Project Report

Constraints and Potentials of Diversified Agricultural Development in Eastern India

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EXECUTIVE SUMMARY

Introduction/Objectives:

A sustained economic growth, rising per capita income and growing urbanization are apparently causing a shift in the consumption patterns in favor of high-value food commodities like fruits, vegetables, dairy, poultry, meat and fish products from staple food such as rice, wheat and coarse cereals. Such a shift in consumption patterns in favor of high-value food commodities depicts an on-going process of agricultural diversification. This study aims to analyze the trends and patterns of agricultural diversification and related development in the eastern states of India comprising the states of Bihar, Uttar Pradesh, Jharkhand, Orissa and West Bengal. The reference period of the study based on secondary data sources has been taken from the period 1970-71 to 2006-07. Data has also been updated to cover the recent years wherever possible. The primary survey data pertains to the agricultural year 2010-11.

Objectives

The main objectives of this study were as follows

i) to analyse the trends and patterns of rural diversification, including both horizontal and vertical diversification in eastern India,

ii) to analyse the constraints and potentials of diversified rural growth in the different Eastern states, considering various agro-climatic, socio-economic, technological, infrastructural, institutional and policy factors,

iii) to analyse the various economic aspects including production, profitability, equity and viability of small and marginal farms in the context of diversification and lastly

iv) to identify potential sources of diversification and suggest appropriate strategies and policies for accelerated and diversified agricultural growth as well as sustainability of small/marginal farms in these regions.

Methodology:

- **Database**

This study was based on both secondary and primary data, which were collected and analysed for arriving at results and conclusions. The secondary data at district, state and national levels for the eastern states were collected from different departments/agencies/publications relating to different variables/parameters of the study for the period 1970-71 to 2006-07. The primary data were based on a survey of a cross section of cultivating households in selected districts of the eastern states. The field study was undertaken for the agricultural year 2010-11.

- **Sampling Technique**

The primary data was based on a survey of a cross section of cultivating households in selected districts of Uttar Pradesh, Bihar, West Bengal, Orissa and Jharkhand. Two districts from each state were purposively selected – one relatively developed and one relatively under developed in consultation with district level officers. Further, two blocks were purposively selected (one relatively developed and one relatively underdeveloped) from each district and were chosen in consultation with local district level officers. Then a village or a cluster of villages were chosen from each of the blocks, one again in consultation with local level officials.

Before the selection of sample farm households, all households were enlisted along with various information including operational holdings i.e., net cultivated area (NCA) in the selected villages. Based on the net cultivated area, farm households were categorized into four broad sub-classes viz., marginal (less than 1 hectare), small (between 1-2 hectares), medium (2-4 hectares) and large (above 4 hectares). Within sub-classes, the households were selected based on proportionate random sampling procedure. Accordingly, 50 households were selected from each village. Thus, making total sample size of 200 in each of the five states and a grand total of 1000. Following this, systematic random sampling method was adopted for the selection of sample households. Under systematic random sampling method, firstly all farm households in a village were enumerated. The next step was to find the random interval. This was calculated by dividing the total number of households in particular farm size category (For e.g. n = 100) in the village by the number of households that are to be selected (e.g.

n = 20). Thus, the random interval is equal to 100/20 = 5. Then the first household was selected using the random numbers table. Subsequently every 5^{th} household from the total number of households was taken to frame a sample. Therefore, if the first selected number was the 5^{th} household, then the subsequent selected households were the 15^{th}, 25^{th}, 35^{th}, 45^{th}, and so on. When the random interval was in decimals, it was converted to the next whole number. However, if a sample household could not be surveyed due to any reason, then the sampling household with the next sampling serial number was substituted for collecting information. Farmers were interviewed by using pre-tested structured schedules.

- **Research tools**

Agricultural diversification in the eastern states were gauged from share of various sub-sectors in GDP as well as total value of output from agriculture & allied activities, sectoral shares in employed persons and cropping pattern. Further two indices of crop diversification were estimated

(i) Index of Crop Diversification by Bhatia (1965)

(ii) Simpson's Index of Diversification

At the district level certain factors were taken to explain agricultural diversification of value of output from crop production, livestock, forestry and fisheries through multiple regressions using data for the triennium ending 2006-07. These factors were fertilizer consumption, irrigation, annual rainfall, grazing lands, credit, regulated markets, village haats, cold storages, rural roads, rural electrification, veterinary hospitals, forest protection committees, rural literacy and urban population.

Furthermore, factor analysis was undertaken to explain diversification of area and livestock per 1000 hectares GCA for the trienniums ending 1972-73, 1982-83, 1992-93 and 2002-03. These factors were irrigation, annual rainfall, credit, regulated markets, rural roads, rural electrification, rural literacy and urban population. In these exercises, the regressions of Jharkhand could not be formulated due to lack of adequate data under most heads.

To understand crop diversification, economics of crop production was analysed for which an analysis of Cost of Cultivation was undertaken. Apart from this, agricultural diversification in the field was also gauged through horticultural, livestock, fisheries and

non-farm diversification. Data collected through field survey were used extensively for the detailed analysis which was presented in tabular format. Results of analysis of both secondary and primary data complement each other to arrive at the conclusions.

Findings/Conclusions:

- **Share of Gross State Domestic Product (GSDP) from Agriculture & Allied Activities**

  In India the share of GDP from agriculture declined from 35% in 1980-81 to 18.11% in 2007-08, while that of non-agriculture increased from 64.30% to 81.89% in the same period. The eastern states followed the same trend as that of India. The share of GSDP from agriculture and allied activities in the eastern region is relatively higher in Uttar Pradesh (29.40%) followed by Bihar (25.34%), Orissa (22.97%), West Bengal (21.39%) and lastly Jharkhand (9.49%). The share of GSDP from non-agriculture is very high in Jharkhand (90.51%) followed by West Bengal (78.61%), Orissa (77.03%), Bihar (74.66%) and lastly Uttar Pradesh (70.60%). This distribution is on expected lines as Jharkhand, Orissa and West Bengal have large mineral deposits resulting in large scale industrialization in this region.

- **Cropping Pattern Changes**

  There has been a significant change in the cropping pattern in the past few decades. In India as a whole as well in all the eastern states the area share of cereals in the GCA has been highest amongst other crops from 1970-71 to 2007-08. It was also observed that the area devoted to food grains (cereals and pulses) was much higher in all the eastern states compared to horticultural crops. The proportionate area under horticultural crops was relatively high only in West Bengal and Bihar.

- **Indices of Crop Diversification**

  The cropping pattern in each state was compared between 1999-2000 and 2006-07 by using the index of crop diversification formulated by Bhatia (1965). It was seen that crop diversification had reduced from their 1999-2000 levels in the state of Bihar, Orissa and Jharkhand, while it increased slightly in Uttar Pradesh and a lot in West Bengal.

From the Simpson's index of crop diversification (SID), which showed diversification away from foodgrains, it was seen that in Bihar it increased since 1970-71 but after 2000-01 it showed a decline. In Jharkhand it decreased. In Orissa it reduced especially since 1995-96. In Uttar Pradesh it increased slightly, whereas in West Bengal crop diversification away from food grains increased tremendously. In West Bengal, Orissa and Jharkhand, maximum diversification of crop was towards oilseeds. In Bihar and Uttar Pradesh, significant crop diversification was towards plantation crops like jute and sugarcane respectively.

- **Inter-crop Distribution of Gross Value of Crop Output from Agriculture**

  There have also been significant changes in the relative shares of various crops in the gross value of crop output from agriculture (crop sector) in the past few decades. In all the eastern states a high proportion of fruits area was under mango. In West Bengal, a high proportion of vegetables area was under cucurbits and brinjal. In Bihar and Uttar Pradesh, it was under potato and in Orissa, it was under rabi vegetables.

  It was seen from the analysis of cropping pattern and value of output of crops that though area diversification away from food grains towards horticultural crops was increasing over the years in the eastern states but in terms of value of output, the share of horticultural crops was very high compared to other crops in all the eastern states except Uttar Pradesh. It is to be noted that Uttar Pradesh is one of the Green Revolution states and hence cultivation of food grains is very important here.

- **Sector wise Distribution of Value of Output in Agriculture and Allied Activities**

  The sector wise distribution of value of output in agriculture and allied activities showed that in Bihar the share of livestock was the highest (31.32%). In West Bengal the share of crop sector was the highest (36.11%). The pattern was similar in Orissa and Jharkhand. In Uttar Pradesh the share of crop sector was the highest (59.23%).

- **Sectoral Shares in Employment**

  In the employment sector, it was seen that the share of employed persons in agriculture (usual principal status plus usual subsidiary status) in all the eastern states showed a decline while that of non-agricultural employment increased.

