1.043	0.044	0.031	0.031	0.023	0.038	0.040	0.023	0.023	0.023	0.012	0.030	0.028	0.019
	Mustard	0.001	1.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001
	Maize	0.029	0.030	1.023	0.023	0.020	0.027	0.029	0.020	0.020	0.020	0.010	0.026	0.024	0.016
	Paddy	0.012	0.014	0.012	1.013	0.014	0.013	0.014	0.014	0.013	0.014	0.007	0.018	0.016	0.011
	other cereals	0.003	0.003	0.002	0.002	1.002	0.003	0.003	0.002	0.002	0.002	0.001	0.002	0.002	0.002
	Vegetables and fruits	0.011	0.012	0.010	0.011	0.011	1.012	0.012	0.011	0.011	0.011	0.006	0.015	0.014	0.009
	Cultivated fodder	0.011	0.012	0.012	0.013	0.014	0.013	1.014	0.014	0.014	0.014	0.010	0.016	0.015	0.018
	Village production	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
	Livestock & poultry	0.202	0.306	0.296	0.195	0.219	0.195	0.213	0.219	1.217	0.219	0.104	0.281	0.239	0.236
	Fuelwood collection	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	1.003	0.002	0.003	0.003	0.004
Commodities	Agricultural	0.133	0.154	0.147	0.156	0.177	0.156	0.169	0.177	0.176	0.177	0.093	0.229	0.212	0.145
	non-agricultural items	0.310	0.470	0.455	0.299	0.336	0.299	0.327	0.336	0.332	0.336	0.159	0.432	0.367	0.363
	services (incl travel expd. etc.)	0.040	0.046	0.044	0.047	0.052	0.046	0.050	0.052	0.051	0.052	0.028	0.055	0.070	0.069
	Forest	0.038	0.043	0.042	0.044	0.049	0.044	0.047	0.049	0.049	0.049	0.034	0.054	0.052	0.063
Factor	renting land (for share cropping)	0.555	0.045	0.545	0.545	0.029	0.040	0.043	0.029	0.029	0.029	0.015	0.038	0.035	0.024
	Rent (Agri land & shops)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	family labour	0.404	1.001	0.547	0.498	1.318	1.140	1.209	1.318	1.304	1.318	0.163	0.400	0.349	0.344
	hired labour	0.044	0.117	0.046	0.202	0.005	0.013	0.041	0.005	0.005	0.005	0.003	0.006	0.006	0.004
	Seeds	0.061	0.055	0.030	0.025	0.003	0.042	0.044	0.003	0.003	0.003	0.002	0.004	0.004	0.003
	Fertilizer	0.105	0.024	0.022	0.024	0.004	0.094	0.026	0.004	0.004	0.004	0.002	0.005	0.005	0.004
	Manure	0.065	0.190	0.186	0.011	0.005	0.007	0.012	0.005	0.005	0.005	0.003	0.007	0.006	0.004
	Pesticides	0.014	0.002	0.025	0.017	0.001	0.017	0.006	0.001	0.001	0.001	0.001	0.002	0.001	0.001
	tractor / draught animals	0.121	0.059	0.057	0.025	0.004	0.006	0.011	0.004	0.004	0.004	0.002	0.005	0.005	0.003
Capital	Forest	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Agricultural land	-0.028	-0.031	-0.031	-0.032	-0.036	-0.032	-0.034	-0.036	-0.036	-0.036	-0.025	-0.039	-0.038	-0.046
External cost	High Income (Rs.10,000 and above)	-0.005	-0.006	-0.006	-0.006	-0.007	-0.006	-0.007	-0.007	-0.007	-0.007	-0.005	-0.008	-0.007	-0.009
	Middle Income (Rs. 5,000 -10,000)	-0.021	-0.023	-0.023	-0.024	-0.027	-0.023	-0.025	-0.027	-0.026	-0.027	-0.018	-0.029	-0.028	-0.034
	Low Income (Rs. 2,000-5,000)	-0.020	-0.023	-0.022	-0.023	-0.026	-0.023	-0.025	-0.026	-0.026	-0.026	-0.018	-0.029	-0.028	-0.033
	Poor (Below Rs. 2000)	-0.009	-0.010	-0.010	-0.010	-0.012	-0.010	-0.011	-0.012	-0.011	-0.012	-0.008	-0.013	-0.012	-0.015
Institution	High Income (Rs. 10,000 and above)	0.365	0.321	0.374	0.350	0.377	0.333	0.355	0.377	0.373	0.377	1.052	0.127	0.111	0.105
	Middle Income (Rs. 5,000 -10,000)	0.364	0.440	0.418	0.403	0.560	0.490	0.521	0.560	0.555	0.560	0.073	1.180	0.158	0.152
	Low Income (Rs. 2,000-5,000)	0.198	0.257	0.211	0.285	0.237	0.212	0.241	0.237	0.234	0.237	0.032	0.079	1.070	0.066
	Poor (Below Rs. 2000)	0.142	0.153	0.160	0.171	0.180	0.159	0.171	0.180	0.178	0.180	0.024	0.059	0.052	1.050
	Total Production	**1.370**	**1.497**	**1.461**	**1.349**	**1.372**	**1.361**	**1.392**	**1.372**	**1.369**	**1.372**	**0.192**	**0.470**	**0.413**	**0.390**
	Own sector multiplier	**1.043**	**1.001**	**1.023**	**1.013**	**1.002**	**1.012**	**1.014**	**1.000**	**1.217**	**1.000**	**1.032**	**1.180**	**1.070**	**1.050**
	Linkage with other	**0.327**	**0.496**	**0.438**	**0.336**	**0.370**	**0.349**	**0.378**	**0.372**	**0.152**	**0.372**				
	Induced hh income	**1.069**	**1.172**	**1.164**	**1.210**	**1.354**	**1.194**	**1.289**	**1.354**	**1.339**	**1.354**	**1.182**	**1.446**	**1.391**	**1.373**

The accounting multipliers discussed above assume that various expenditure propensities hold for incremental demand generated by exogenous change. In other words, it is assumed that the average expenditure propensity is equal to the one at the margin. This implies that all household income and expenditure elasticities for goods are identical and equal to one. Such an assumption may not hold in most cases and there is a need for incorporating marginal expenditure propensities into the analysis. The fixed price multipliers generated after such replacement is taken into account for assessing their impact on the village economy. The marginal expenditure propensities obtained for the villages of Pauti and Damdama-Bhogpur through an estimation of linear expenditure system (LES) are presented in Tables 6.3 and 6.4 below along with the average expenditure propensities.

It may be noted that in Pauti, the marginal expenditure propensities of low-income class and poor have been treated as equal in the study. The number poor income class households in the village is small and estimation of the expenditure propensity for this group produced perverse results. An estimation of the LES was, therefore, carried out by merging the group with low-income class households.

Table 6.3: Average and Marginal Expenditure Propensities for Pauti

Commodity Group	Households Groups							
	High Income Class		Middle Income Class		Low Income Class		Poor	
	AEP	*MEP*	*AEP*	*MEP*	*AEP*	*MEP*	*AEP*	*MEP*
Agriculture	0.17679	0.03676	0.30706	0.36097	0.34728	0.34434	0.08991	0.34434
Non-agriculture	0.03400	0.38520	0.02291	0.58329	0.03188	0.55731	0.02720	0.55731
Services	0.00256	0.01157	0.00904	0.00122	0.00884	0.00165	0.00836	0.00165
Forest	0.00366	0.00057	0.01014	0.00034	0.01163	0.00107	0.00966	0.00107
Savings	0.18153	0.18973	0.07591	0.00937	0.05583	0.00941	0.01282	0.00941
Rest of Villages	0.03106	0.13707	0.01607	0.00142	0.02566	0.00074	0.01045	0.00074
Rest of World	0.56317	0.23910	0.55423	0.04340	0.51477	0.08548	0.84021	0.08548

Note: (i) The marginal propensities are estimated from a linear expenditure system equations. (ii) the *AEP* and *MEP* in the table stand for average expenditure propensity and marginal expenditure propensity.

Table 6.4: Average and Marginal Expenditure Propensities for Damdama-Bhogpur

Commodity Group	Households Groups							
	High Income Class		Middle Income Class		Low Income Class		Poor	
	AEP	*MEP*	*AEP*	*MEP*	*AEP*	*MEP*	*AEP*	*MEP*
Agriculture	0.06924	0.00938	0.17120	0.08896	0.16133	0.37195	0.09591	0.07503
Non-agriculture	0.11254	0.32214	0.31697	0.12411	0.26546	0.12986	0.26761	0.04530
Services	0.02074	0.00090	0.03772	0.00272	0.05461	0.00906	0.05478	0.02877
Forest	0.04704	0.01094	0.06475	0.00448	0.06505	0.14262	0.08415	0.19560
Savings	0.23686	0.20037	0.17139	0.64254	0.04219	0.05581	0.01678	0.03191
Rest of Villages	0.07469	0.00924	0.06919	0.04247	0.11834	0.09479	0.10463	0.02457
Rest of World	0.41026	0.44702	0.15888	0.09472	0.28307	0.19591	0.36651	0.59882

Note: (i) the marginal propensities are estimated from a linear expenditure system equations. (ii) the *AEP* and *MEP* in the table stand for average expenditure propensity and marginal expenditure propensity.

It may be useful to point out that the fixed price multipliers are derived on the assumption of excess capacity prevailing in all the sectors of the village economy. Such an assumption is unrealistic when applied to agriculture and forest sectors. So the present analysis assumes that the agriculture and forest sectors are supply constrained while excess capacity prevails in the remaining sectors of the village economy. Incorporating supply constraints in agriculture and forest sectors we derive mixed multipliers. Tables 6.5 through 6.8 give the fixed price and mixed multipliers for the two villages of Pauti and Damdama-Bhogpur in Haryana.

From Table 6.5 we see for Pauti, that a Re. 1 increase in the production of forest products results in Rs. 2.379 increase in the total production in the village of which its own production increases by Rs. 1.001 while the output of other sectors increases by only Rs. 1.378. The corresponding increase in the production of forest product results in Rs. 2.317 increase in household income. Existence of excess capacity in the agriculture and forest sectors activities being unrealistic, a unit increase in the demand for their product will not be met as these sectors are supply constrained and the matching increase in output will not take place. The increased demand for their products have to be met by sources outside the village thereby resulting in leakage of resources from the village economy. As can be seen from Table 6.6, a Re. 1 increase in the supply of forest products will result in Rs. 0.420 increase in total village production of which the sector's own production would increase by Rs. 1.000, while the output of other sectors would increase by Rs. -0.580, i.e., there is a decline of the induced output production. As compared to the fixed price multiplier where the household income increases by Rs. 2.317, the mixed multiplier household income increases by Rs. 1.007 in response to Re. 1 increase in the supply of forest products. Thus we see

that as a result of imposition of supply constraints on the forest sector the resultant increase in village output will be less vis-à-vis the scenario observed in the existence of excess capacity.