- **Field Survey Results**

  It was observed from the field survey that, sample farming households in the selected villages of the study regions mainly cultivated cereals, pulses, oilseeds, vegetables, jute and sugarcane. Cultivation of fruits and flowers was rarely observed. It was seen that cereals were cultivated by majority households across all farm size categories in all the states. Further Cereals also occupied a large proportion of the gross cropped area in all the states.

- The Simpson's Index of Diversification (SID) was the highest in Orissa (0.25) followed by Bihar (0.18), West Bengal (0.16), Uttar Pradesh (0.15), and Jharkhand (0.08). In the states of Orissa, Bihar, West Bengal and Jharkhand the crop diversification away from food grains was mainly towards oilseeds while in Uttar Pradesh it was mainly towards sugarcane. Some diversification towards cultivation of vegetables was observed mainly in the states of Orissa and West Bengal. From the SID compared using both primary and secondary data it was seen that the state of Orissa showed more diversification away from food grains and Jharkhand showed least diversification.
- It was also found that developed districts showed greater crop diversification away from food grains towards non-food grain crops compared to under developed districts except for Kishanganj in Bihar and Jalpaiguri in West Bengal which showed diversification towards oilseeds and jute.
- It was also seen from the field level data that small and marginal farmers showed more horizontal diversification within the crop sector towards high value crops such as oilseeds, sugarcane, jute and vegetables compared to the other categories. Conversely, this category of farmers has shown comparatively lesser horizontal diversification within the allied sectors such as livestock and fisheries compared to the other farm sizes.

- From the pattern of livestock in the study regions it was seen that majority of the sample farming households owned cattle. The highest proportion of cattle was seen in West Bengal (70%) followed by Uttar Pradesh (65%), Jharkhand (60%), Orissa (54%) and Bihar (52%). Higher proportion of poultry was seen in most underdeveloped districts excepting West Bengal. As regards fisheries, the districts that showed the highest proportion of farmers who were engaged in fisheries was Burdwan district of West Bengal (20%) followed by Bhadrak district of Orissa (11.27%). Most farming households fished from ponds rather than paddy fields.
- Overall it was seen that income from farm sources was more than non-farm sources in all the selected states of eastern India. The income from non-farm sources were lesser in the under developed districts compared to the developed ones. Excepting Jharkhand, the net income from livestock sector was the highest followed by the agriculture (crop sector) and then the fisheries sector in all the states. In Jharkhand, the net income from agriculture was the highest followed by livestock and fisheries sector. Further, the net income from the livestock sector was greater than the crop sector in all the under developed districts, whereas it was lesser than the crop sector in all the developed districts, except the Varanasi district in Uttar Pradesh, where income from the livestock sector was more than the crop sector.
- Further, it was also seen that despite the fact that small and marginal farmers were diversifying more within the crop sector into high value crops compared to other farm size categories, their output-input ratio and income-input ratio were lower than other farm size categories. Infact their working capital expenses were found to be relatively higher than other land classes, indicating that these farmers incurred relatively higher cost of cultivation, but at the same time, they did not earn commensurate income despite high value crop diversification, indicating inefficient use of resources by them and also inadequate access to markets for their high value products.
- From the factor analysis of value of output in agricultural diversification using districtwise time series data, it was seen that in the state of Bihar unbalanced use of fertilizers was posing a constraint to horticultural diversification. In the state of

Jharkhand it was found that inappropriate water management and inadequate water supply was a major constraint towards horticultural diversification. Moreover, for the fisheries sector poor road conditions, bad road connectivity and transportation problems in the state were a major problem. In Orissa, livestock diversification was hindered by road connectivity and transportation problems. In Orissa, Uttar Pradesh and West Bengal the diversification towards the forestry sector was mainly constrained by poor rural literacy rates. Further, from the field level data, the major constraints reported by small and marginal farmers for crop diversification towards high value crops were lack of proper irrigation facilities, lack of knowledge and information, and non-availability of timely credit. Further, in the livestock sector most small and marginal farmers reported lack of access to veterinary service centres to be a problem.

Recommendations:

- Despite the fact that small and marginal farmers are diversifying horizontally more within the crop sector compared to the allied sectors, they need to diversify much more towards high value crops and also within the allied sectors. At the same time, their resource use efficiency within the crop sector need to improve.
- Further vertical diversification towards non-farm activities was also very less in the study region and therefore an integrated policy support system is required for promoting sustainable horizontal and vertical diversification of the rural economy in eastern India.
- The major constraints reported by small and marginal farmers for crop diversification towards high value crops were lack of proper irrigation facilities, lack of knowledge and information, and non-availability of timely credit. Further, in the livestock sector, most small and marginal farmers reported lack of access to veterinary service centres to be a problem. Diversification into fisheries sector, was mostly constrained by lack of timely credit, inaccessibility to cold storages, poor road conditions and connectivity and transportation problems. Thus, in the crop, livestock and fisheries sector policies have to be made such that the specific problems faced by small and marginal farmers can be mitigated. Improving the

small farmers access to irrigation, credit, technology and veterinary care services would hold the key in this respect.

- Further, agriculture sector can hardly afford to sustain all its growing population and therefore vertical diversification especially of small and marginal farms is necessary. Small and marginal farmers have to be basically part-time farmers. But the investment and organizational requirements of such vertical diversification in the form of agro based industries, agri-business, agro-processing and services would have to be even greater.
- From the factor analysis of value of output in agricultural diversification, it was seen that in the state of Bihar unbalanced use of fertilizers was posing a constraint to horticultural diversification. Hence a balanced use of fertilizers was required, which could be achieved by providing proper training in horticultural management and practices to farmers. In the state of Jharkhand it was found that inappropriate water management and inadequate water supply was a major constraint towards horticultural diversification. Moreover, poor road conditions, bad road connectivity and transportation problems stood in the way of development of livestock and fisheries. Therefore, for the fisheries sector poor road conditions, bad road connectivity and transportation problems in the state have to be improved. In Orissa, Uttar Pradesh and West Bengal the diversification towards the forestry sector was mainly constrained by poor rural literacy rates. Therefore, literacy and awareness building for regeneration and sustainable management of forest resources would be essential. Also, poor infrastructure of road and electricity hold back the development of non-farm sector on adequate scale. Hence development of basic infrastructure, both hard and soft including road connectivity, electricity, literacy training and skills would be required to help promote non-farm diversification. Thus, in both the crop as well as the allied sectors, policies have to be made such that the specific problems faced by farmers (especially small and marginal) can be mitigated.

CHAPTER I

INTRODUCTION

Background

The term 'diversification' has been derived from the word 'diverge' which means to move or extend in the direction different from a common point (Jha, Kumar and Mohanty, 2000). Agricultural diversification can be described in terms of the shift from the regional dominance of one crop towards the production of a large number of crops to meet the increasing demand of those crops. It can also be described as the economic development of non agricultural activities (Start, 2001). The process of diversification can be classified into horizontal and vertical diversification. Horizontal diversification can be referred to as that form of diversification wherein farmers diversify their agricultural activities in order to either stabilize or increase their income or both. It can either take the form of shift from subsistence farming to commercial farming or the shift from low value food crops to high value crops. Vertical Diversification refers to the farmers' access to non-farm income, i.e., the income from non agricultural sources (Haque.T, 1996).

A diversified agricultural economy opens up many opportunities. Soil fertility can be increased by way of crop rotation. It adds value in the agriculture by increasing the total crop productivity and at the same time stabilizes the farm income by minimizing the risk associated with only one crop. Since majority of the farmers in India have small landholdings and their income from crop cultivation as well as non farm income is not enough to meet their subsistence level and also, the country that produces only a few specialized crops is more prone to risk due to fluctuations in domestic and international prices, hence, both the horizontal and vertical diversification become the need of the hour.

Further, a sustained economic growth, rising per capita income and growing urbanization are apparently causing a shift in the consumption patterns in favor of high-value food commodities like fruits, vegetables, dairy, poultry, meat and fish products from staple food such as rice, wheat and coarse cereals. Such a shift in consumption

patterns in favor of high-value food commodities depicts an on-going process of agricultural diversification. This study basically aims at analysing the trends and patterns of agricultural diversification and related development in the regions of eastern India.

Objectives

The main objectives of this study are as follows:

i) to analyse the trends and patterns of rural diversification, including both horizontal and vertical diversification in eastern India comprising the states of Bihar, Uttar Pradesh, Jharkhand, Orissa and West Bengal;

ii) to analyse the constraints and potentials of diversified rural growth in the different eastern states, considering various agro-climatic, socio-economic, technological, infrastructural, institutional and policy factors and

iii) to analyse various economic aspects including production, profitability, equity and viability of small and marginal farms in the context of diversification.

iv) to identify potential sources and suggest appropriate strategies and policies for accelerated and diversified agricultural growth as well as sustainability of small/marginal farms in these areas.

Data Base

Both secondary and primary data were collected and analysed for arriving at results and conclusions.

Secondary Sources of Data

The secondary data at district, state and national levels for the eastern states were collected from different departments/agencies/publications relating to different variables/parameters of the study for the period 1970-71 to 2006-07. Most of the secondary sources of data were collected from the Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, National Sample Survey Rounds of Central Statistical Organisation (CSO), State Statistical Abstracts, Department of Animal Husbandry & Dairying, National Horticultural Board and Economic Survey, Government of India.

Primary Sources of Data

For the purpose of preliminary farm level data, a household survey was conducted in all five states of eastern India, namely Uttar Pradesh, Bihar, West Bengal, Orissa and

Jharkhand. Two districts from each state were purposively selected – one relatively developed and one relatively under developed in consultation with district level officers. Further, two blocks/clusters of villages from each district were chosen in consultation with local district level officers and then, 50 farm households of all size groups from each of the selected block/cluster were selected forming a sample of around 1000 farm households for the study (Table 1.1).

Table 1.1: Name of Blocks and Villages Selected for Primary Survey

States	Districts	Blocks	Villages	No. of Households
Bihar	Kishanganj (Underdeveloped)	Bahadurganj	Natwapara	50
		Kishanganj	Simbalbari	50
	Rohtas (Developed)	Sasaram	Malawan	50
		Shivsagar	Kumhu	50
Jharkhand	Lohardaga (Underdeveloped)	Bhandra	Charima	50
		Lohardaga	Harmu	50
	Sahebganj (Developed)	Rajmahal	Dhutiar	50
		Sahebganj	Mahadebganj	50
Orissa	Bhadrak (Developed)	Bhadrak	Jagdalpur	60
			Kedarpur	40
	Kandhamal (Underdeveloped)	Phulbani	Karnada	60
		Tumudibandha	Benanbehal	40
Uttar Pradesh	Mirzapur (Underdeveloped)	Jamalpur	Deoria	2
			Gorakhpur	76
			Sarsa	2
		Narayanpur	Agarsan	5
			Khiraruri	15
	Varanasi (Developed)	Chiraiganu	Tohaphapur	50
		Sewapuri	Karadhana	50
West Bengal	Burdwan (Developed)	Ausgram	Belari	50
		Khadaghosh	Khadaghosh	50
	Jalpaiguri (Underdeveloped)	Mal	Oddlabari	50
			Rajganj	50

Farming households in each block were divided into 3 categories based on their net cultivated area (NCA) into marginal (less than 1 hectare), small (between 1 to 2

hectares), medium (between 2 and 4 hectares) and large (above 4 hectares). A detailed questionnaire schedule was prepared for the collection of primary data.

Methodology

Agricultural diversification in the eastern states were gauged from share of various sub-sectors in GDP as well as total value of output from agriculture & allied activities, sectoral shares of employed persons, cropping pattern and agricultural vis-à-vis non-agricultural exports. Further two indices of crop diversification were estimated

(iii) Index of Crop Diversification by Bhatia (1965)[1]

(iv) Simpson's Index of Diversification

At the district level certain factors were taken to explain agricultural diversification of value of output from crop production, livestock, forestry and fisheries through multiple regressions using data for the triennium ending 2006-07. These factors were fertilizer consumption, irrigation, annual rainfall, grazing lands, credit, regulated markets, village haats, cold storages, rural roads, rural electrification, veterinary hospitals, forest protection committees, rural literacy and urban population.

Furthermore, factor analysis was undertaken to explain diversification of area and livestock per 1000 hectares GCA for the trienniums ending 1972-73, 1982-83, 1992-93 and 2002-03. These factors were irrigation, annual rainfall, credit, regulated markets, rural roads, rural electrification, rural literacy and urban population. In these exercises, the regressions of Jharkhand could not be formulated due to lack of adequate data under most heads.

To understand crop diversification, economics of crop production was analysed for which an analysis of cost of cultivation was undertaken. Apart from this, agricultural diversification in the field was also gauged through horticultural, livestock, fisheries and non-farm diversification. Data collected through field survey were used extensively for the detailed analysis which was presented in tabular format. Results of analysis of both secondary and primary data complement each other to arrive at the conclusions.

[1] Hussain, M.,1999, 'Systematic Agricultural Geography', Rawat Publication, Jaipur and New Delhi

Economic Profile and Production Structure of Sample Farming Households

A survey of cultivating households was conducted in the eastern states of Uttar Pradesh, Bihar, West Bengal, Orissa and Jharkhand to study their economics of production and resource use efficiency. This section discusses the economic profile and production structure of the selected farming households. It will provide useful background information to the subsequent agricultural diversification analysis.

Distribution of Farming Households and Land Holdings

Table 1.2 shows the distribution of farming households, net cultivated area (NCA) and gross cropped area (GCA) per household over different farm size categories in both developed and underdeveloped districts. In all the selected states and districts, the proportion of marginal farmers is higher than small and medium and large farmers. In terms of area distribution, there is unequal distribution of net cultivated area among farming households in all the states. Out of the net cultivated area of the total households surveyed in , medium and large farmers defined as those operating area more than 2 hectares, constitute a comparatively smaller proportion of total farming households but account for a higher per household operated area. The marginal and small farmers constituting a large proportion of households have comparatively lower net cultivated area.

Table 1.2: Distribution of Farming Households and Land Holdings

State	District	Farm Size Categories	%age of Farmers	NCA per farming Household (hec)	GCA per farming Household (hec)	Cropping Intensity (%)
Bihar	**Rohtas**	Marginal	45	0.60	1.05	175.00
		Small	32	1.35	2.33	172.59
		Medium	19	2.44	3.72	152.46
		Large	4	5.32	9.38	176.32
		Total	**100**	**2.43**	**4.12**	**169.72**
	Kishanganj	Marginal	54	0.58	0.91	156.90
		Small	34	1.18	1.70	144.07
		Medium	12	2.48	3.33	134.27
		Total	**100**	**1.67**	**2.52**	**150.88**
Jharkhand	**Sahebganj**	Marginal	37	0.50	0.63	126.00
		Small	27	1.35	1.62	120.00
		Medium	26	2.48	3.26	131.45
		Large	10	5.46	7.33	134.25
		Total	**100**	**2.45**	**3.21**	**131.15**

	Lohardaga	Marginal	70	0.44	0.54	122.73
		Small	22	1.29	1.45	112.40
		Medium	7	2.39	3.18	133.05
		Large	1	4.86	4.86	100.00
		Total	**100**	**2.25**	**2.51**	**111.69**
Orissa	**Bhadrak**	Marginal	47	0.58	0.74	127.59
		Small	29	1.27	1.58	124.41
		Medium	22	2.24	3.03	135.27
		Large	2	4.05	4.86	120.00
		Total	**100**	**2.04**	**2.55**	**125.43**
	Kandhamal	Marginal	54	0.55	0.59	107.27
		Small	21	1.29	1.36	105.43
		Medium	25	2.14	2.49	116.36
		Total	**100**	**1.50**	**1.75**	**116.25**
Uttar Pradesh	**Varanasi**	Marginal	44	0.60	1.22	203.33
		Small	37	1.31	2.48	189.31
		Medium	18	2.47	4.35	176.11
		Large	1	4.30	7.63	177.44
		Total	**100**	**2.17**	**3.92**	**180.65**
	Mirzapur	Marginal	33	0.74	1.48	200.00
		Small	49	1.33	2.65	199.25
		Medium	12	2.88	5.76	200.00
		Large	6	4.99	9.99	200.20
		Total	**100**	**2.49**	**4.97**	**200.00**
West Bengal	**Burdwan**	Marginal	40	0.42	0.75	178.57
		Small	30	1.32	1.97	149.24
		Medium	25	2.49	3.47	139.36
		Large	5	5.60	9.46	168.93
		Total	**100**	**2.46**	**3.91**	**159.21**
	Jalpaiguri	Marginal	40	0.36	0.45	125.00
		Small	30	1.18	1.44	122.03
		Medium	30	2.39	2.95	123.43
		Total	**100**	**1.60**	**2.19**	**137.03**

Source: Primary Field Survey

The cropping intensity (GCA/NCA) is highest in Uttar Pradesh (190.99%) followed by Bihar (160.80%), West Bengal (148.73%), Jharkhand (121.70%) and Orissa (120.81%). Cropping intensity is high when farmers on an average grow two seasonal crops a year, do multiple cropping or grow several crops in a year. It is low when farmers on an average grow less than two seasonal crops a year and also when they devote areas to annual crops (Table 1.2).