Table 6.5: Fixed Price Multipliers for Pauti

		Wheat	Mustard	Cotton	Other cereals	Vegtables & fruits	Cultivated Fodder	Village production	Livestock & poultry	Forest Products	Village Services	High income	Middle income	Low income	Poor Income
Activities	wheat	1.074	0.088	0.093	0.077	0.076	0.093	0.110	0.111	0.111	0.111	0.053	0.164	0.156	0.156
	mustard	0.017	1.019	0.021	0.018	0.018	0.021	0.024	0.024	0.024	0.024	0.011	0.036	0.034	0.034
	Cotton	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	other cereals	0.017	0.020	0.021	1.017	0.017	0.021	0.025	0.025	0.025	0.025	0.012	0.037	0.036	0.036
	vegetables and fruits	0.001	0.001	0.001	0.001	1.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002
	Cultivated fodder	0.044	0.030	0.034	0.053	0.063	1.046	0.033	0.033	0.033	0.033	0.016	0.049	0.047	0.047
	village production	0.013	0.015	0.015	0.013	0.012	0.015	1.018	0.018	0.018	0.018	0.013	0.022	0.021	0.021
	livestock & poultry	0.739	0.828	0.860	0.749	0.699	0.858	0.998	2.005	1.006	1.006	0.744	1.255	1.200	1.200
	fuelwood collection	0.001	0.001	0.001	0.001	0.001	0.001	0.018	0.001	1.001	0.001	0.001	0.001	0.001	0.001
	village service	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Commodities	Agricultural	0.318	0.380	0.404	0.331	0.324	0.401	0.477	0.482	0.481	0.481	0.229	0.710	0.678	0.678
	non-agricultural items	0.831	0.930	0.966	0.842	0.786	0.964	1.122	1.130	1.131	1.131	0.837	1.411	1.349	1.349
	services (incl travel expd. etc.)	0.010	0.012	0.012	0.011	0.010	0.012	0.014	0.014	0.014	0.014	0.017	0.012	0.012	0.012
	Forest	0.000	0.000	0.000	0.000	0.000	0.000	-0.009	-0.001	-0.001	-0.001	0.000	-0.001	-0.001	-0.001
Factor	renting land (for share cropping)	0.072	0.023	0.077	0.050	0.007	0.029	0.009	0.009	0.009	0.009	0.004	0.014	0.013	0.013
	family labour	1.311	1.641	1.795	1.220	1.458	1.787	2.251	2.266	2.268	2.268	0.901	1.615	1.544	1.544
	hired labour	0.073	0.070	0.062	0.162	0.011	0.051	0.014	0.014	0.014	0.014	0.006	0.020	0.019	0.019
	seeds	0.066	0.020	0.025	0.090	0.119	0.058	0.010	0.011	0.011	0.011	0.005	0.016	0.015	0.015
	fertiliser	0.102	0.100	0.034	0.116	0.027	0.061	0.016	0.016	0.016	0.016	0.008	0.024	0.023	0.023
	manure	0.061	0.028	0.013	0.048	0.006	0.014	0.008	0.008	0.008	0.008	0.004	0.012	0.011	0.011
	pesticides	0.004	0.001	0.040	0.000	0.110	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001
	tractor / draught animals	0.156	0.146	0.062	0.304	0.129	0.130	0.029	0.029	0.029	0.029	0.014	0.042	0.040	0.040
	Electricity charges	0.071	0.038	0.038	0.028	0.036	0.032	0.009	0.009	0.009	0.009	0.004	0.014	0.013	0.013
	water charges	0.101	0.062	0.033	0.026	0.095	0.027	0.013	0.013	0.013	0.013	0.006	0.019	0.018	0.018
	Forest Resource	0.000	0.001	0.001	0.000	0.000	0.001	0.036	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Capital	Forest	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Agricultural land	-0.006	-0.007	-0.008	-0.007	-0.006	-0.008	-0.159	-0.009	-0.009	-0.009	-0.007	-0.010	-0.012	-0.012
External Costs	High Income (Rs. 10,000 and above)	-0.004	-0.004	-0.005	-0.004	-0.004	-0.005	-0.094	-0.005	-0.005	-0.005	-0.004	-0.006	-0.007	-0.007
	Middle Income (Rs. 5,000 -10,000)	-0.001	-0.002	-0.002	-0.002	-0.001	-0.002	-0.036	-0.002	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003
	Low Income (Rs. 2,000-5,000)	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.062	-0.004	-0.004	-0.004	-0.003	-0.004	-0.005	-0.005
	Poor (Below Rs. 2000)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.013	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Institutions	High Income (Rs. 10,000 and above)	0.790	0.888	0.926	0.801	0.791	0.929	1.058	1.065	1.066	1.066	1.426	0.782	0.747	0.747
	Middle Income (Rs. 5,000 -10,000)	0.355	0.431	0.464	0.344	0.381	0.463	0.567	0.570	0.571	0.571	0.227	1.410	0.392	0.392
	Low Income (Rs. 2,000-5,000)	0.357	0.440	0.474	0.355	0.381	0.472	0.579	0.583	0.584	0.584	0.232	0.419	1.400	0.400
	Poor (Below Rs. 2000)	0.106	0.113	0.110	0.155	0.073	0.106	0.096	0.097	0.097	0.097	0.039	0.076	0.073	1.073
	Total Production	**2.018**	**2.131**	**2.181**	**2.046**	**1.998**	**2.191**	**2.396**	**2.378**	**2.379**	**2.379**	**0.954**	**1.778**	**1.699**	**1.699**
	Own Sector Multiplier	**1.074**	**1.019**	**1.000**	**1.017**	**1.001**	**1.046**	**1.018**	**2.005**	**1.001**	**1.000**	**1.426**	**1.410**	**1.400**	**1.073**
	Linkage with other	**0.944**	**1.112**	**1.181**	**1.029**	**0.997**	**1.145**	**1.378**	**0.373**	**1.378**	**1.379**				
	Induced hh income	**1.609**	**1.872**	**1.975**	**1.656**	**1.627**	**1.970**	**2.300**	**2.315**	**2.317**	**2.317**	**1.924**	**2.687**	**2.612**	**2.612**

Table 6.6: Mixed Multipliers for Pauti

		Wheat	Mustard	Cotton	Other Cereals	Vegtable & fruits	Cultivated fodder	Village production	Livestock & poultry	Forest Products	Village Services	High income	Middle income	Low income	Poor Income
Activities	wheat	0.972	-0.036	-0.040	-0.030	-0.031	-0.039	-0.047	-0.049	-0.048	-0.048	-0.009	-0.084	-0.080	-0.080
	mustard	-0.007	0.992	-0.009	-0.008	-0.008	-0.009	-0.010	-0.010	-0.010	-0.010	-0.002	-0.018	-0.017	-0.017
	cotton	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	other cereals	-0.006	-0.008	-0.009	0.993	-0.007	-0.009	-0.011	-0.011	-0.011	-0.011	-0.002	-0.019	-0.018	-0.018
	vegetables and fruits	0.000	0.000	0.000	0.000	1.000	0.000	0.000	-0.001	-0.001	-0.001	0.000	-0.001	-0.001	-0.001
	Cultivated fodder	-0.029	-0.014	-0.016	-0.038	-0.048	0.972	-0.012	-0.013	-0.013	-0.013	-0.002	-0.022	-0.021	-0.021
	village production	0.006	0.006	0.007	0.006	0.005	0.006	1.007	0.008	0.008	0.008	0.006	0.009	0.009	0.009
	livestock & poultry	-0.318	-0.359	-0.371	-0.317	-0.288	-0.365	-0.420	0.566	-0.435	-0.435	-0.345	-0.523	-0.499	-0.499
	fuelwood collection	0.000	0.000	0.000	0.000	0.000	0.000	-0.018	0.000	1.000	0.000	0.000	0.000	-0.001	-0.001
	village services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Commodities	Agricultural	0.117	0.157	0.172	0.125	0.129	0.168	0.202	0.211	0.210	0.210	0.038	0.363	0.346	0.346
	non-agricultural items	0.357	0.404	0.417	0.356	0.324	0.411	0.472	0.488	0.489	0.489	0.388	0.588	0.561	0.561
	Services	0.004	0.005	0.005	0.004	0.005	0.005	0.006	0.006	0.006	0.006	0.012	0.001	0.002	0.002
	Forest	0.000	0.000	0.000	0.000	0.000	0.000	-0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Factors	renting land (for share cropping)	0.065	0.015	0.069	0.043	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	family labour	0.379	0.605	0.716	0.267	0.554	0.701	0.972	1.006	1.007	1.007	0.006	0.009	0.009	0.009
	hired labour	0.063	0.059	0.050	0.151	0.000	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	seeds	0.058	0.011	0.015	0.082	0.110	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	fertiliser	0.090	0.086	0.020	0.103	0.014	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	manure	0.056	0.022	0.006	0.042	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	pesticides & medicines	0.004	0.001	0.039	0.000	0.110	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	tractor / draught animals	0.134	0.123	0.037	0.280	0.105	0.104	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	electricity charges	0.064	0.031	0.031	0.021	0.029	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	water charges	0.092	0.052	0.022	0.017	0.085	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Forest Resources	0.000	0.000	0.000	0.000	0.000	0.000	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Capital	forest	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	agricultural land	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.153	-0.004	-0.004	-0.004	-0.003	-0.003	-0.006	-0.006
External costs	Highncome(Rs.10,000 & above)	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.090	-0.002	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003
	Middle Income (Rs.5,000-10,000)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.035	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	Low Income(Rs.2,000-5,000)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.060	-0.002	-0.002	-0.002	-0.001	-0.001	-0.002	-0.002
	Poor(Below Rs.2000)	0.000	0.000	0.000	0.000	0.000	0.000	-0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Institution	Highincome(Rs.10,000 & above)	0.343	0.391	0.407	0.342	0.354	0.406	0.444	0.459	0.460	0.460	1.003	0.004	0.004	0.004
	Middleincome(Rs.5,000-10,000)	0.119	0.169	0.190	0.103	0.152	0.188	0.243	0.251	0.252	0.252	0.001	1.002	0.002	0.002
	Lowincome (Rs.2,000-5,000)	0.116	0.172	0.195	0.109	0.147	0.191	0.248	0.257	0.257	0.257	0.002	0.002	1.002	0.002
	Poor(Below .2000)	0.063	0.065	0.060	0.111	0.030	0.055	0.037	0.038	0.039	0.039	0.000	0.000	0.000	1.000
	Total Production	**0.572**	**0.525**	**0.503**	**0.559**	**0.577**	**0.498**	**0.413**	**0.420**	**0.420**	**0.420**	**-0.394**	**-0.753**	**-0.720**	**-0.720**
	OwnSectorMultiers	**0.972**	**0.992**	**1.000**	**0.993**	**1.000**	**0.972**	**1.007**	**0.566**	**1.000**	**1.000**	**1.003**	**1.002**	**1.002**	**1.000**
	Linkage with other	**-0.400**	**-0.467**	**-0.497**	**-0.434**	**-0.423**	**-0.474**	**-0.594**	**-0.146**	**-0.580**	**-0.580**				
	Induced hh income	**0.641**	**0.798**	**0.853**	**0.664**	**0.683**	**0.841**	**0.972**	**1.006**	**1.007**	**1.007**	**1.006**	**1.009**	**1.009**	**1.009**

Table 6.7: Fixed Price Multipliers for Damdama-Bhogpur

		wheat	mustard	maize	paddy	other cereals	vegetable	Cultivated fodder	Village Production	Livestock poultry	Forest Products	High Income	Middle Income	Low Income	Poor Income
Activities	Wheat	1.041	0.042	0.028	0.030	0.019	0.034	0.037	0.019	0.019	0.019	0.006	0.014	0.055	0.014
	Mustard	0.001	1.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.002	0.000
	Maize	0.027	0.029	1.020	0.022	0.016	0.024	0.026	0.016	0.016	0.016	0.005	0.012	0.047	0.012
	Paddy	0.011	0.013	0.010	1.012	0.011	0.011	0.012	0.011	0.011	0.011	0.003	0.008	0.032	0.008
	other cereals	0.003	0.003	0.002	0.002	1.002	0.003	0.003	0.002	0.002	0.002	0.000	0.001	0.005	0.001
	vegetables and fruits	0.010	0.011	0.009	0.011	0.009	1.010	0.011	0.009	0.009	0.009	0.003	0.007	0.027	0.007
	Cultivated fodder	0.010	0.011	0.011	0.013	0.012	0.010	1.012	0.012	0.012	0.012	0.005	0.002	0.028	0.035
	village production	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
	livestock & poultry	0.162	0.241	0.245	0.135	0.141	0.126	0.138	0.141	1.139	0.141	0.244	0.100	0.138	0.056
	fuelwood collection	0.002	0.003	0.002	0.003	0.003	0.002	0.003	0.003	0.003	1.003	0.001	0.001	0.006	0.008
Commodities	Agricultural	0.114	0.140	0.123	0.150	0.143	0.127	0.141	0.143	0.141	0.143	0.043	0.107	0.419	0.101
	non-agricultural items	0.248	0.370	0.376	0.207	0.216	0.193	0.212	0.216	0.213	0.216	0.374	0.154	0.212	0.086
	services (incl travel expd. etc.)	0.007	0.008	0.008	0.008	0.008	0.007	0.008	0.008	0.008	0.008	0.003	0.004	0.012	0.030
	Forest	0.034	0.040	0.037	0.045	0.041	0.036	0.040	0.041	0.040	0.041	0.016	0.008	0.097	0.122
Factor	renting land (for share cropping)	0.552	0.043	0.542	0.544	0.023	0.035	0.038	0.023	0.023	0.023	0.007	0.017	0.069	0.017
	Imputed rent of agri land	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	family labour	0.353	0.925	0.482	0.432	1.218	1.053	1.116	1.218	1.205	1.218	0.287	0.136	0.322	0.199
	hired labour	0.043	0.117	0.045	0.202	0.004	0.012	0.040	0.004	0.004	0.004	0.001	0.003	0.012	0.004
	Seeds	0.061	0.055	0.029	0.025	0.003	0.041	0.043	0.003	0.003	0.003	0.001	0.002	0.007	0.003
	Fertilizer	0.104	0.023	0.021	0.024	0.003	0.093	0.025	0.003	0.003	0.003	0.001	0.002	0.010	0.003
	Manure	0.064	0.190	0.185	0.010	0.004	0.006	0.011	0.004	0.004	0.004	0.001	0.003	0.012	0.003
	Pesticides	0.014	0.002	0.025	0.017	0.001	0.017	0.006	0.001	0.001	0.001	0.000	0.001	0.003	0.001
	tractor / draught animals	0.120	0.059	0.057	0.025	0.003	0.005	0.010	0.003	0.003	0.003	0.001	0.002	0.010	0.002
Capital	Forest	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	agricultural land	-0.025	-0.029	-0.027	-0.032	-0.030	-0.026	-0.029	-0.030	-0.029	-0.030	-0.012	-0.006	-0.071	-0.017
Exrternal cost	High Income (Rs.10,000 and above)	-0.005	-0.005	-0.005	-0.006	-0.006	-0.005	-0.006	-0.006	-0.006	-0.006	-0.002	-0.001	-0.013	-0.065
	Middle Income (Rs. 5,000 -10,000)	-0.018	-0.021	-0.020	-0.024	-0.022	-0.019	-0.022	-0.022	-0.022	-0.022	-0.009	-0.004	-0.052	0.064
	Low Income (Rs. 2,000-5,000)	-0.018	-0.021	-0.020	-0.024	-0.022	-0.019	-0.021	-0.022	-0.021	-0.022	-0.008	-0.004	-0.051	-0.062
	Poor (Below Rs. 2000)	-0.008	-0.009	-0.009	-0.010	-0.009	-0.008	-0.009	-0.009	-0.009	-0.009	-0.004	-0.002	-0.023	-0.028
Institution	High Income (Rs. 10,000 and above)	0.350	0.299	0.355	0.332	0.347	0.307	0.328	0.347	0.343	0.347	1.082	0.045	0.118	0.062
	Middle Income (Rs. 5,000 -10,000)	0.342	0.407	0.390	0.375	0.517	0.452	0.481	0.517	0.511	0.517	0.122	1.063	0.159	0.089
	Low Income (Rs. 2,000-5,000)	0.188	0.244	0.199	0.274	0.218	0.196	0.224	0.218	0.215	0.218	0.052	0.028	1.074	0.040
	Poor (Below Rs. 2000)	0.135	0.143	0.150	0.162	0.165	0.146	0.158	0.165	0.164	0.165	0.039	0.021	0.054	1.029
	Total Production	**1.313**	**1.416**	**1.389**	**1.281**	**1.262**	**1.265**	**1.291**	**1.262**	**1.259**	**1.262**	**0.302**	**0.167**	**0.445**	**0.233**
	Own sector multiplie	**1.041**	**1.001**	**1.020**	**1.012**	**1.002**	**1.010**	**1.012**	**1.000**	**1.139**	**1.003**	**1.082**	**1.063**	**1.074**	**1.029**
	Linkage with other	**0.272**	**0.415**	**0.369**	**0.269**	**0.260**	**0.255**	**0.279**	**0.262**	**0.120**	**0.259**				
	Induced hh income	**1.014**	**1.093**	**1.094**	**1.143**	**1.247**	**1.101**	**1.191**	**1.247**	**1.234**	**1.247**	**1.296**	**1.157**	**1.405**	**1.221**

Table 6.8: Mixed Multiplier for Damdama-Bhogpur

		Wheat	Mustard	Maize	Paddy	Other cereals	Vegetables	Cultivated fodder	Village production	Livestock poultry	Forest Products	High Income	Middle Income	Low Income	Poor Income
Activities	Wheat	0.965	-0.034	-0.022	-0.025	-0.014	-0.029	-0.031	-0.014	-0.014	-0.014	-0.001	-0.011	-0.046	-0.009
	Mustard	-0.001	0.999	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	0.000	0.000	-0.002	0.000
	Maize	-0.023	-0.023	0.985	-0.018	-0.012	-0.020	-0.022	-0.012	-0.012	-0.012	-0.001	-0.010	-0.040	-0.008
	Paddy	-0.008	-0.009	-0.007	0.990	-0.009	-0.009	-0.010	-0.009	-0.009	-0.009	-0.001	-0.007	-0.028	-0.006
	Other cereals	-0.003	-0.003	-0.002	-0.002	0.999	-0.002	-0.002	-0.001	-0.001	-0.001	0.000	-0.001	-0.004	-0.001
	Vegetables and fruits	-0.007	-0.008	-0.006	-0.009	-0.007	0.992	-0.009	-0.007	-0.007	-0.007	-0.001	-0.006	-0.024	-0.005
	Cultivated fodder	-0.007	-0.008	-0.007	-0.010	-0.009	-0.008	0.991	-0.009	-0.009	-0.009	-0.002	-0.001	-0.024	-0.033
	Village production	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
	Livestock & poultry	-0.125	-0.192	-0.200	-0.102	-0.110	-0.094	-0.104	-0.110	0.891	-0.110	-0.210	-0.081	-0.085	-0.030
	Fuelwood collection	-0.016	-0.017	-0.016	-0.023	-0.021	-0.018	-0.020	-0.021	-0.021	-0.021	-0.004	-0.002	-0.054	-0.074
Commodities	Agricultural	0.081	0.096	0.081	0.120	0.114	0.099	0.110	0.114	0.113	0.114	0.009	0.089	0.372	0.075
	Non-agricultural items	0.191	0.295	0.307	0.156	0.169	0.145	0.159	0.169	0.168	0.169	0.322	0.124	0.130	0.045
	Services (incl travel expd. etc.)	0.005	0.005	0.005	0.007	0.007	0.006	0.006	0.007	0.007	0.007	0.001	0.003	0.009	0.029
	Forest	0.025	0.027	0.025	0.036	0.033	0.028	0.031	0.033	0.032	0.033	0.006	0.003	0.083	0.115
Factor	Renting land (for share cropping)	0.511	0.000	0.511	0.511	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Imputed rent of agri land	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Family labour	0.112	0.586	0.149	0.211	1.000	0.851	0.894	1.000	0.989	1.000	0.000	0.000	0.000	0.000
	Hired labour	0.038	0.111	0.041	0.197	0.000	0.007	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Seeds	0.057	0.051	0.026	0.022	0.000	0.037	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Fertilizer	0.099	0.017	0.017	0.019	0.000	0.088	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Manure	0.057	0.182	0.180	0.004	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Pesticides	0.013	0.000	0.024	0.015	0.000	0.016	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	tractor / draught animals	0.114	0.052	0.052	0.020	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Capital	Forest	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Agricultural land	-0.018	-0.019	-0.018	-0.026	-0.024	-0.020	-0.023	-0.024	-0.023	-0.024	-0.005	-0.002	-0.061	-0.083
External Cost	High Income (Rs.10,000 and above)	-0.003	-0.004	-0.003	-0.005	-0.005	-0.004	-0.004	-0.005	-0.004	-0.005	-0.001	0.000	-0.012	-0.016
	Middle Income (Rs. 5,000 -10,000)	-0.013	-0.014	-0.013	-0.019	-0.017	-0.015	-0.017	-0.017	-0.017	-0.017	-0.003	-0.001	-0.045	-0.061
	Low Income (Rs. 2,000-5,000)	-0.013	-0.014	-0.013	-0.019	-0.017	-0.015	-0.017	-0.017	-0.017	-0.017	-0.003	-0.001	-0.044	-0.061
	Poor (Below Rs. 2000)	-0.006	-0.006	-0.006	-0.008	-0.008	-0.007	-0.007	-0.008	-0.007	-0.008	-0.001	-0.001	-0.019	-0.027
Institution	High Income (Rs. 10,000 and above)	0.266	0.187	0.249	0.257	0.277	0.236	0.250	0.277	0.274	0.277	1.000	0.000	0.000	0.000
	Middle Income (Rs. 5,000 -10,000)	0.227	0.251	0.240	0.271	0.417	0.356	0.375	0.417	0.413	0.417	0.000	1.000	0.000	0.000
	Low Income (Rs. 2,000-5,000)	0.136	0.174	0.133	0.227	0.174	0.152	0.176	0.174	0.172	0.174	0.000	0.000	1.000	0.000
	Poor (Below Rs. 2000)	0.096	0.091	0.101	0.128	0.133	0.114	0.123	0.133	0.131	0.133	0.000	0.000	0.000	1.000
	Total Production	**0.756**	**0.674**	**0.694**	**0.780**	**0.795**	**0.794**	**0.773**	**0.795**	**0.797**	**0.795**	**-0.240**	**-0.131**	**-0.346**	**-0.183**
	Own Sector Multipliers	**0.965**	**0.999**	**0.985**	**0.990**	**0.999**	**0.992**	**0.991**	**1.000**	**0.891**	**0.998**	**1.000**	**1.000**	**1.000**	**1.000**
	Linkage with other	**-0.209**	**-0.325**	**-0.291**	**-0.210**	**-0.204**	**-0.198**	**-0.218**	**-0.205**	**-0.094**	**-0.203**				
	Induced hh income	**0.725**	**0.703**	**0.724**	**0.882**	**1.000**	**0.857**	**0.923**	**1.000**	**0.989**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**

Similarly, for Damdama-Bhogpur we see from Table 6.7 that a Re. 1 increase in the production of forest products results in Rs. 1.262 increase in the total production in the village of which its own production increases by Rs. 1.003 while the output of other sectors increases by only Rs. 0.259. The

corresponding increase in the production of forest product results in Rs. 1.247 increase in household income. As mentioned earlier increased demand for the products of sectors that are supply constrained have to be met by sources outside the village thereby resulting in leakage of resources from the village economy. As can be seen from Table 6.8 a Re. 1 increase in the supply of forest products will result in Rs. 0.795 increase in total village production of which the sector's own production would increase by Rs. 0.998 while the output of other sectors would increase by Rs. –0.203, i.e., there is a fall in the output of other sectors. As compared to the fixed multiplier case where the household income increases by Rs. 1.247, the mixed multiplier household income remains the same in response to Re. 1 increase in the supply of forest products. Thus we see that in Damdama-Bhogpur also the expected result holds. That is, as a result of imposition of supply constraints on the forest sector the resultant increase in village output will be less vis-à-vis the scenario observed in the case of existence of excess capacity.

6.2 Income Generation Impact on the Village Economies:

The fixed price and mixed multipliers are used to analyse income generation impacts of production and expenditure in the two villages selected in the study. We start with the economic impact of sectoral production where various village activities, especially those related to the forest considered in the SAM table, are evaluated in accordance with their respective abilities to generate value added in the village economic system. The relative impact of different household groups' expenditure on the value added in the village economy is also considered. The multipliers along with their decomposition are also used to test the relative strength of production and consumption linkages in generating village level income.

(i) Production linkages and village level value added:

Tables 6.9 and 6.10 below give the value-added multipliers (both the fixed price and mixed multipliers) for the major production activities in the villages of Pauti and Damdama-Bhogpur. The mixed multipliers are derived under the assumption of excess capacity in all but agriculture and forest related activities. Consider the fixed price multipliers for both the villages. From Tables 6.9 and 6.10 it can be seen that the forest sector has the highest value added generation in both the villages vis-à-vis the other major sectors of the village economy, the forest sector value added multiplier being 2.291 and 1.246 respectively for Pauti and Damdama-Bhogpur. The agricultural activities have multiplier in the range of 1.432 to 1.867 in Pauti and 0.948 to 1.848 in Damdama. In both the villages, in addition to the forest sector others having a high value added generation are village services, livestock and poultry, and village production in case of Pauti and village production, livestock & poultry and retail trade in Damdama-Bhogpur (refer to Tables 6.9 and 6.10). As pointed out above the fixed price multipliers are calculated

assuming perfectly elastic supply in all the sectors of production. But such an assumption is unrealistic. So when we impose supply constraints in agriculture and forest related sectors the values of the multipliers change. It is evident from the mixed multipliers given in Tables 6.9 and 6.10 below.

Table 6.9: Value-added Multipliers for Pauti Village Production Activities

Production Activities		Fixed price Multipliers	Mixed price Multipliers	MMF/FPM	Mixed Multipliers Ranking
Forest	1.Forest products	2.291	1.007 #	0.440	1
Agriculture	1. Wheat	1.455	0.507 #	0.348	8
	2. Mustard	1.734	0.680 #	0.392	6
	3. Cotton	1.934	0.835 #	0.432	4
	4. Other cereals	1.432	0.461 #	0.322	10
	5. Oil seeds and pulses	1.527	0.497 #	0.326	9
	6. Vegetables & fruits	1.476	0.554 #	0.375	7
	7. Cultivated fodder	1.867	0.761 #	0.407	5
	8. Livestock & Poultry	2.289	1.006 #	0.440	2
Others	1. Village Production	2.274	0.972	0.427	3
	2. Village Services	2.291	1.007	0.440	1

Note: # Denotes that the multiplier is supply driven. That is, the multiplier gives the amount by which value added would increase given a Re. 1 increase in the supply of sectoral output. All other multipliers are demand driven.

Table 6.10: Value-added Multipliers for Damdama-Bhogpur Village Production Activities

Production Activities		Fixed price Multipliers	Mixed price Multipliers	MMF/FPM	Mixed Multipliers Ranking
Forest	1. Forest products	1.246	1.000 #	0.803	1
Agriculture	1. Wheat	0.948	0.662 #	0.698	9
	2. Mustard	1.848	0.698 #	0.377	8
	3. Maize	1.069	0.701 #	0.656	7
	4. Paddy	1.178	0.919 #	0.780	6
	5. Other cereals	1.246	1.000 #	0.803	1
	6. Vegetables & fruits	1.100	0.859 #	0.780	4
	7. Cultivated fodder	1.194	0.929 #	0.778	5
	8. Livestock & poultry	1.233	0.989 #	0.803	2
Others	1. Village Production	1.246	1.000	0.803	1
	2. Retail trade	1.219	0.983	0.806	3

Note: # Denotes that the multiplier is supply driven. That is, the multiplier gives the amount by which value added would increase given a Re. 1 increase in the supply of sectoral output. All other multipliers are demand driven.

The observation that the forest sector has the highest value added generation may not be sustainable if the supply is not perfectly elastic. So the mixed multipliers are presented which assume that the supply of agriculture and forest related activities are inelastic. From Tables 6.9 and 6.10 it is evident that the value-added multiplier of the forest sector falls to 1.007 from 2.291 for Pauti (i.e., 44 % of its fixed price level) and to 1.000 from 1.246 for Damdama-Bhogpur (i.e., 80 % of its fixed price level). The

value-added multipliers for the other sectors are also smaller, a result which follows directly from the assumption of supply constraints in agriculture and forest related activities. Even with the presence of supply constraints, it is evident from Tables 6.9 and 6.10 that in both the villages the forest sector has the highest value added generation potential, albeit much less as compared to fixed multiplier level. The observed variation in the magnitude of fixed price and mixed multipliers presented in Tables 6.9 and 6.10 could be due to the assumption of perfect elastic and perfect inelastic supply conditions in agriculture and forestry sectors. The 'true' multiplier value for a particular sector is most likely lie somewhere between these two extremes.

(ii) Household expenditure linkages:

In addition to determining the aggregate village level effects of sectoral production increases, it is also important to assess the relative economic impact of growth in household expenditure that would result from expanded earnings.