Scheme of Chapterisation

Chapter 1: Introduction

Chapter 2: Trends and Patterns of Agricultural Diversification in India

Chapter 3: Production Structure, Profitability and Viability of Small and Marginal Farms (Results of Farm Level Survey)

Chapter 4: Constraints, Potentials for Agricultural Diversification

Chapter 5: Policy Interventions for Agricultural Diversification

Chapter 6: Conclusions and Policy Implications

CHAPTER II

TRENDS AND PATTERNS OF AGRICULTURAL DIVERSIFICATION

Agriculture and allied activities including crop and animal husbandry, fisheries, forestry and agro processing provides the basis of our food and livelihood security. Agriculture and allied activities also provide significant support for economic growth and social transformation of the country. As one of the world's largest agrarian economies, the agriculture sector (including allied activities) in India accounted for 18.11% of the GDP and contributed approximately 10% of total exports during 2007-08. Notwithstanding the fact that the share of this sector in the GDP has been declining over the years, its role remains critical as it provides employment to around 52% of the workforce. This chapter looks into the trends and patterns of each component of the agriculture and allied activities sector.

Share of Gross State Domestic Product from Agriculture & Allied Activities

Table 2.1 shows the changes in the shares of agriculture vis-à-vis non-agriculture in the state domestic product in eastern India. It may be seen from the table that in the country as a whole, the share of agriculture in the Gross Domestic Product (GDP) declined from 35% in 1980-81 to 18.11% in 2007-08, while that of non-agriculture increased from 64.30% to 81.89% in the same period. The eastern states follow the same trend as that of India. In all the eastern states, the share of agriculture is higher than the all India level except in Jharkhand in the recent years. Conversely, in all the eastern states, the share of Gross State Domestic Product (GSDP) from non-agriculture is lower than the all India level except in Jharkhand in the recent years.

Further, within the eastern region the share of GSDP from agriculture and allied activities is relatively higher in Uttar Pradesh (29.40%) followed by Bihar (25.34%), Orissa (22.97%), West Bengal (21.39%) and lastly Jharkhand (9.49%). The share of GSDP from non-agriculture is very high in Jharkhand (90.51%) followed by West Bengal (78.61%), Orissa (77.03%), Bihar (74.66%) and lastly Uttar Pradesh (70.60%). This distribution is on expected lines as Jharkhand, Orissa and West Bengal have large mineral deposits resulting in large scale industrialization in this region.

Table 2.1: Share of GDP from Agriculture and Non-Agriculture in Eastern India (%)

Sectors	1980-81	1985-86	1990-91	1995-96	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
India												
Agriculture	35.70	31.17	29.28	26.49	23.35	23.20	20.87	20.97	19.20	18.80	18.35	18.11
Non-Agriculture	64.30	68.83	70.72	73.51	76.65	76.80	79.13	79.03	80.80	81.20	81.65	81.89
Bihar												
Agriculture	45.99	41.59	40.48	44.16	37.65	34.22	35.97	32.07	30.09	28.00	30.34	25.34
Non-Agriculture	54.01	58.41	59.52	55.84	62.35	65.78	64.03	67.93	69.91	72.00	69.66	74.66
Orissa												
Agriculture	50.19	49.21	36.56	40.87	27.69	29.21	27.43	29.39	25.36	24.63	24.06	22.97
Non-Agriculture	49.81	50.79	63.44	59.13	72.31	70.79	72.57	70.61	74.64	75.37	75.94	77.03
Uttar Pradesh												
Agriculture	50.38	43.46	40.75	36.42	34.05	33.49	32.58	32.20	30.99	30.75	30.24	29.40
Non-Agriculture	49.62	56.54	59.25	63.58	65.95	66.51	67.42	67.80	69.01	69.25	69.76	70.60
West Bengal												
Agriculture	30.06	31.77	30.56	32.78	28.68	27.66	26.40	26.14	24.24	23.27	22.59	21.39
Non-Agriculture	69.94	68.23	69.44	67.22	71.32	72.34	73.60	73.86	75.76	76.73	77.41	78.61
Jharkhand												
Sectors			**1993-94**	**1995-96**	**2000-01**	**2001-02**	**2002-03**	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**
Agriculture			22.70	20.58	18.08	25.28	21.69	21.22	21.15	13.30	12.40	9.49
Non-Agriculture			77.30	79.42	81.92	74.72	78.31	78.78	78.85	86.70	87.60	90.51

Source: Central Statistical Organisation, National Accounts Division

Share of Gross State Domestic Product within Agriculture & Allied Activities

Within the agriculture & allied activities sector in India, the share of GDP in agriculture including livestock declined from 91.89% in 1980-71 to 91.78% in 2007-08. The share of forestry & logging decreased from 6.17% to 3.71% and that of fishing increased from 1.94% to 4.5% during the same period (Table 2.2). Within agriculture & allied activities, the share of agriculture including livestock was lower than all India levels in Jharkhand, Orissa, West Bengal and Bihar in recent years with an exception of Uttar Pradesh where the shares were higher than the all India levels. Within agriculture & allied activities, the share of forestry & logging was highest in Jharkhand, followed by Orissa and Bihar. In Uttar Pradesh and West Bengal, the shares were below all India levels in recent years. Within agriculture & allied activities, the share of fisheries was highest in recent years in West Bengal due to its favourable geographical location with proximity to both river Ganga and the Bay of Bengal. West Bengal was followed by Orissa and Bihar. The fisheries sector showed very low shares in Jharkhand and Uttar Pradesh.

Table 2.2: Share of GDP within Agriculture and Allied Activities in India (%)

Agriculture & Allied Activities	1980-81	1985-86	1990-91	1995-96	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
India												
Agriculture incl. Livestock	91.89	91.36	91.46	91.81	90.96	90.93	90.14	90.74	90.77	90.46	91.24	91.78
Forestry & Logging	6.17	6.06	5.47	4.25	4.29	4.30	4.46	4.20	4.23	4.20	3.86	3.71
Fishing	1.94	2.57	3.07	3.94	4.75	4.78	5.40	5.06	5.01	5.34	4.90	4.50
Bihar												
Agriculture incl. Livestock	93.42	93.34	93.17	91.19	91.50	89.31	90.27	88.67	88.80	88.20	90.00	88.10
Forestry & Logging	4.53	3.94	3.51	4.94	4.67	5.48	4.92	5.79	6.09	6.57	5.55	6.46
Fishing	2.05	2.72	3.33	3.87	3.83	5.22	4.81	5.54	5.11	5.23	4.45	5.44
Orissa												
Agriculture incl. Livestock	88.07	88.38	81.33	88.89	83.03	84.42	85.11	86.16	86.66	86.84	86.41	86.73
Forestry & Logging	9.44	8.41	13.57	6.50	9.78	8.71	7.74	8.02	7.40	7.19	8.05	7.56
Fishing	2.49	3.21	5.10	4.61	7.19	6.87	7.15	5.82	5.94	5.97	5.53	5.70
Uttar Pradesh												
Agriculture incl. Livestock	96.19	97.70	98.33	98.28	95.96	97.14	96.23	96.15	95.94	95.44	95.28	95.20
Forestry & Logging	3.47	1.69	0.90	0.66	2.95	1.69	2.53	2.57	2.77	3.33	3.53	3.52
Fishing	0.34	0.62	0.76	1.06	1.09	1.17	1.23	1.28	1.28	1.23	1.19	1.28
West Bengal												
Agriculture incl. Livestock	86.38	85.69	87.42	87.18	86.77	85.52	84.29	86.24	86.39	85.78	85.36	86.93
Forestry & Logging	3.56	4.03	5.46	4.33	4.19	3.55	3.35	3.12	3.21	3.16	3.36	2.84
Fishing	10.07	10.28	7.12	8.50	9.04	10.93	12.36	10.64	10.41	11.06	11.28	10.23
Jharkhand												
Agriculture & Allied Activities			**1993-94**	**1995-96**	**2000-01**	**2001-02**	**2002-03**	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**
Agriculture incl. Livestock			86.12	86.24	79.45	83.30	90.34	92.57	92.56	86.40	84.91	83.99
Forestry & Logging			8.51	7.60	16.89	11.40	6.65	6.60	6.39	11.89	13.26	12.08
Fishing			5.37	6.17	3.66	5.29	3.01	0.83	1.05	1.71	1.83	3.93

Source: Central Statistical Organisation, National Accounts Division

Crop Diversification

There has been a significant change in the cropping pattern as well as in the relative share of various crops in the gross value of crop output in the past few decades.