Table 6.11: Value-added Multipliers for Households in Pauti Village

Household type	Fixed price Multipliers	Mixed Multipliers	MMF/FPM	Mixed Multipliers Ranking
Rich Household	2.560	0.015	0.012	2
Poor Household	3.152	0.017	0.011	1

Table 6.12: Value-added Multipliers for Households in Damdama-Bhogpur Village

Household type	Fixed price Multipliers	Mixed Multipliers	MMF/FPM	Mixed Multipliers Ranking
Rich Household	0.4516	0.000062	0.00026	1
Poor Household	0.6221	0.000025	0.00007	2

Fixed price and mixed value added multipliers for the different household groups modelled in the SAM are presented in Tables 6.11 and 6.12 above for Pauti and Damdama-Bhogpur villages. Such multipliers show that an increase in village value added for Re. 1 increases the household expenditure under the assumption of excess capacity in all the sectors (in case of fixed multipliers) and inelastic supply in agriculture and forest related sectors (in case mixed multipliers). From Table 6.11, we see that in Pauti in case of fixed price multipliers the poor household group (comprising of low income class and poor income class) has the most desirable expenditure pattern in terms of generating economic growth in the village. The pattern remains unchanged in case of mixed multiplier although the values substantially. In case of Damdama-Bhogpur village also (refer to Table 6.12) it is the poor household group comprising the poorest two income groups, poor and low income class, have a greater economic growth generating potential vis-à-vis the rich sections of the village. The results however, change in case of mixed multiplier

in this village. The rich household comprising the high and middle income class have the greater economic potential. Note that the multipliers become significantly small for all the households in both the villages in case of mixed multipliers. Such a feature may be observed because of the fact that these households devote a relatively larger share of their budget to supply constrained agricultural and forest output. If the farm output fails to expand to meet the increased demand, then import of agricultural and forest products will increase thereby resulting in a greater leakage from the village economy.

(iii) Production versus consumption linkages:

We have decomposed both the fixed price and mixed multiplier into direct, indirect and induced effects to test for the relative strength of production and consumption linkages for the two villages considered in the study. The induced effect shows the result of including household income and expenditure linkages in multiplier estimation and can therefore be considered as a measure of the strength of consumption linkages. It may be shown that the direct effect is simply the value added per unit of output while the indirect effect is the residual. Tables 6.13 and 6.14 below provide results for both the demand driven and supply constrained sectors for the villages of Pauti and Damdama-Bhogpur respectively. The first column in each panel of both the tables provides the total value added multiplier taken directly from the fixed price and mixed multipliers for the sectors listed in the left. Columns 2-4 decompose the multipliers into direct, indirect and induced effects, while column 5 gives induced effect as a percentage of total multiplier. From the tables it can be seen that, under the assumption of complete excess capacity, the consumption linkages account for about 54-55 % of the total value added in case of Pauti and about 20-22 % in case of Damdama-Bhogpur. When the supply constraint restriction is imposed on the agriculture and forest related activities, the consumption linkages account for approximately 0.7-1 % of the total value added in case of Pauti and about 0.003 % in case of Damdama-Bhogpur. The implications of such features are that the consumption linkages are not at all strong as was conventionally thought to be. The results of the present study, therefore, run similar to the findings of Lewis and Thorbecke (1992).

Table 6.13: Decomposition of Value Added Multipliers into Direct, Indirect, and Induced Effects for Village Pauti

Production Activities		Fixed Price Multiplier Decomposition					
		Total Multipliers	Direct Effect	Indirect Effect	Induced Effect	Induced/ Total	Induced/(total – direct)
Forest	1. Forest products	2.291	1.000	0.041	1.250	0.545	0.968
Agriculture	1. Wheat	1.455	0.501	0.194	0.760	0.522	0.796
	2. Mustard	1.734	0.673	0.090	0.970	0.559	0.915
	3. Cotton	1.934	0.828	0.061	1.045	0.540	0.945
	4. Other cereals	1.432	0.455	0.182	0.794	0.555	0.813
	5.Oilseeds and pulses	1.527	0.492	0.089	0.946	0.620	0.914
	6. Vegetables & fruits	1.476	0.549	0.107	0.820	0.555	0.884
	7. Cultivated fodder	1.867	0.754	0.085	1.027	0.550	0.923
	8. Livestock	2.289	0.999	0.041	1.250	0.546	0.968
Others	1. Village Production	2.274	0.965	0.103	1.206	0.530	0.921
	2. Village Services	2.291	1.000	0.041	1.250	0.545	0.968

Production Activities		Mixed Multiplier Decomposition					
		Total Multipliers	Direct Effect	Indirect Effect	Induced Effect	Induced/ Total	Induced/(total -direct)
Forest	1. Forest products #	1.007	1.000	0.000	0.007	0.007	1.000
Agriculture	1. Wheat #	0.507	0.501	0.001	0.005	0.009	0.845
	2. Mustard #	0.680	0.673	0.000	0.006	0.009	0.946
	3. Cotton #	0.835	0.828	0.000	0.006	0.008	0.985
	4. Other cereals #	0.461	0.455	0.001	0.005	0.010	0.881
	5.Oilseeds and pulses #	0.497	0.491	0.000	0.006	0.012	1.000
	6. Vegetables & fruits #	0.554	0.549	0.000	0.005	0.009	1.000
	7. Cultivated fodder #	0.761	0.754	0.000	0.006	0.008	0.982
	8. Livestock #	1.006	0.999	0.000	0.007	0.007	1.000
Others	1. Village Production	0.972	0.965	0.000	0.007	0.007	1.000
	2. Village Services	1.007	1.000	0.000	0.007	0.007	1.000

Note: # Denotes that the multiplier is supply driven. That is, the multiplier gives the amount by which value added would increase given a Re. 1 increase in the supply of sectoral output. All other multipliers are demand driven.

Table 6.14: Decomposition of Value Added Multipliers into Direct, Indirect, and Induced Effects for Village Damdama-Bhogpur

Production Activities		Fixed Price Multiplier Decomposition					
		Total Multipliers	Direct Effect	Indirect Effect	Induced Effect	Induced/Total	Induced/(total -direct)
Forest	1. Forest products	1.246	1.000	-0.031	0.277	0.222	1.126
Agriculture	1. Wheat	0.948	0.662	0.072	0.214	0.225	0.747
	2. Mustard	1.848	0.698	0.941	0.209	0.113	0.182
	3. Maize	1.069	0.701	0.157	0.211	0.197	0.574
	4. Paddy	1.178	0.919	-0.012	0.271	0.230	1.045
	5. Other cereals	1.246	1.000	-0.031	0.277	0.222	1.126
	6. Vegetables & fruits	1.100	0.859	0.004	0.238	0.216	0.985
	7. Cultivated fodder	1.194	0.929	0.006	0.259	0.217	0.977
	8. Livestock & poultry	1.233	0.989	-0.031	0.274	0.222	1.126
Others	1. Village Production	1.246	1.000	-0.031	0.277	0.222	1.126
	2. Retail trade	1.219	0.983	-0.036	0.272	0.223	1.151

Production Activities		Mixed Multiplier Decomposition					
		Total Multipliers	Direct Effect	Indirect Effect	Induced Effect	Induced /Total	Induced/(total -direct)
Forest	1. Forest products #	1.00002	1.00000	0.00000	0.00003	0.00003	1.12500
Agriculture	1. Wheat #	0.66159	0.66156	0.00001	0.00002	0.00003	0.66667
	2. Mustard #	0.69766	0.69762	0.00002	0.00002	0.00003	0.52439
	3. Maize #	0.70146	0.70142	0.00002	0.00002	0.00003	0.43721
	4. Paddy #	0.91903	0.91901	0.00000	0.00002	0.00002	0.95455
	5. Other cereals #	1.00002	1.00000	0.00000	0.00002	0.00002	1.00417
	6. Vegetables & fruits #	0.85857	0.85855	0.00000	0.00002	0.00003	1.15500
	7. Cultivated fodder #	0.92886	0.92884	0.00000	0.00002	0.00003	1.12273
	8. Livestock & poultry #	0.98947	0.98945	0.00000	0.00003	0.00003	1.16087
Others	1. Village Production	1.00002	1.00000	0.00000	0.00002	0.00003	1.00000
	2. Retail trade	0.98280	0.98251	0.00027	0.00002	0.00002	0.07655

Note: # Denotes that the multiplier is supply driven. That is, the multiplier gives the amount by which value added would increase given a Re. 1 increase in the supply of sectoral output. All other multipliers are demand driven.

Inclusion of direct effects, which are exogenously determined in this framework and which can be attributed neither to production nor to consumption linkages, in the denominator in column 5 of the Tables 6.13 and 6.14 results in an underestimation of the consumption linkages. Hence, in the last column in the tables we present the induced effect as a percent of total multiplier minus the direct effects. The results show that the consumption linkages explain a much larger portion of the value of the income multiplier when the direct effects are excluded.

On the basis of the above analysis, it can be said that when we consider induced effects as a percent of total multipliers the consumption linkages explain only a very small portion of the value of the

income multiplier in both the villages. But when we remove the exogenous effects from the total effects, the consumption linkages explain a large portion of the value of the income multiplier. Under the assumption of supply constrained agriculture and forest sectors, the consumption linkage account for an even greater portion of the value added multipliers (excluding direct effects). In case of the forest products the consumption linkages are very strong in explaining the total value added multipliers vis-à-vis the other sectors.

(iv) Distributional Impact of Income Generation:

An interesting issue before the policy formulation engaged in poverty alleviation exercise is the contribution of different production activities, directly or indirectly, to the incomes accruing to the poor socio-economic household groups. The overall contribution of an increase in the output of an activity is measured by the fixed price multiplier originating with that particular production activity and destined to the specific poor household group under consideration. As pointed out earlier the multiplier can be decomposed into two multiplicative effects, the distributional effects and the interdependency effect.

The distributional effects include incomes received by a given household group from factors such as labour and land provided by that group and used as primary inputs in the production of the commodity under consideration. It also includes the indirect factor incomes received by the same group from the intermediate inputs required in the production of that commodity and incomes accruing to that group from transfers and remittances from other socio-economic household groups.

The interdependency effects capture the indirect spending and re-spending effects by the groups that benefited, income-wise, from the initial increase in output. This effect reflects the extent of integration within an economy, on both the consumption and production sides. The more the consumers spend on domestic goods and services, the more diversified are their consumption patterns, the larger will be the interdependency effect.

Tables 6.15 and 6.16 give the decomposition of multipliers from production activities to incomes received by the poor socio-economic groups (i.e., the poor income class and low-income class) in the villages of Damdama-Bhogopur and Pauti respectively. It may be recalled that the present analysis classified the households into four groups namely, the rich-income class having a monthly income which is above Rs 10,000, the middle-income class having a monthly income which lies between Rs 10,000 - 5,000, low-income class with monthly income lying in the range Rs. 5,000 – 2,000, and finally the poor income class having monthly income below Rs 2,000. The last two groups of household i.e., the low and poor income class are considered to constitute 'the poor' in the village. The landless and the marginal farmers, as mentioned earlier belong to the poor and low-income class, while the large and medium landowners fall under the category of high and middle-income class.

From Table 6.15 it is evident that the total multipliers originating from the retail trade is the highest followed by paddy, mustard, and forest products in case of Damdama-Bhogpur village. Such a result indicates that these activities make relatively high contributions towards poverty allevialtion in the village (0.4620, 0.4360, 0.3862 and 0.3832 respectively). The main reason for these high values as compared to those in the other sectors appears to be the high magnitude of their distributional effect. In other words, income of the poorer section of the village would increase by respectively 0.3875, 0.3542, 0.2468, and 0.3061 for one unit increase in the output of retail trade, paddy, mustard, and forest products.

An examination of Table 6.16 for village Pauti would reveal that the total multipliers originating from forest and village services is the highest (0.6803 for both the sectors). The main reason for this appears to be high distributional effect, which is 0.2938 for both the activities. This means that Re. 1 increase in the output of these two sectors would result in a Rs. 0.2938 increase in income of the two poor household groups. As is evident from the table, the distributional effects of agricultural activity like wheat, vegetables and fruits, and other cereals on the poor group of households is low as compared to activities related to forest.

On the basis of the above results, it can be said that in both the villages the distributional effect of forest as compared to the other activities on the poor household groups is higher. Thus one can conclude that the forest sector has the potential to contribute significantly towards alleviating poverty in both the villages

Table 6.15: Decomposition of Multipliers from Production Activities to Poverty Groups for the village Damdama-Bhogpur

Distributional Effects (PA_j^d)	Wheat	Mustard	Maize	Paddy	Other cereals	Oilseeds & pulses	Vegetables and fruits	Cultivated fodder	Village production	Livestock & poultry	Forest Products	Retail trade
Poverty	0.2322	0.2648	0.2346	0.3542	0.3061	0.1477	0.2655	0.2981	0.3061	0.3028	0.3061	0.3875
Low Income (Rs. 2,000-5,000)	0.1362	0.1741	0.1333	0.2267	0.1735	0.0973	0.1518	0.1755	0.1735	0.1717	0.1735	0.2569
Poor Income (Below Rs. 2000)	0.0960	0.0906	0.1013	0.1275	0.1326	0.0503	0.1137	0.1225	0.1326	0.1312	0.1326	0.1307

Interdependency Effects (PA_r^d)	Wheat	Mustard	Maize	Paddy	Other cereals	Oilseeds & pulses	Vegetables and fruits	Cultivated fodder	Village production	Livestock & poultry	Forest Products	Retail trade
Poverty	1.3891	1.4588	1.4893	1.2309	1.2520	2.0931	1.2880	1.2819	1.2520	1.2520	1.2520	1.1921
Low Income (Rs. 2,000-5,000)	1.3802	1.3992	1.4918	1.2071	1.2548	1.9508	1.2892	1.2748	1.2548	1.2547	1.2548	1.1664
Poor Income (Below Rs. 2000)	1.4016	1.5735	1.4860	1.2732	1.2484	2.3683	1.2864	1.2920	1.2484	1.2484	1.2484	1.2426

Fixed Multiplier (PA_r^m)	Wheat	Mustard	Maize	Paddy	Other cereals	Oilseeds & pulses	Vegetables and fruits	Cultivated fodder	Village production	Livestock & poultry	Forest Products	Retail trade
Poverty	0.3226	0.3862	0.3493	0.4360	0.3832	0.3090	0.3419	0.3821	0.3832	0.3791	0.3832	0.4620
Low Income (Rs. 2,000-5,000)	0.1880	0.2436	0.1989	0.2736	0.2177	0.1898	0.1957	0.2238	0.2177	0.2154	0.2177	0.2996
Poor Income (Below Rs. 2000)	0.1346	0.1426	0.1505	0.1624	0.1655	0.1192	0.1463	0.1583	0.1655	0.1637	0.1655	0.1624

Table 6.16: Decomposition of Multipliers from Production Activities to Poverty Groups for the Village Pauti

Distributional Effects (PA_j^d)	Wheat	Mustard	Cotton	Other cereals	Oilseeds & pulses	Vegetables & fruits	Cultivated fodder	Village production	Livestock & poultry	Forest Products	Village services
Poverty	0.1775	0.2356	0.2535	0.2181	0.2563	0.1759	0.2446	0.2835	0.2935	0.2938	0.2938
Low Income (Rs. 2,000-5,000)	0.1150	0.1706	0.1933	0.1072	0.1271	0.1457	0.1894	0.2466	0.2553	0.2556	0.2556
Poor Income (Below Rs. 2000)	0.0626	0.0650	0.0602	0.1109	0.1292	0.0302	0.0553	0.0369	0.0382	0.0382	0.0382

Interdependency Effects (PA_r^d)	Wheat	Mustard	Cotton	Other cereals	Oilseeds & pulses	Vegetables & fruits	Cultivated fodder	Village production	Livestock & poultry	Forest Products	Village services
Poverty	2.6088	2.3469	2.3059	2.3421	2.2107	2.5825	2.3629	2.3821	2.3167	2.3155	2.3155
Low Income (Rs. 2,000-5,000)	3.1089	2.5801	2.4535	3.3150	3.0689	2.6166	2.4930	2.3493	2.2847	2.2837	2.2837
Poor Income (Below Rs. 2000)	1.6895	1.7355	1.8321	1.4013	1.3665	2.4182	1.9169	2.6013	2.5303	2.5286	2.5286

Fixed Multiplier (PA_r^m)	Wheat	Mustard	Cotton	Other cereals	Oilseeds & pulses	Vegetables & fruits	Cultivated fodder	Village production	Livestock & poultry	Forest Products	Village services
Poverty	0.4632	0.5529	0.5846	0.5109	0.5667	0.4542	0.5780	0.6753	0.6799	0.6803	0.6803
Low Income (Rs. 2,000-5,000)	0.3575	0.4400	0.4743	0.3555	0.3901	0.3813	0.4721	0.5793	0.5832	0.5837	0.5837
Poor Income (Below Rs. 2000)	0.1057	0.1129	0.1103	0.1554	0.1766	0.0730	0.1059	0.0960	0.0966	0.0967	0.0967

7. Policy Implications of the Study

The foregoing analysis on two villages of Haryana examines the linkages prevailing between the forest sector and the village economy adopting a SAM framework. An attempt is made to assess the economic structure of the villages and the scope of making use of forest resources in production, consumption and income generation processes. Based on the multiplier analysis of the village SAM some policy suggestions are made for strengthening the village-forestry relationship keeping in view the accrual of benefit to the village population in general and poorer sections in particular.

Pauti:

It has been observed above that the multiplier analysis established the linkages between the forest sector and the village economy. For example, Rs. 1000 injection of resources in the forest sector results in an increase of forest sector production by Rs. 1004 and total village production activities by Rs. 1197. Such an injection of resources in the forest sector also has an impact on the factors of production, which are engaged in the production activities. The total value added of the forest sector increases by Rs. 1152. The increase in total village production activities including the forest sector and an increase in factors of production also results in an increase of induced household incomes by Rs. 1161. Consequently the poorer section in the village receive Rs. 341 while the remaining Rs. 820 accrues to the rich in the village. Thus we see that although the poor do benefit from an increased household income the major share of it accrues to the richest household groups in the village.

The injection of resources in the forest sector also results in an increase in fuelwood collection activity by Rs. 1004, implying an increase in fuelwood consumption by the households. Burning of fuelwood for cooking, which is one of the major sources of indoor air pollution, has an adverse effect on the health of the household. The medical expenditure incurred by the household to treat diseases related to indoor air pollution is expected to increase by Rs. 48.

The direct and indirect income receipts of the household from different forest activities indicate the distributional effect of these activities. We see in Pauti, due to Rs. 1000 injection in the forest sector the poor group receives Rs. 294 in the form of direct and indirect income. From this income the share of low and poor income class being Rs. 256 and Rs. 38 respectively.

Damdama-Bhogpur:

From the multiplier analysis for the village Damdama-Bhogpur we see the linkages between the forest sector and the village economy. For example, Rs. 1000 injection of resources in the forest sector

results in an increase of forest sector production by Rs. 1000 and total village production activities by Rs. 1372. Such an injection of resources in the forest sector also has an impact on the factors of production, which are engaged in the production activities. The total value added of the forest sector increases by Rs. 1352. The increase in total village production activities including that of the forest sector and consequent employment of factors of production result in induced household incomes of Rs. 1354. Of this increase in household income the poorer section in the village receive only Rs. 417 while the remaining Rs. 937 accrue to the rich in the village. Thus we see that although the poor do benefit from an increased household income the major share of it accrues to the richest household groups.

The injection of resources in the forest sector also results in an increase in fuelwood collection activity by Rs. 1003. Burning of additional quantity if fuelwood for cooking, which is one of the major sources of indoor air pollution, has an adverse effect on the health of the household. The medical expenditure incurred by the household to treat diseases related to indoor air pollution is expected to increase by Rs. 72.

The direct and indirect income receipts of the households from different forest activities indicate their distributional effect. In Damdama-Bhogpur due to Rs. 1000 injection in the forest sector the poor group receives Rs. 306 in the form of direct and indirect income receipts. From such an income, the shares of low and poor income class are Rs. 173 and Rs. 133 respectively.

On the basis of the above findings it can be said that exogenous interventions in forestry sector can be made for the benefit of the poorer sections. Such interventions may take two forms:

a) Intervention of social forestry type, where the forests are grown over panchayat lands and the stock of trees remain the property of the village panchayat. Consequently the income generation from such a scheme accrues to the village panchayat. Benefits of this scheme is reaped by the villagers indirectly as the income earned through auctioning of forest grown under this scheme is utilised by the panchayat for improving the infrastructure of the village. Poorer sections of the village, therefore, benefit indirectly from the improved infrastructural facilities and directly from the increased availability of forest products like fuelwood, fodder and other non-timber forest products. Under this option the benefits accruing to individual households is difficult to quantify.

b) Direct intervention to increase the forest resources. This route includes increase of forest resource regeneration of degraded forests, bringing the scrublands under forests, bringing tracts of lands under plantation forest in the village wherever available. Details of village specific feasible plantation in this respect are discussed elaborately subsequently.

Recommendation for Afforestation programme:

In view of the supply constraints faced by the poor households with respect to fuelwood, fodder and non timber forest products, an afforestation program should be able to specify the amount of forest area that would be required to ease the supply constraint and recommend species of plants that will be suitable for producing the required varieties of forest products. The afforestation program should be able to take into account the available area that may be utilised for such activities. In the given context of Rewari and Panchkula districts in Haryana the shortage of fuelwood and fodder affects the basic livelihood and subsistence aspect and therefore maybe assigned primary importance. Timber and non-timber forest products are important in so far as they become complementary resources for enhancement of income generation.

Afforestation for Fuelwood and Fodder Supply in Rewari and Panchkula Districts

The villages, which are adjacent to the forest, obtain most of their fuelwood from forests. However, a substantial amount of cattle dung cakes are also used as a fuel, in both the districts, with Rewari being higher as there is relatively less forest than the district Panchkula. The cattle dung being a good fertilizer and a bad fuel it is therefore recommended that over time it should be replaced by fuelwood. In a situation where all the cattle dung is replaced by the forest wood, the total fuelwood demand of the district will increase. Including such possibilities we have estimated the forest land requirement in each of the two districts under consideration. Details are given in the following:

Rewari

Fuelwood: Estimate of fuelwood consumption for the district has been made with a consumption rate of 1.3 kg/person/day. According to this estimate fuelwood demand for the entire district would amount to 298,200.8 tons per year. Taking into consideration the mean annual increment of the existing forest area of 2900 hectares for the Rewari district, the sustainable fuelwood supply would be 50,906 tons. This would require an additional 14,088 hectares of land to be brought under forests.

Fodder: The total estimated annual fodder consumption by the total livestock of the district amounts to 2,015,334 tons. In this the forest leaves contribute to the to the tune of 58,225 tons. According to our calculation (based on mean annual increment), it would require 18,791 hectares of forestland to supply the required fodder for the whole district.

The district has 19,000 hectares of available fallow and wasteland, which can be brought under forest plantation. After making a judicious use of this land for fuelwood and fodder plantation any deficiency in demand can be met by conscious attempt to increase the density of the forest. Rewari being an arid region and adjacent to the desert only xerophytic plants can grow. The following species of plants may be considered for extensive plantation in the additional area that may be brought under the afforestation programme.

List of Fuelwood varieties of trees

Kikar (*Acacia nilctica Var.Indica)*

Vilayati kikar (*Prosopis juliflora*)

Safeda (*Eucalyptus*)

Jal (*Salvadora oleoides*)

Khejri (*prosopis cineraria*)

List of Fodder Species

Bad-Ber *(Zizyphus mauretania)*

Kikar (*Acacia nilctica Var.Indica)*

Peepal (*Ficus religiosa*)

Dub-grass (*Cyanodon dactylon*)

Khejri (*prosopis cineraria*)

Dab *(Desmostachya bipinnata)*

Anjan (*Cenchrus ciliaris*)

Non-Timber Forest Product

Arand *(icinus communis)*

Khajur (*Phoenix sylvestis*)

Dhak (*Butea monosperma*)

Kair *(Caparis desidua)*

Jal (*Salvadora oleoides*)

Koomta *(Acacia senegal)*

Papri (*Holoptelea integrifolia*)

Bakain *(Melia azedarach)*

Panchkula

Fuelwood: Estimate of the total fuelwood consumption for the district has been made with a consumption rate of 1.68 kg/day/person. According to this estimate, the fuelwood demand for the whole district would be 159770.7 tons. Taking into consideration the mean annual increment of wood of the forest, the total supply would be 103,094 tons per year. This would imply shortfall 149,461.3 tons. To meet this deficit an additional 1,044 hectares of forestland would be required.

Fodder: The estimated total yearly consumption of fodder by the livestock in the district amounts to 159,770 tons, in which the forest leaves constitute 126,552 tons (the rest being agricultural residues). According to our calculation, it would require 913 hectares of forestland to supply leaves towards fodder for the whole district of Panchkula.

The district has 1900 hectares of forest land. However, as an estimate of available fallow and wasteland in the district are not available it is difficult to recommend whether the land comprising of forest, fallow and waste would be sufficient to meet the additional demand for fuelwood and fodder. Perhaps it would be prudent to utilize the available surplus degraded land for fuelwood and fodder plantation to start with. If such an attempt fails to meet the requisite demand the option of increasing the density of the forest has to be exercised. In view of the deficit of fodder availability in the state of Haryana, its cultivation may also be a useful source of income generation for the poor households in the rural areas. The present study therefore suggests the following varieties of fuelwood and fodder species to be considered for plantation.

List of the Fuelwood species.

Bakli *(Anogeissus latifolia)*
Bamboo *(Dendrosalamus stristus)*
Kikar *(Acacia nilotica)*
Jhingan *(Lannea coromandelica)*

List of Fodder Species

Grasses

Cenchrus ciliaris
Cenchrus setigerus
Panicum antitodale
Crysopogon fulvus

Dichanthuim annulum
Congo-signal grass

Legumes
Stylosanthes hamata
Stylosanthes scabra
Stylosanthes guianensis

Trees
Bauhinia variegata
Albizzia lebbeck
Leucaena lucocephala
Morus alba (Mulberry)
Grewia optiva.

Taking into account the ground realities of the two districts we have suggested for an increased supply of fuelwood from the forests as a useful resource base. However, such a measure is intended to be a short-term solution. Associated health costs because of indoor air pollution, we have noticed in course of our analysis, would compel us to keep the option open for substitution of fuelwood with cleaner fuels in the long run. Such a possibility is likely to emerge as the level of income improves and better technological solutions are initiated.

8. Summary and Conclusion

Intervention in the forest sector with the objective of poverty reduction has been a focal point of many developmental agencies. Benefits derived by the rural poor from the forest the resources like timber, non-timber forest products and environmental services are often taken into account while assessing the options for effective intervention.

Poverty-forestry link, however, remains controversial issue. While poor people's role in forest degradation due to over exploitation of its resources does not enjoy consensus, the poverty reduction potential of forest products on which the poor depend most is not yet resolved. The intervention strategy of most of the practitioners therefore is based on case specific micro-level analysis.