Cropping Pattern Changes

In India as a whole as well in all the eastern states the area share of cereals in the Gross Cropped Area (GCA) has been highest amongst other crops from 1970-71 to 2007-08. In India, the area share under cereals in the GCA has declined from 70.30% in 1970-71 to 61.89% in 2007-08. Area under pulses has reduced marginally. Area under oilseeds has increased from 9.41% to 13.20%. Area under fruits & vegetables has increased from 0.35% to 1.59%. The area shares of crops like cotton, jute, coconut, sugarcane, and spices showed a marginal increase during this period (Table 2.3).

In Bihar, the area share of cereals in the GCA has been around 80% in most years from 1970-71 to 2007-08. Proportionate area under pulses has shown a marginal increase. The proportion of area under oilseeds and sugarcane declined marginally while proportion of area under fruits & vegetables and jute & mesta increased slightly over the years. In Orissa, the area share of cereals in the GCA declined from 68.33% in 1970-71 to 51.35% in 2007-08. However, the area share of cereals started to increase since 1995 but was lower than the levels attained in the 1970s. Proportionate area under pulses showed substantial increase. The proportion of area under oilseeds, sugarcane, jute & mesta and fruits & vegetables declined marginally. The area share of sugarcane increased marginally thereafter. In Uttar Pradesh, the area share of cereals in the GCA increased marginally from 65.61% in 1970-71 to 67.91% in 2007-08. Proportionate area under pulses has shown a marginal decline. The proportion of area under oilseeds and sugarcane increased while that under fruits and vegetables decreased marginally over the years. In West Bengal, the area share of cereals in the GCA has declined from 74.72% in 1970-71 to 63.27% in 2007-08. Proportionate area under pulses has shown a marginal decline. The proportion of area under oilseeds increased from 2.07% to 7.25% over the years while that under fruits & vegetables and jute & mesta increased marginally. The area share under sugarcane decreased over the years. As regards cropping pattern in Jharkhand, the area share of cereals in the GCA has declined marginally from 83.72% in 2000-01 to 76.92% in 2007-08. Proportionate area under pulses showed a substantial

increase. The proportion of area under jute has shown a marginal decline while that under fruits & vegetables, oilseeds and sugarcane has shown an increase over the years (Table 2.24).

Table 2.3 also shows that the area devoted to food grains was much higher in all the eastern states compared to horticultural crops. The proportionate area under horticultural crops is relatively high only in West Bengal and Bihar.

Table 2.3: Cropping Pattern in Eastern India (%)

Crops	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2007-08
India									
Cereals	70.3	70.14	69.97	68.79	66.42	64.46	64.04	61.8	61.89
Pulses	12.75	13.38	12.41	13.12	12.81	11.87	10.77	11.38	11.87
Oilseeds	9.41	9.26	9.72	10.22	12.55	13.83	12.05	14.16	13.2
Cotton	4.3	4.02	4.32	4.05	3.87	4.82	4.51	4.41	4.69
Jute & Mesta	0.61	0.5	0.72	0.81	0.53	0.5	0.54	0.46	0.48
Coconut	0.59	0.59	0.6	0.66	0.77	0.97	0.97	0.99	1.05
Sugarcane	1.48	1.51	1.47	1.53	1.92	2.21	2.29	2.13	2.51
Fruits & Vegetables	0.3	0.41	0.54	0.6	0.64	0.8	1.38	1.56	1.59
Spices	0	0	0	0	0	0	0.89	0.77	0.67
Bihar including Jharkhand till 2000-01									
Cereals	85	73.58	81.68	77.11	81.11	83	72.36	82.41	81.18
Pulses	7	8.22	8.84	8.34	10.67	9.2	8.97	8.07	7.68
Oilseeds	2.31	2.2	2	1.85	1.98	2.25	1.94	1.88	1.78
Fruits & Vegetables	1.29	1.26	1.28	1.28	2.63	1.48	3.36	3.74	3.61
Sugarcane	2.19	1.24	1.03	1.13	1.02	1.36	1.17	1.37	1.37
Jute	1.47	0.92	1.57	1.91	1.56	1.83	2.09	1.99	1.95
Orissa									
Cereals	68.33	66.19	57.42	53.44	48.71	52.9	52.00	51.66	51.35
Pulses	0.85	1.14	1.71	1.97	21.84	9.62	8.00	9.06	9.53
Oilseeds	4.16	4.19	6.94	8.68	7.73	8.81	3.5	3.71	3.58
Fruits & Vegetables	0.37	0.09	0.1	0.44	0.16	0.18	0.28	0.3	0.3
Sugarcane	0.55	0.59	0.6	0.62	0.51	0.51	0.21	0.18	0.22
Jute	0.65	0.49	0.54	0.6	0.37	0.27	0.35	0.28	0.31
Uttar Pradesh									
Cereals	65.61	66.85	71.77	68.63	61.13	62.71	69.58	68.42	67.91
Pulses	11.79	9.74	8.53	8.28	11.13	10.97	10.64	10.87	8.65
Oilseeds	3.1	3.88	3.09	3.56	3.47	6.72	5.63	4.24	5.38
Sugarcane	0.06	0.04	0.04	0.04	0.01	8.08	7.66	8.52	8.74
Fruits & Vegetables	3.11	3.89	3.11	4.03	3.57	4.17	5.48	4.2	1.27

West Bengal									
Cereals	74.72	75.87	75.23	68.51	71.13	68.72	76.33	64.72	63.27
Pulses	2.06	1.65	1.61	1.05	3.04	2.34	3.05	2.33	1.91
Oilseeds	2.07	2.44	3.24	4.56	5.92	5.72	6.49	6.72	7.25
Jute & Mesta	5.68	4.2	8.24	9.15	5.77	6.95	6.84	5.97	6.33
Sugarcane	0.53	0.37	0.2	0.16	0.19	0.27	0.25	0.15	0.17
Fruits & Vegetables	1.1	1.42	1.56	1.73	2.24	2.17	2.75	1.98	1.99
Jharkhand									
	2000-01	**2001-02**	**2002-03**	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**	
Cereals	83.72	86.74	81.59	78.04	77.44	77.59	78	76.92	
Pulses	5.66	2.83	8.29	12.33	13.22	12.38	15.06	15.77	
Oilseeds	2.18	2.15	1.05	1.58	1.4	1.3	4.74	4.78	
Fruits & Vegetables	1.02	1.51	1.63	1.51	1.61	1.58	1.32	1.45	
Sugarcane	0.19	0.18	0.21	0.19	0.19	0.19	0.16	0.23	
Jute	0.06	0.06	0	0.05	0.04	0	0.04	0.04	

Source: Calculated Based on Data Collected from DE&S Min. of Agriculture, GOI

District Level Analysis of Cropping Patterns

The cropping pattern changes at the district level were analysed through two types of diversification indices.

1. Index of Crop Diversification by (1965)[2] and,
2. Simpson's Index of Diversification

For the measurement of crop diversification Bhatia in 1965 developed a formula based on Gross Cropped Area (GCA). The formula has been expressed as:

$$\textit{Index of Crop Diversification} = \frac{\text{Percentage of Sown Area under } X \text{ Crops}}{\text{Number of } X \text{ Crops}}$$

Where *X* crops are those crops that individually occupy 10% or more of the GCA in the area under study. The main advantage of crop diversification is that it provides a relationship between the relative areal strength of the crops grown in a region. The larger number of crops having about 10% of the GCA, the higher is the crop diversification in the region. In fact, it is an indicator of multiplication of agricultural activities which obviously involve intense competition among various activities for space. The keener the competition, the higher the degree of diversification, and lesser the competition, greater will be the degree of specialization or mono-culture. Thereby, a high index value shows

[2] Hussain, M.,1999, 'Systematic Agricultural Geography', Rawat Publication, Jaipur and New Delhi

lesser diversification and increased specialization and a low index value shows higher diversification.[3]

It would be seen from table 2.4, it is seen that in that in the state of Bihar, three crops occupied more than 10% of GCA in 1999-2000. Only in six districts (Araria, Katihar, Madhepura, Muzaffarpur, Purnia and Saharsa), four crops occupied more than 10% of GCA. In 2005-06 it was seen that two crop combinations dominated in Bihar, where only in two districts (Katihar and Purnia) four crops occupied more than 10% of GCA. There was an increase in the index values of diversification for 24 out of 38 districts (64%) from 1999-2000 to 2005-06, thereby indicating a reduction in crop diversification from the 1999-2000 levels.