As the dependence of rural poor on each category of forest resource differs, the correspondence between resource-type and category of rural poor is to be examined through a framework capable of comprehensively capturing the interdependence between forest and the economy functioning in its fringe area. A social accounting matrix (SAM) framework seems appropriate for analyzing such micro-level inter sectoral linkages.

The present study generates a set of empirical results on the extent and the nature of economic linkages between the village economy and forest resources in two villages of the state of Haryana, India. The analysis is based on the income generating multipliers derived from a village level social accounting matrix framework.

Making use of the SAM technique, an attempt is made to capture both indirect and direct effects of exogenous policy-induced changes on forest resources. Findings of the study can be used as a basis for intervention in the forest sector for poverty reduction. By selecting two villages located in different climatic zones, the study enlarges the scope of extending the results to other villages of the state with similar economic conditions.

The framework developed in the exercise is based on an extended SAM and incorporates the effects of forest related environmental services like soil degradation, carbon sequestration and bio-fuel use on health. Thus the impact of income generation by households when resource degradation process is resorted to is addressed.

The study aims at assessing (a) the potential of forest based production activities in the generation value addition, (b) the inducement provided by various household groups' expenditure patterns in increasing village income, (c) the strength of forest production and consumption linkages in stimulating the overall income growth of the village and (d) the poverty reduction features of production activities in forest through generation of distributive effects. Two sets of exercises assuming non-constraint and constraint supply capacities of forest and agriculture sectors have been undertaken.

When an assumption of supply constraints in the forestry sector is brought in, the magnitude of the impact due to an exogenous shock transmitted through the various production activities or household groups diminishes. If complete excess capacity in the village forest is assumed, stimulating demand is sufficient to encourage increases in output and income. Under such an assumption, the agricultural sector, which is also supply constrained does not increase output production. So policy has to intervene from the supply side. The relative impact of different production activities on household groups changes under assumptions of capacity constraints in the economy.

The present analysis finds that forest activities have an advantage over agricultural ones in generating income. Both demand driven and supply-constrained formulations of the analysis point out that forest products have higher value addition capability. However, the extent of income augmentation from forest activities is likely to be affected by supply elasticities of its products. Value-added multiplier under assumptions of perfectly inelastic supply in forest is only 44% of the level under assumptions of perfectly elastic supply.

At the household level, forest based activities perform better than agriculture income generation. Relatively richer categories of households gain more than the poorer groups from such a process. This finding therefore shows that the distribution of income is difficult to change by stimulating the increments in forest output only.

Without the imposition of supply constraints among sectors of the village economy, expenditure of the two poorer household groups inducing a higher income growth can be projected. However, if the forestry sector has an inelastic supply response, richer households of the village would stimulate income growth most through their expenditure. The exogenous intervention in the forestry sector therefore, may have to focus on the reduction of its supply-constrained segments.

Results of the study indicate the relative strength of production over consumption linkages in the generating village economy's growth. However, when a supply-constrained forest sector exists, consumption linkages may account for an even greater portion of the value of income multipliers (excluding direct effects).

On the basis of the results obtained from the multiplier analysis two forms of exogenous interventions in forestry sector are proposed for the benefit of the poorer sections:

a) intervention of social forestry type, where the forests are grown over panchayat lands and the stock of trees remain the property of the village panchayat, and
b) direct intervention to increase the forest resources.

8.1 Limitations of the Study:

Notwithstanding the above findings some of the important limitations of the SAM multipliers cannot be overlooked. Although the SAM model captures the economic linkages among agricultural production-forestry as well as households-forestry, it suffers from the underlying assumptions of linear, fixed proportion technology. The fixed price multipliers are based on demand driven system. The presence of market imperfections is likely to cause prices not to be exogenous and constant. Moreover, resource constraints will make the prevalence of unchanged price untenable. Introduction of supply constraints in agriculture and forest activities in the present study and adoption of fixed multipliers may have produced better results but the substitution responses which may emerge from production and consumption sides have remained beyond the purview of the analysis.

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Annexure-1

Methodology for Estimation of Soil Erosion

Damdama-Bhogpur

The soil erosion was estimated employing the Universal soil loss equation (USLE) by assuming it to be a function of various factors such as rainfall, compactness of the soil, slope and the slope length, vegetation cover and erosion control practice factor. The soil loss from the village agricultural land was estimated using the USLE. For estimating the soil loss, the village was divided into various slopes where agriculture is being carried out on the village map obtained from the land revenue department. Five such slopes were identified. The slopes of the individual pockets were measured using dumpy levels and theodolite. Individual land holding of each landowner in each slope was calculated from the recorded landholding records (Jamabandi) of the land revenue department (Patwari, Pinjore) and verification of the same from the landowner himself. Once the share of arable land of each landowner in each single slope had been ascertained, the annual soil loss was estimated using the USLE. The Universal soil loss equation is a product of six coefficients as described below:

$$E = R \times K \times L \times S \times C \times P$$

where, E is soil loss (tons/ha/yr), R is rainfall erodivity factor, K is soil erodivity factor, L is slope length factor, S is slope steepness factor, C is cover and management factor, P is erosion control practice factor. Most of the factors were obtained from the Central Soil and Water Conservation Research and Training Institute (CSWCRTI), Dehradun, except the rainfall and the slope value. The values for the various factors are given in Table A1.

Table A1: Soil Erosion Factors for Damdama-Bhogpur

Sl No	Name of the slope	Rainfall factor (R)	Soil erodivity factor (K)	Slope factor (LS)	Cover and management factor (C)	Erosion control practice factor (P)
1	Slope 1	569	0.35	0.481	0.61	0.38
2	Slope 2	569	0.35	0.32	0.61	0.38
3	Slope 3	569	0.35	0.61	0.61	0.38
4	Slope 4	569	0.35	0.75	0.61	0.38
5	Slope 5	569	0.35	0.51	0.61	0.38
6	Slope 6	569	0.35	0.35	0.61	0.38

The values for LS were calculated separately for the six different slopes using the slope value for Damdama-Bhogpur. The rainfall data was obtained from the tehsil office Kalka and the slope was calculated by measuring it manually using dumpee level and theodolite. By multiplying all these factors the total soil annual erosion from various slopes was calculated, then further the loss of soil for each person annually was calculated having in the six slopes. These figures in tons per hectare were summed up for to obtain the total soil loss of each landowner.

Pauti

In Pauti village the same methodology as outlined above for Damdama-Bhogpur was adopted. In this terrain only two slopes were identified and the arable amount of land for each landowner in each slope was identified using the same methodology as described above. The rainfall data was collected from the district collector's office and rest other coefficients were obtained from the CSWCRTI, Dehradun. The factors obtained for Pauti are described in Table A2.

Table A2: Soil Erosion Factors for Pauti

Sl No	Name of the slope	Rainfall factor (R)	Soil erodivity factor (K)	Slope factor (LS)	Cover and management factor (C)	Erosion control practice factor (P)
1	Slope 1	569	0.35	0.35	0.61	0.75
2	Slope 2	569	0.35	0.32	0.61	0.75

These factors were multiplied to calculate the soil loss from each slope. The total soil loss for each landowner was also estimated and then summed up to obtain soil loss for each individual. The total loss for each individual was then summed up to obtain the total soil loss of the village.

Annexure-2

Methodology for Estimating Annual Carbon Sequestration by the Forests

Damdama-Bhogpur

The amount of carbon sequestered in the forests of Damdama-Bhogpur has been calculated from the annual increment of the growing stock. The forest area adjoining the village is 273.7, 132.0 and 12 hectares and the dominant tree species in the forest area are Khair (*Acacia catechu*), Chaal (*Annogeissus latifolia*) and Jinghan (*Lannea coromandelica*). There are certain factors for efflux of carbon from the system such as logging of timber, extraction of the fuelwood by the villagers, leaves as fodder, which have been separately calculated and deducted from the annual carbon sequestration in the forests.

Growing stock of the forest resources has been estimated by measuring the tree diameter at breast height (DBH) for all the tree species in a circular area of 15m. radius (404.14 sq.m.). Trees of all species from ten such circles were recorded from forest area adjoining the village, with a separation of at least 100 mts distance between the circles. The trees were then grouped according to their species and further sub-grouped according to their girth size within the species. Few trees of ornamental and medicinal varieties, such as *Cassia fistula*, *Zizypus* sp. which were found occasionally, were clubbed under miscellaneous. The volume of the trees in cubic meters was found out with the help of local volume tables of different dominant species given in the working plan for the forest of Panchkula and Pinjore ranges of Morni-Pinjore forest division (2001-02 to 2015-16).

The annual increment or the yield was estimated by Von mantel's formula, also adopted by the forest department, which is,

$$Y = 2 \times GS/R$$

where Y is the yield, GS is growing stock and R is rotation of years. The rotation of years varies from tree to tree. R is between 15-20 years for most of the species growing in this area. The total annual increment from the ten circles was summed up. The total area of the ten circles were also summed up and converted into hectare by dividing it with 100,00. Using these figures of total annual increment and total area the annual increment per hectare was worked out. Using the estimate of annual increment per hectare, the annual increment for the entire forest area adjoining the village was calculated from where the representative circles were taken. The annual increment was converted to biomass in tones by multiplying it with 0.95, which was further converted to carbon in tonnes by multiplying it with 0.45 (IPCC, 1995).

It is assumed that the growing stock dose not include small branches and the leaves. Therefore, these have been separately calculated. It is assumed that a specific fraction (volume in cum) of the

growing stock is the volume of leaves, and this volume of leaves for different species annually added, as the leaves of the trees fall of during winters and re-grow during spring. The amount of carbon stored in the leaves (tonnes) was also calculated similarly and added with the total annual increment of carbon of the forest.

Similarly the total logging by forest department in the forest area, collection of fuelwood by the villagers and the collection of leaves for fodder were estimated and converted into carbon by the conversion factors adopted above and deducted from the total annual carbon sequestered in the forest.
The net carbon sequestration by the forest was estimated by adding the annual increment of carbon (in tones) with the carbon sequestered in the leaves (in tones) and deducting the efflux of carbon such as logging of timber, fuelwood extraction and leaves by the villagers (in tones).

Pauti

The total forest area adjoining the village Pauti is 132 hectares. The forest is dominated by species such as Kikar (*Acacia nilotica*), Ulloo neem (*Alanthus excelsa*), Safeda (*Eucalyptus*), Jand jandi (*Prosopis cineraria*), Babool (*Acacia jacquemontii*). To estimate the growing stock of this forest a separate exercise of recording tree diameter at breast height in small circles has not been carried out. The number of trees classified according to their girth diameter provided in the working plan of the forest of Mahendergarh forest division (1999-2000 to 2008-09) has been relied upon. Table for conversion of girth size to volume was used as provided in the working plan of forest to calculate the growing stock in cubic meters. The conversion tables adopted here are broadly of two types one for the *Eucalyptus* sp. and another for rest of the species. From the growing stock annual increment was calculated adopting the Von mantel's formula as described above. The incremental leaf of the forest was also calculated as described earlier. Thereafter the components, which were responsible for efflux of the carbon from the system, such as yearly logging by forest department, removal of fuelwood and leaves for fodder by the villagers, were calculated adopting same methodology as described above.

The volume was converted to biomass (in tonnes) and thereafter to carbon by adopting the conversion coefficient provided by the IPCC, 1995 guidelines.

The net carbon sequestration by the forest was calculated by adding the carbon sequestered by the leaves of the forest with the annual increment of carbon of the forest and deducting the transport of carbon in terms of the removal of forest products such as yearly timber logging, removal of fuelwood and leaves.