Table 2.4: Index of Crop Diversification – Bihar

1999-2000			2005-06		
Districts	**Index of Crop Diversification**	**No. of Crops with >10% area of GCA**	**Districts**	**Index of Crop Diversification**	**No. of Crops with >10% area of GCA**
Araria	2	48.20	Araria	3	27.62
Arhasia	4	19.60			
Aurangabad	3	26.49	Aurangabad	2	41.66
Baghalpur	2	36.03	Baghalpur	3	28.92
Bhanka	2	37.17	Banka	2	39.84
Begusarai	2	40.51	Begusarai	3	31.01
Bhabha	1	64.64	Bhabha	2	43.77
Bhojpur	1	64.18	Bhojpur	2	41.28
Buxar	1	64.18	Buxar	2	42.17
Champaran(East)	2	36.69	Champaran(East)	2	45.26
Champaran(West)	3	25.53	Champaran(West)	2	40.24
Darbhanga	3	25.37	Darbhanga	2	41.45
Gaya	1	55.73	Gaya	2	41.65
Gopalganj	2	38.30	Gopalganj	2	44.11
Jahanabad	3	28.53	Jahanabad	2	41.16
Katihar	4	21.47	Katihar	4	22.99
Khagaria	2	39.36	Khagaria	3	29.43
Kishanganj	3	23.92	Kishanganj	3	28.84
Lakhisaria	3	25.36	Lakhisaria	3	27.03
Madhubani	2	36.25	Madhubani	2	45.01
Madhupura	4	20.55	Madhupura	3	27.57
Monghyr	2	43.24	Monghyr	3	31.66
Muzaffarpur	4	22.05	Muzaffarpur	2	39.15
Nalanda	1	69.71	Nalanda	2	43.43

[3] This exercise has been done for all the eastern states excepting Jharkhand due to unavailability of appropriate districtwise crops data

Nawadha	1	71.26	Nawadha	2	44.87
Patna	3	24.83	Patna	3	26.99
Purnia	4	18.39	Purnia	4	22.41
Rohtas	1	76.18	Rohtas	2	45.82
Saharsa	4	22.62	Saharsa	3	28.61
Samastipur	3	23.78	Samastipur	3	29.16
Saran	3	29.31	Saran	3	31.74
Shivhar	2	34.89	Shivhar	2	46.31
Shkhpura	2	39.12	Shkhpura	2	41.17
Sitamarhi	2	36.12	Sitamarhi	2	43.84
Siwan	3	28.89	Siwan	2	43.56
Supaul	2	50.00	Supaul	3	26.70
Vaishali	3	23.65	Vaishali	3	29.18
Zamui	2	36.12	Zamui	2	44.04
Grand Total	**3**	**23.88**	**Grand Total**	**2**	**38.80**

Source: Calculated based on the data collected from DE&S Min. of Agriculture, GOI

The index values of crop diversification are very high in the state of Orissa, (Table 2.5) indicating a high degree of crop specialization in the sate in both years. In 1999-2000, only in two districts (Koraput and Rayagada) three crops occupied more than 10% GCA. The year 2005-06 showed a decline in crop diversification in Rayagada and Koraput from the 1999-2000 levels as two crops started dominating GCA as well as an increase in their index values. There was an increase in the index values of diversification for 22 out of 31 districts (71%) from 1999-2000 to 2005-06, thereby indicating a reduction in crop diversification from the 1999-2000 levels.

Table 2.5: Index of Crop Diversification - Orissa

1999-2000			**2005-06**		
Districts	**Index of Crop Diversification**	**No. of Crops with >10% area of GCA**	**Districts**	**Index of Crop Diversification**	**No. of Crops with >10% area of GCA**
Angul	70.36	1	Angul	81.61	1
Balasore	94.46	1	Balasore	96.14	1
Bhadrak	95.56	1	Bhadrak	97.39	1
Bolangir	74.85	1	Bolangir	83.12	1
Boudh	83.78	1	Boudh	88.48	1
Buragarh	85.92	1	Buragarh	86.76	1
Cuttack	78.84	1	Cuttack	42.76	2
Deogarh	80.53	1	Deogarh	84.14	1
Dhenkanal	81.38	1	Dhenkanal	86.16	1
Gajapatti	58.33	1	Gajapatti	41.51	2
Ganjam	43.91	2	Ganjam	45.32	2
Jagatsingpur	90.77	1	Jagatsingpur	47.85	2
Jajpur	82.80	1	Jajpur	78.71	1
Jharsugda	89.63	1	Jharsugda	92.96	1
Kalahandi	73.94	1	Kalahandi	91.11	1

Kandhamal	82.23	1	Kandhamal	83.78	1
Kedrapara	86.68	1	Kedrapara	45.31	2
Keonjhar	80.67	1	Keonjhar	94.99	1
Khurda	47.21	2	Khurda	47.55	2
Koraput	30.00	3	Koraput	46.51	2
Malkangiri	78.71	1	Malkangiri	45.58	2
Mayurbhanj	87.75	1	Mayurbhanj	95.87	1
Nawapara	76.11	1	Nawapara	90.14	1
Naworangpur	66.64	1	Naworangpur	44.68	2
Nayagarh	44.21	2	Nayagarh	44.94	2
Phulbani	49.08	2			
Puri	93.23	1	Puri	89.84	1
Rayagada	26.04	3	Rayagada	39.92	2
Sambalpur	88.30	1	Sambalpur	94.08	1
Sonepur	92.10	1	Sonepur	95.55	1
Sundargarh	86.73	1	Sundargarh	94.42	1
Grand Total	**80.47**	**1**	**Grand Total**	**85.03**	**1**

Source: Calculated based on the data collected from DE&S Min. of Agriculture, GOI

In the state of Uttar Pradesh (Table 2.6), during 1999-2000, four crop combinations occupied more than 10% of GCA only in three districts (Banda, Kannauj and Lalitpur), while in 2005-06, four crop combinations occupied more than 10% GCA in six districts (Bullandshahar, Gonda, Jalaun, Jhansi, Lalitpur, Mahoba and Shivasti). There was an increase in the index values of diversification for 34 out of 70 districts (48.57%) from 1999-2000 to 2005-06, thereby indicating a slight increase in crop diversification from the 1999-2000 levels.

Table 2.6: Index of Crop Diversification – Uttar Pradesh

1999-2000			**2005-06**		
Districts	**Index of Crop Diversification**	**No. of Crops with >10% Area of GCA**	**Districts**	**Index of Crop Diversification**	**No. of Crops with >10% Area of GCA**
Agra	28.41	3.00	Agra	28.28	3
Aligarh	31.57	2.00	Aligarh	34.23	2
Allahabad	37.49	2.00	Allahabad	38.78	2
Ambedkar Ngr.	43.06	2.00	Ambedkar Ngr.	43.00	2
Auraiya	24.35	3.00	Auraiya	24.00	3
Azamgarh	42.86	2.00	Azamgarh	43.42	2
Badaun	28.33	3.00	Badaun	27.17	3
Bagpat	45.56	2.00	Bagpat	47.08	2
Bahraich	39.78	2.00	Bahraich	27.37	3
Ballia	39.10	2.00	Ballia	37.39	2
Balrampur	35.84	2.00	Balrampur	26.18	3
Banda	22.57	4.00	Banda	24.78	3
Barabanki	39.36	2.00	Barabanki	37.94	2
Bareilly	30.87	3.00	Bareilly	29.82	3

Basti	39.78	2.00	Basti	30.16	3
Bijnor	32.57	3.00	Bijnor	32.40	3
Bullandshahr	25.76	3.00	Bullandshahr	21.52	4
Chandauli	45.60	2.00	Chandauli	43.56	2
Chitrakut	23.54	3.00	Chitrakut	22.39	3
Deoria	42.38	2.00	Deoria	43.57	2
Etah	23.31	3.00	Etah	25.01	3
Etawah	24.87	3.00	Etawah	25.68	3
Faizabad	40.48	2.00	Faizabad	39.91	2
Farrukhabad	23.80	3.00	Farrukhabad	24.31	3
Fatehpur	24.52	3.00	Fatehpur	24.43	3
Firozabad	31.81	2.00	Firozabad	26.40	3
G.Buddha Ngr.	33.82	2.00	G.Buddha Ngr.	39.33	2
Ghaziabad	29.28	3.00	Ghaziabad	40.85	2
Ghazipur	40.32	2.00	Ghazipur	40.00	2
Gonda	27.59	3.00	Gonda	22.44	4
Gorakhpur	44.51	2.00	Gorakhpur	45.14	2
Hamirpur	23.82	3.00	Hamirpur	21.37	3
Hardoi	32.96	2.00	Hardoi	35.33	2
Hatharas	23.96	3.00	Hatharas	26.46	3
J.B.Phule Ngr.	30.12	3.00	J.B.Phule Ngr.	30.00	3
Jalaun	25.67	3.00	Jalaun	18.93	4
Jaunpur	27.65	3.00	Jaunpur	37.62	2
Jhansi	23.61	3.00	Jhansi	21.05	4
Kannauj	20.65	4.00	Kannauj	25.13	3
Kanpur City	26.23	2.00	Kanpur City	28.51	2
Kanpur Dehat	100.00	1.00	Kanpur Dehat	28.34	2
Kaushambi	22.30	3.00	Kaushambi	31.98	2
Kheri	29.94	3.00	Kheri	29.34	3
Kushi Ngr.	31.24	3.00	Kushi Ngr.	30.96	3
Lalitpur	19.42	4.00	Lalitpur	19.11	4
Lucknow	38.33	2.00	Lucknow	39.34	2
Maharahganj	45.01	2.00	Maharahganj	43.60	2
Mahoba	23.95	3.00	Mahoba	19.17	4
Mainpuri	26.42	3.00	Mainpuri	27.38	3
Mathura	26.62	3.00	Mathura	27.11	3
Mau	43.41	2.00	Mau	44.56	2
Meerut	41.86	2.00	Meerut	43.72	2
Mirzapur	36.74	2.00	Mirzapur	36.11	2
Moradabad	28.47	3.00	Moradabad	27.58	3
Muzaffarnagar	32.23	3.00	Muzaffarnagar	45.07	2
Pilibhit	32.48	3.00	Pilibhit	32.16	3
Pratapgarh	38.83	2.00	Pratapgarh	39.94	2
Raebareli	38.61	2.00	Raebareli	39.82	2
Rampur	42.83	2.00	Rampur	43.79	2
S.Ravi Das Ngr.	38.15	2.00	S.Ravi Das Ngr.	39.84	2
Saharanpur	31.26	3.00	Saharanpur	31.31	3
Sant Kabir Ngr.	44.03	2.00	Sant Kabir Ngr.	44.80	2

Shahjahanpur	40.79	2.00	Shahjahanpur	40.27	2
Shivasti	30.45	3.00	Shivasti	23.49	4
Siddharth Ngr.	44.77	2.00	Siddharth Ngr.	45.97	2
Sitapur	27.39	3.00	Sitapur	26.75	3
Sonbhadra	28.97	2.00	Sonbhadra	31.05	2
Sultanpur	39.79	2.00	Sultanpur	39.92	2
Unnao	36.65	2.00	Unnao	36.36	2
Varanasi	36.81	2.00	Varanasi	39.47	2
Grand Total	**32.50**	**2.00**	**Grand Total**	**32.09**	**2**

Source: Calculated based on the data collected from DE&S Min. of Agriculture, GOI

In the state of West Bengal (Table 2.7), during 1999-2000, three crop combinations occupied more than 10% of GCA only in three districts (Darjeeling, Murshidabad and Nadia), while in 2005-06, three crop combinations occupied more than 10% GCA in four districts (Darjeeling, Malda, Murshidabad and Nadia). There was a slight increase in the index values of diversification only in one district (Midnapur East) from 1999-2000 to 2005-06 as well as a decline in the overall state index value of the state from 73 to 69, thereby indicating an increase in crop diversification from the 1999-2000 levels.

Table 2.7: Index of Crop Diversification – West Bengal

1999-2000			**2005-06**		
Districts	**Index of Crop Diversification**	**No. of Crops with >10% Area of GCA**	**Districts**	**Index of Crop Diversification**	**No. of Crops with >10% Area of GCA**
24 Parganas (North)	41.65	2	24 Parganas (North)	39.93	2
24 Parganas (South)	91.23	1	24 Parganas (South)	91.23	1
Bankura	86.47	1	Bankura	82.20	1
Birbhum	83.42	1	Birbhum	77.49	1
Burdwan	85.49	1	Burdwan	81.76	1
Cooch-Behar	41.94	2	Cooch-Behar	36.78	2
Darjeeling	26.77	3	Darjeeling	24.53	3
Dinajpur(South)	79.96	1	Dinajpur(South)	74.67	1
Dinajur(North)	38.95	2	Dinajur(North)	36.90	2
Hooghly	43.02	2	Hooghly	42.24	2
Howrah	85.86	1	Howrah	82.42	1
Jalpaiguri	40.01	2	Jalpaiguri	37.36	2
Malda	37.52	2	Malda	25.28	3
Midnapur (East)	88.06	1	Midnapur (East)	89.67	1
Midnapur (West)	83.00	1	Midnapur (West)	76.87	1
Murshidabad	27.70	3	Murshidabad	26.12	3
Nadia	26.23	3	Nadia	25.83	3
Purulia	89.16	1	Purulia	87.43	1
Grand Total	**73.38**	**1**	**Grand Total**	**68.99**	**1**

Source: Calculated based on the data collected from DE&S Min. of Agriculture, GOI

Horizontal diversification is the increase in the number of crops grown given the economical rationality of this expansion. The extent of horizontal diversification has been gauged empirically through another index termed Simpson's index of diversification (SID)[4]. This index has been worked out using the following formula:

SID = 1-(proportionate area of food grains in the gross cropped area)

In this index food grains has been taken because the proportionate area under food grains (cereals and pulses) are the highest in India.

Table 2.8: Simpson's Index of Diversification

Regions	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2007-08
India	0.17	0.16	0.18	0.18	0.21	0.24	0.25	0.27	0.26
Bihar	0.08	0.18	0.09	0.15	0.08	0.08	0.19	0.10	0.11
Orissa	0.31	0.33	0.41	0.45	0.29	0.37	0.40	0.39	0.39
Uttar Pradesh	0.23	0.23	0.2	0.23	0.28	0.26	0.20	0.21	0.23
West Bengal	0.23	0.22	0.23	0.30	0.26	0.29	0.21	0.33	0.35
Jharkhand		**2000-01**	**2001-02**	**2002-03**	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**
		0.11	0.10	0.10	0.10	0.09	0.10	0.07	0.07

Source: Calculated based on the data collected from DE&S Min. of Agriculture, GOI

From the above Table 2.8 it is seen that at the all India level crop diversification away from food grains has increased over the years from 1970-71 to 2007-08. In Bihar it has increased since 1970-71 but after 2000-01 it showed a decline. Moreover, the levels of diversification in Bihar were very less compared to the other eastern states. In Jharkhand crop diversification away from food grains has decreased and the levels are lowest compared to the other eastern states. The levels of crop diversification are highest in Orissa followed by West Bengal and Uttar Pradesh. In Orissa crop diversification away from food grains reduced especially since 1995-96 mainly because though area under cereals decreased area under pulses started to increase resulting in greater area under food grain cultivation. In Uttar Pradesh crop diversification away from food grains increased slightly, whereas in West Bengal crop diversification away from food grains increased tremendously.

[4] Singh et.al (2006)

The districtwise analysis of SID (Table 2.9) also shows similar levels of diversification as the state levels explained in the above paragraph. The SID was compared taking two time periods, 1999-2000 and 2006-07, or the latest year for which districtwise data was available. In Bihar diversification away from food grains was seen only in 27% of the districts within the two time periods. In Jharkhand diversification away from food grains declined in all districts. In Orissa, diversification away from food grains was seen only in 57% of the districts within the two time periods. In Uttar Pradesh diversification away from food grains showed an increase in 74% districts and all the districts in West Bengal showed diversification away from food grains within both time periods.

From Table 2.10 it is seen that in the year 2006-07, in Bihar crop diversification away from food grains was towards horticultural crops (4.05%) followed by plantation crops (3.96%) and oilseeds (2.02%). Proportionate area under horticultural crops was highest in Jehanabad (15.58%). Proportionate area under plantation crops was highest in Kishanganj (33.70%) and the proportionate area under oilseeds was highest in West Champaran (5.77%). During 2005-06 in Orissa diversification was towards oilseeds (4.02%) followed by plantation crops (0.55%) and horticultural crops (0.47%). Proportionate area under oilseeds was highest in Malkangiri district (14.81%). Proportionate area under plantation crops was highest in Koraput (3%) and the proportionate area under horticultural crops was highest in Kandhamal (3.22%). During 2003-04 in Uttar Pradesh diversification was towards plantation crops (9.02%) followed by oilseeds (4.88%) and horticultural crops (4.38%). Proportionate area under plantation crops was highest in Muzaffarnagar (58.22%). Proportionate area under oilseeds was highest in Agra (31.91%) and the proportionate area under horticultural crops was highest in West Champaran (5.77%). In 2006-07 in West Bengal diversification was towards oilseeds (7.49%) followed by plantation crops (6.97%) and horticultural crops (2.42%). Proportionate area under oilseeds was highest in the district of Nadia (15.82%). Proportionate area under plantation crops was highest in Cooch-Behar (20.06%) and the proportionate area under horticultural crops was highest in Hoogly district (8.41%). In Jharkhand during the year 2003-04, the proportionate area apart from food grains was

mostly under oilseeds (1.67%) and the largest share of area under oilseeds was in Lohardaga (Table 2.10).