Annexure 3 – Questionnaire canvassed for Household Survey in the villages, Pauti and Damdama-Bhogpur

1. Household Particulars

1.1 Name of the Head of the Household **1.2 Does the house have electric connection?** **Yes / No**			
1.3 Source of Drinking water			
(i) Water Supply (tap) (iii) Tubewell (v) Pond		(ii) Open well (iv) River (vi) Others, specify	
1.4 Mode of fuel used for cooking:			
(i) firewood (iii) LPG (v) Dry mustard sticks		(ii) cow dung (iv) kerosene (vi) Others, specify	
1.5 Type of House:		**1.6 Number of Rooms in the house:**	
(i) Pucca (ii) Kutcha (iii) Mixed		**1.7 Expected Rent of the House:**	

Section 2: Land ownership and Utilization

	Area (in acre)		Area (in acre)
2.1 Land Owned		2.7 Own land under cultivation	
2.2 Cultivable Land		2.8 Land leased in	
2.3 Homestead Land		2.9 Land leased out	
2.4 Fallow / Uncultivated Land (Encroached land etc.)		2.10 Land operated otherwise	
2.5 Cultivable Waste Land (2.7 + 2.8 + 2.10)		2.11 Operational land holding	
2.6 Orchard			

Section 3: Financial Position of the Household

	Transactions	*Amount*	*Sources*		
			1	*2*	*3*
3.1	**Amount Borrowed**				
3.2	**Amount Repaid**				
3.3	**Interest Paid**				
3.4	**Savings**				
3.5	**Investments**				

Section 4: Household Characteristics

4.1	*4.2*	*4.3*	*4.4*	*4.5*	*4.6*	*4.7*	*4.8*	*4.9*		*4.10*		*4.11a*		*4.11b*		*4.12*	
												Wage Employment					
Name of Family members	Relationship with Head of the household	Sex (M/F)	Age (years)	Marital Status	Education	Skills Possessed	Usual Activity	Occupation		Self employment		Agriculture		Non-Agricultural		total employment	
								Main	Subsidiary	*(days)*	*(Rs)*	*(days)*	*(Rs)*	*(days)*	*(Rs)*	*(days)*	*(Rs)*

Section 5: Annual Household Income

	Sources of Income:	Amount (Rs.)
5.1	Cultivation of own Land (list the items cultivated)	
5.2	Cultivation of leased in Land (list the items cultivated)	
5.3	* Rent received from leased out land	
5.4	* Rent paid for leased in land	
5.5	* Income from lending farm implements, stock, etc.	
5.6	* Income from lending tractor, thresher and pump-set	
5.7	Income from sale of agricultural by-products e.g., straw etc.	
5.8	Wages	
5.9	* Salary	
5.10	* Income from Shop	
5.11	Allied activities (animal husbandry, poultry etc.)	
5.12	Income from forest products (NTFPs etc.)	
5.13	* Household Industry (specify)	
5.14	* Professional (Services)	
5.15	* Pensions, remittances, rent, gifts etc.	
5.16	* Income of self employed	
5.17	* Other sources (specify)	

Note: Only items marked * should be asked

Section 6: Coverage under Different Government Schemes:

6.1	Have you or any other members of your household received any benefits under any government schemes or programmes?	YES / NO
6.2	If YES please indicate the scheme under which you have received benefits (1) JRY / PMRY (2) DWCRA (3) IRDP (4) Million Wells Programme (5) DRDA Watershed scheme (6) Others, specify	
6.3	When did you receive the benefits: Months: Year:	
6.4	Are you still continuing with the scheme?	YES / NO
6.5	If YES, how much income per year you receive from the scheme?	Rs.
6.6	Do you purchase goods from Fair Price or Ration Shop?	YES / NO
6.7	If YES, specify the quantity purchased last year (1) Wheat (2) Sugar (3) Rice (4) Others, specify	

Section 7: Household Wealth

Utensils: (list them)	Number	Utensils: (list them)	Number		Number
				Durables: Radio Tape Recorder TV Bullock/Camel Cart Two Wheelers Bicycle Tractors Watches Clock Coolers Fan Telephone / Mobile Jeep/Three-wheelers Pump-set Thresher Others	
				Livestock:	**Number**
				Buffalo Cow Bullock Camel Goats/Sheep Chicken Others, specify	

Section 8: Production Activitles

Items / Products	Total Produced		Retained for self consumption		Sold in the village		Sold in nearby villages	Sold in urban market		Savings (qnty.) in the form of	
	Qnty.	*Value*	*Qnty.*	*Value*	*Qnty.*	*Value*		*Qnty.*	*Value*	*Seeds*	*Other*
	a		*b*		*c*		*d*	*e*		*f*	
Agricultural crops											
wheat											
Mustard											
Chana											
Bajra											
Jowar											
cotton (kapas)											
arhar											
Barley											
Maize											
Paddy											
Daal Masoor											
Barley											
Til											
Vegetables											
parmal											
ghiya - laoki											
tori											
khira (cucumber)											
bhindi											
tomato											
lahsoon (garlic)											
Arvi											
Green Chillies											
Carrot (Gajar)											
muli (raddish)											
Bathua											
Potato											
Palak											
Ginger(Adrack)											
Onion											
Haldi											
Dhania											
fut											
Meethi											

Items / Products	Total Produced		Retained for self consumption		Sold in the village		Sold in nearby villages		Sold in urban market		Savings (qnty.) in the form of	
	Qnty.	*Value*	*Qnty.*	*Value*	*Qnty.*	*Value*			*Qnty.*	*Value*	*Seeds*	*Other*
Fodder												
gwar												
kachri												
kasni												
barseen												
jai												
Harichari												
fruits												
kharbuja												
shatoot												
papita												
guava												
anar												
tarbooj												
Mango												
milk												
chicken												
eggs												
meat												
fish												
Agri residues												
bhusa - chana												
bhusa - wheat												
hari chari												
kadbi												
cotton fuelwood												
arhar fuelwood												

	Items / Products	Total Produced		Retained for self consumption		Sold in the village		Sold in nearby villages		Sold in urban market		Savings (qnty.) in the form of	
		Qnty.	*Value*	*Qnty.*	*Value*	*Qnty.*	*Value*			*Qnty.*	*Value*	*Seeds*	*Other*
	sarson fuelwood												
	Maize Bhusa												
	Rice Bhusa												
	Tudi												
misc													
	earthenware												
	wooden items												
	leather items												
	Cow Dung Cakes												
	Cow Dung Manure												
services													
	earthenware												
	wooden items												
	leather items												
	barber												
	washerman												
	tailor												
	water supplier												
	blacksmith												
	teaching												
	doctor												
	shops												
	hotels												
	small trade												

Section 9.1: Inputs (Agricultural Production)

Items / Products		wheat			sarson (mustard)			chana			bajra		
		stage 1	*stage 2*	*stage 3*	*stage 1*	*stage 2*	*stage 3*	*stage 1*	*stage 2*	*stage 3*	*stage 1*	*stage 2*	*stage 3*
Land (in acres)													
Family labour	*Nos.*												
	Days												
Hired labour	*Nos.*												
	Days												
Seeds	*Qnty.*												
	Value												
Gobar	*Qnty.*												
	Rs.												
Fertiliser (DAP)	*Qnty.*												
	Rs.												
Urea	*Qnty.*												
	Rs.												
Pesticides	*Qnty.*												
	Rs.												
Pumpset	*Type / HP*												
	time (hrs)												
	Fuel												
	electricity												
	rent												
Tractor	*Type*												
	Fuel												
	time (hrs)												
	rent												
Thresher	*rent*												
Others, specify													

Items / Products		jowar			kapas (cotton)			Arhar					
		stage 1	stage 2	stage 3	stage 1	stage 2	stage 3	stage 1	stage 2	stage 3			
Land (in acres)													
Family labour	*Nos.*												
	Days												
Hired labour	*Nos.*												
	Days												
Seeds	*Qnty.*												
	Value												
Gobar	*Qnty.*												
	Rs.												
Fertiliser (DAP)	*Qnty.*												
	Rs.												
Urea	*Qnty.*												
	Rs.												
Pesticides	*Qnty.*												
	Rs.												
Pumpset	*Type / HP*												
	time (hrs)												
	Fuel												
	electricity												
	rent												
Tractor	*Type*												
	Fuel												
	time (hrs)												
	rent												
Thresher	*rent*												
Others, specify													

Section 9.2: Inputs

Items / Products	Land (in acres)	Labour Employed				Seeds		Fertilizers (qnty/ Rs)		Pesticides		
		Family Labour		*Hired Lanour*		*Qnty.*	*Value*	*Organic*	*Inorganic*			
		Nos.	*days*	*Nos.*	*days*							
Vegetables												
parmal												
ghiya - laoki												
tori												
khira (cucumber)												
bhindi												
tomato												
carrot (gajar)												
muli (raddish)												
dhania												
lahsoon (garlic)												
fut												
Fodder												
gwar												
kachri												
kasni												
barseen												
jai												
hari chari												
kadbi												
fruits												
kharbuja												
shatoot												
papita												
guava												
anar												

	Items / Products	Land (in acres)	Labour Employed				Seeds		Fertilizers (qnty/ Rs)		Pesticides		
			Family Labour		*Hired Lanour*		*Qnty.*	*Value*	*Organic*	*Inorganic*			
			Nos.	*days*	*Nos.*	*days*							
misc													
	earthenware												
	wooden items												
	leather items												

Section 10.1: Consumption Expenditure:

Sl. No	Items	Purchased from fellow villagers		Purchased from the village shop		Purchased from other villages		Purchased from Rest of the world		Retained from own Production	
		Qnty.	*Value*	*Qnty.*	*Value*	*(Qnty.)*	*Value*	*Qnty.*	*Value*	*(Qnty.)*	*Value*
Agricultural crops											
	wheat										
	Mustard										
	Chana										
	Bajra										
	Jowar										
	cotton (kapas)										
	arhar										
	Barley										
	Maize										
	Paddy										
	Daal Masoor										
	Barley										
	Til										
Vegetables											
	parmal										
	ghiya - laoki										
	tori										
	khira (cucumber)										
	bhindi										
	tomato										
	lahsoon (garlic)										
	Arvi										
	Green Chillies										
	Carrot (Gajar)										
	muli (raddish)										
	Bathua										
	Potato										
	Palak										
	Ginger(Adrack)										
	Onion										
	Haldi										
	Dhania										

Sl. No	Items	Purchased from fellow villagers		Purchased from the village shop		Purchased from other villages		Purchased from Rest of the world		Retained from own Production	
		Qnty.	Value	Qnty.	Value	(Qnty.)	Value	Qnty.	Value	(Qnty.)	Value
	fut										
	Meethi										
Fodder											
	gwar										
	kachri										
	kasni										
	barseen										
	jai										
	Harichari										
	kakra (binola)										
fruits											
	kharbuja										
	shatoot										
	papita										
	guava										
	anar										
	banana										
	mango										
	ghee										
	milk										
	chicken										
	eggs										
	meat										
	fish										
others											
	atta										
	barber										

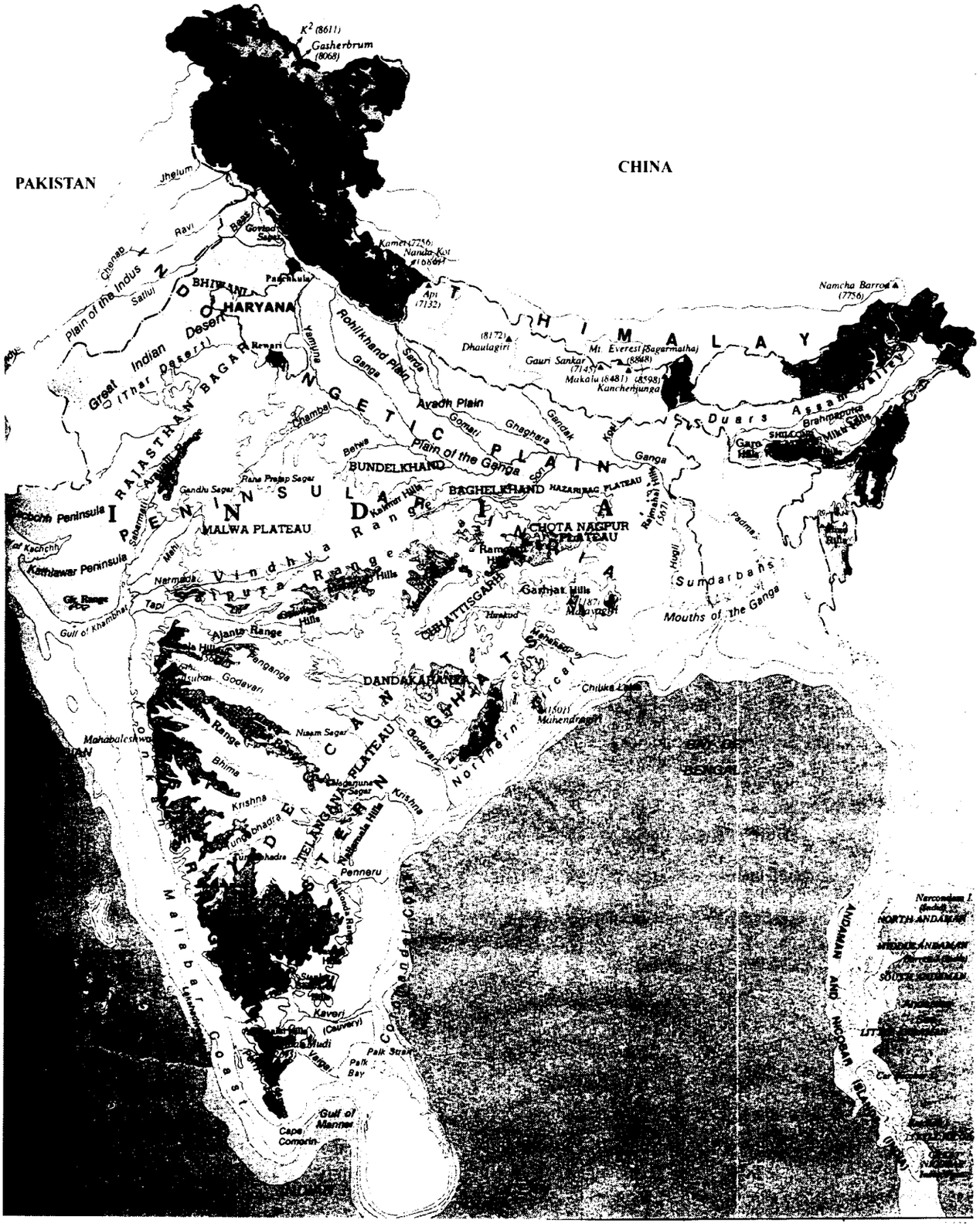
Sl. No	Items	Purchased from fellow villagers		Purchased from the village shop		Purchased from other villages		Purchased from Rest of the world		Retained from own Production			
		Qnty.	*Value*	*Qnty.*	*Value*	*(Qnty.)*	*Value*	*Qnty.*	*Value*	*(Qnty.)*	*Value*		
	Barley(Jhon)												
	battery												
	Besen												
	Biri												
	blacksmith												
	Blade												
	books												
	bulbs & electric gadgets												
	Bura												
	Candle												
	Chura (churi)												
	clothes												
	cooking oil												
	cosmetics												
	diesel & petrol												
	doctor												
	earthenware												
	electricity												
	electricity												
	Gud												
	hotels												
	kerosene												
	khal												
	leather items												
	LPG												
	medecines												
	Milk powder												
	mustard oil												
	News Paper												
	pan tobacco&introxicant												
	Plastic Ware												
	rice												
	salt												
	Shakker												
	shoes& chappals												

Sl. No	Items	Purchased from fellow villagers		Purchased from the village shop		Purchased from other villages		Purchased from Rest of the world		Retained from own Production			
		Qnty.	Value	Qnty.	Value	(Qnty.)	Value	Qnty.	Value	(Qnty.)	Value		
	small trade												
	Soyabin Chunk												
	spices												
	sugar												
	Sugar(Red)												
	sweets												
	tailor												
	tea												
	teaching												
	Telephone Bill(PCO)												
	Telphone(bill)												
	toileterries & cosmetics												
	travelling expd												
	washerman												
	water supplier												
	wooden items												

Section 10.2: Consumption Expenditure:											
Forest Products and Agricultural Residues											
1	**Forest products**	**Collected from forests**		**Purchased from fellow villagers**		**Purchased from the village market**		**Purchased from ROW**		**Collected by employing**	
		Qnty.	*Value*	*Qnty.*	*Value*	*Qnty.*	*Value*	*Qnty.*	*Value*	*Family labour*	*Hired Labour*
	fuelwood										
	fodder (leaves)										
	fodder (grasses)										
	timber										
	branches										
	mushrooms										
	bamboo										
2	**Agricultural Residues**	**Collected from fields**		**Purchased from fellow villagers**		**Purchased from the village market**		**Purchased from ROW**		**Collected by employing**	
		Qnty.	*Value*	*Qnty.*	*Value*	*Qnty.*	*Value*	*Qnty.*	*Value*	*Family labour*	*Hired Labour*
	bhusa - chana										
	bhusa - wheat										
	hari chari										
	kadbi										
	cotton fuelwood										
	arhar fuelwood										
	sarson fuelwood										

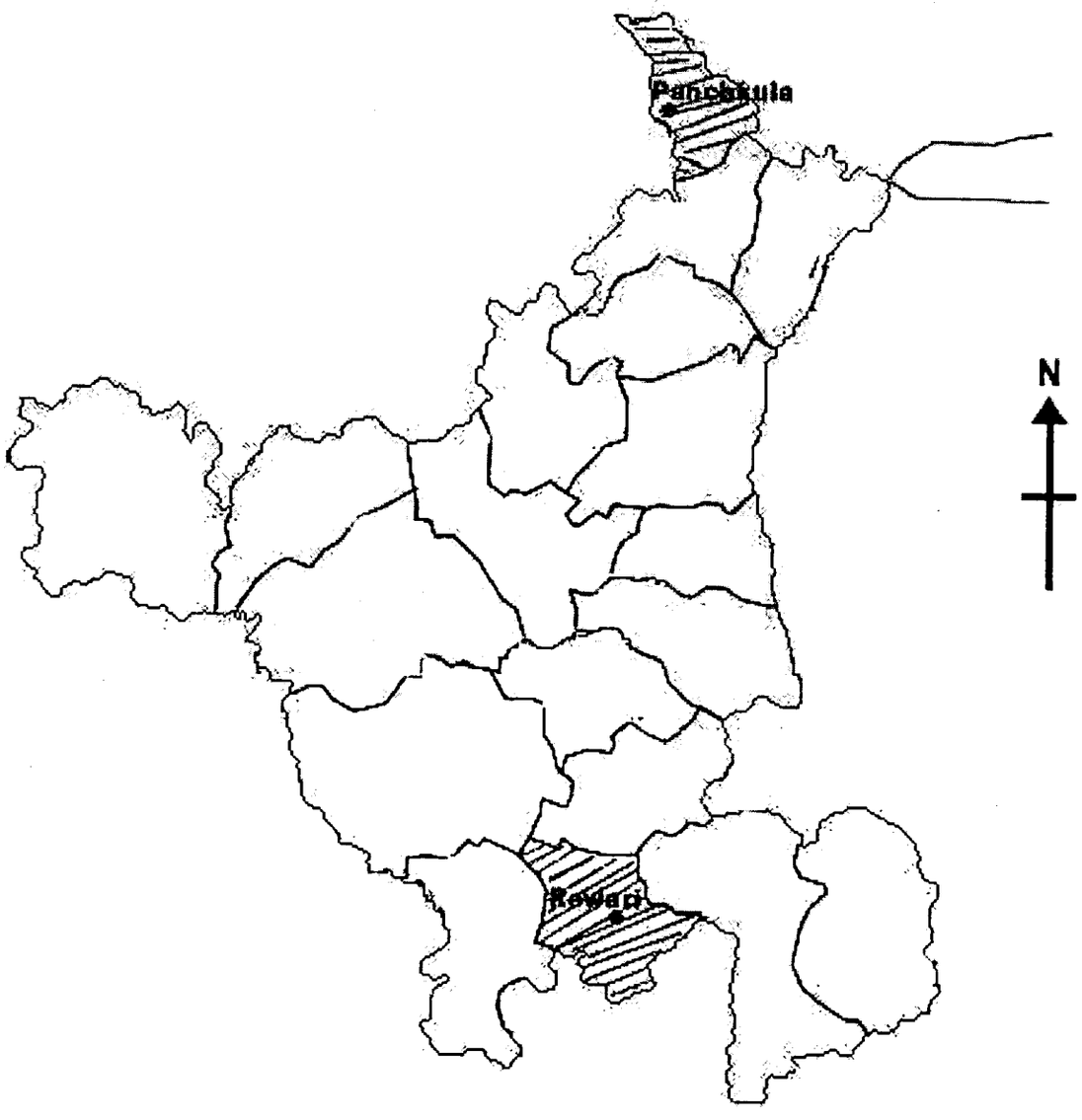
Appendix 1:

Map of India Showing the Location of Haryana.



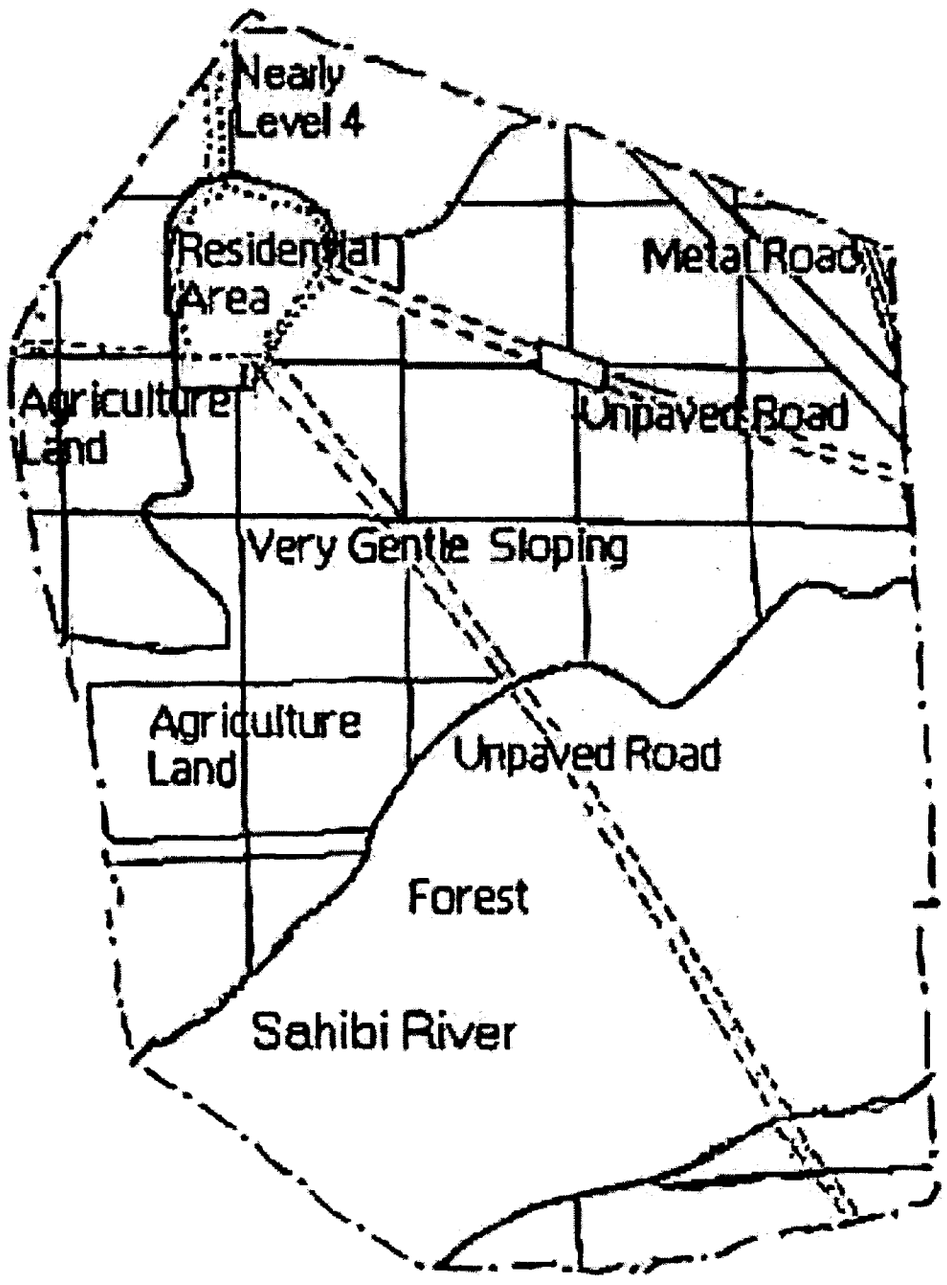
Appendix:2

Map of Haryana Showing the Districts of Rewari and Panchkula



Appendix 3:

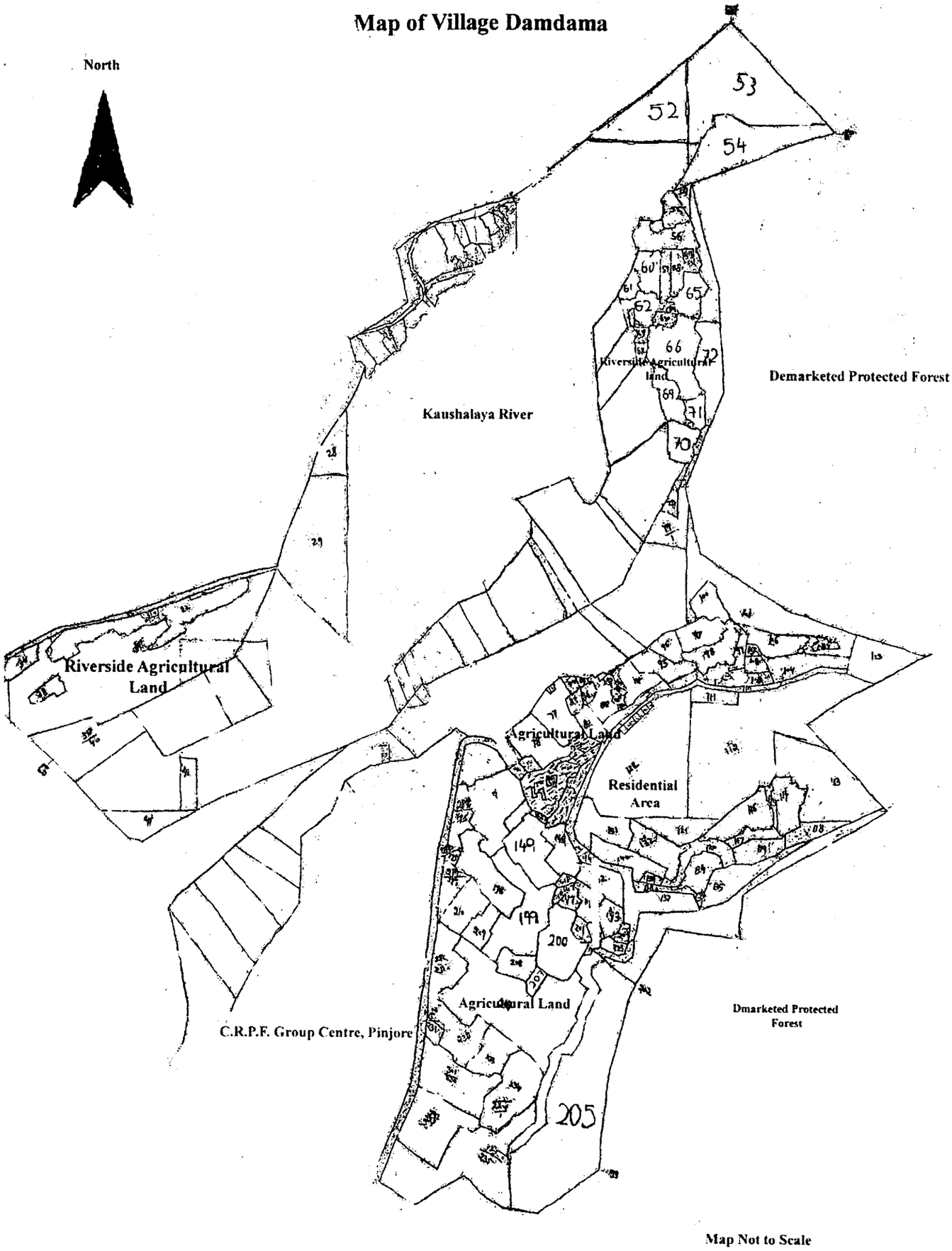
Map of village Pauti



Map not to Scale

Appendix 4:

Map of Village Damdama



Map Not to Scale