Table 2.9: Districtwise Simpson's Index of Diversification

Uttar Pradesh	**1999**	**2003**	**Bihar**	**1999**	**2006**	**Orissa**	**1999**	**2005**	**West Bengal**	**1999**	**2006**	**Jharkhand**	**1999**	**2003**
Agra	0.28	0.42	Araria	0.46	0.32	Angul	0.51	0.49	24 Parganas (N)	0.25	0.39	Bokaro	0.08	0.03
Aligarh	0.10	0.11	Aurangabad	0.10	0.07	Balasore	0.26	0.36	24 Parganas (S)	0.07	0.18	Chatra	0.12	0.05
Allahabad	0.06	0.05	Baghalpur	0.08	0.13	Bhadrak	0.25	0.31	Bankura	0.12	0.27	Deogarh	0.06	0.03
Ambedkar Ngr.	0.09	0.10	Bhanka	0.06	0.03	Bolangir	0.46	0.36	Birbhum	0.10	0.23	Dhanbad	0.05	0.03
Auraiya	0.12	0.13	Begusarai	0.10	0.12	Boudh	0.37	0.35	Burdwan	0.14	0.28	Dumka	0.09	0.03
Azamgarh	0.08	0.08	Bhabha	0.08	0.08	Buragarh	0.35	0.42	Cooch-Behar	0.29	0.45	Giridih	0.07	0.03
Badaun	0.11	0.12	Bhojpur	0.05	0.10	Cuttack	0.42	0.46	Darjeeling	0.15	0.32	Godda	0.07	0.03
Bagpat	0.50	0.54	Buxar	0.10	0.07	Deogarh	0.40	0.52	Dinajpur (S)	0.15	0.31	Gumla	0.11	0.06
Bahraich	0.14	0.08	Champaran (E)	0.11	0.01	Dhenkanal	0.39	0.43	Dinajur (N)	0.26	0.36	Hazaribagh	0.14	0.04
Ballia	0.07	0.07	Champaran (W)	0.24	0.12	Gajapatti	0.62	0.34	Hooghly	0.30	0.44	Koderma	0.17	0.05
Balrampur	0.15	0.27	Darbhanga	0.08	0.03	Ganjam	0.46	0.38	Howrah	0.14	0.27	Lohardaga	0.21	0.13
Banda	0.03	0.03	Gaya	0.14	0.07	Jagatsingpur	0.30	0.38	Jalpaiguri	0.24	0.38	Pakur	0.08	0.04
Barabanki	0.12	0.12	Gopalganj	0.12	0.06	Jajpur	0.38	0.48	Malda	0.16	0.34	Palamau	0.13	0.07
Bareilly	0.19	0.22	Jahanabad	0.05	0.16	Jharsugda	0.31	0.42	Midnapur (E)	0.11	0.20	Ranchi	0.08	0.04
Basti	0.14	0.17	Zamui	0.06	0.01	Kalahandi	0.47	0.33	Midnapur (W)	0.15	0.32	Sahebganj	0.08	0.03
Bijnor	0.54	0.56	Katihar	0.25	0.30	Kandhamal	0.38	0.61	Murshidabad	0.29	0.40	Singhbhum (E)	0.05	0.03
Bullandshahr	0.15	0.19	Khagaria	0.06	0.15	Kedrapara	0.34	0.45	Nadia	0.35	0.51	Singhbhum (W)	0.05	0.03
Chandauli	0.03	0.03	Kishanganj	0.42	0.37	Keonjhar	0.40	0.33	Purulia	0.02	0.16	**Jharkhand**	**0.09**	**0.05**
Chitrakut	0.03	0.04	Lakhisaria	0.04	0.06	Khurda	0.38	0.34	**West Bengal**	**0.19**	**0.33**			
Deoria	0.09	0.08	Madhubani	0.07	0.02	Koraput	0.63	0.37						
Etah	0.12	0.12	Madhupura	0.12	0.16	Malkangiri	0.42	0.47						
Etawah	0.14	0.16	Monghyr	0.03	0.05	Mayurbhanj	0.33	0.33						
Faizabad	0.10	0.15	Muzaffarpur	0.08	0.03	Nawapara	0.44	0.32						

Farrukhabad	0.28	0.35	Nalanda	0.07	0.02	Naworangpur	0.54	0.33						
Fatehpur	0.08	0.12	Nawadha	0.07	0.05	Nayagarh	0.52	0.36						
Firozabad	0.17	0.22	Patna	0.06	0.12	Puri	0.27	0.41						
G.Buddha Ngr.	0.06	0.05	Purnia	0.32	0.26	Rayagada	0.64	0.45						
Ghaziabad	0.40	0.39	Rohtas	0.06	0.05	Sambalpur	0.32	0.40						
Ghazipur	0.08	0.06	Saharsa	0.03	0.07	Sonepur	0.28	0.32						
Gonda	0.11	0.17	Samastipur	0.19	0.06	Sundargarh	0.33	0.38						
Gorakhpur	0.05	0.06	Saran	0.06	0.03	**Orissa**	**0.40**	**0.39**						
Hamirpur	0.16	0.15	Shivhar	0.13	0.02									
Hardoi	0.13	0.14	Shkhpura	0.06	0.02									
Hatharas	0.19	0.21	Sitamarhi	0.13	0.02									
J.B.Phule Ngr.	0.35	0.39	Siwan	0.07	0.06									
Jalaun	0.21	0.24	Supaul	0.21	0.19									
Jaunpur	0.09	0.09	Vaishali	0.18	0.03									
Jhansi	0.32	0.32	**Bihar**	**0.13**	**0.10**									
Kannauj	0.24	0.34												
Kanpur City	0.16	0.17												
Kanpur Dehat	0.00	0.15												
Kaushmbi	0.07	0.08												
Kheri	0.36	0.41												
Kushi Ngr.	0.27	0.27												
Lalitpur	0.17	0.20												
Lucknow	0.08	0.09												
Maharahganj	0.09	0.10												
Mahoba	0.33	0.29												
Mainpuri	0.08	0.12												
Mathura	0.15	0.21												
Mau	0.08	0.07												
Meerut	0.54	0.60												
Mirzapur	0.07	0.10												
Moradbad	0.21	0.19												
Muzaffarnagar	0.54	0.60												
Pilibhit	0.15	0.16												
Pratapgarh	0.05	0.05												

Raebareli	0.07	0.08												
Rampur	0.12	0.10												
S.Ravi Das Ngr.	0.05	0.04												
Saharnpur	0.37	0.43												
Sant Kabir Ngr.	0.07	0.08												
Shahjahanpur	0.14	0.16												
Shivasti	0.05	0.05												
Siddharth Ngr.	0.06	0.06												
Sitapur	0.23	0.28												
Sonbhadra	0.07	0.13												
Sultanpur	0.08	0.10												
Unnao	0.07	0.10												
Varanasi	0.10	0.10												
Uttar Pradesh	**0.16**	**0.18**												

Source: Calculated based on the data collected from DE&S Min. of Agriculture, GOI

Table 2.10: Districtwise Cropping Pattern in Eastern States

Bihar 2006-07	% Area under Food grains	% Area under Horticulture	% Area under oilseeds	% Area under Plantation Crops
Araria	68.25	4.52	2.83	24.40
Aurangabad	92.66	5.14	2.21	0.00
Baghalpur	86.77	10.91	2.05	0.27
Banka	96.65	0.61	1.33	1.40
Begusarai	88.18	8.15	3.49	0.18
Bhabha	92.19	5.74	2.07	0.00
Bhojpur	89.86	9.01	1.12	0.01
Buxar	93.28	5.61	1.10	0.00
Champaran (E)	98.92	0.38	0.68	0.01
Champaran (W)	88.22	6.01	5.77	0.00
Darbhanga	96.90	1.87	1.23	0.00
Gaya	93.36	4.62	1.86	0.16
Gopalganj	93.79	4.84	1.31	0.06
Jahanabad	83.75	15.58	0.62	0.05
Jamui	99.09	0.39	0.52	0.00
Katihar	70.00	1.20	3.13	25.68
Khagaria	84.71	12.23	2.84	0.22
Kishanganj	62.81	0.87	2.62	33.70
Lakhisaria	93.79	4.81	1.40	0.01
Madhubani	98.21	1.06	0.70	0.03
Madhupura	84.25	5.88	3.20	6.67
Monghyr	95.53	3.38	0.93	0.17
Muzaffarpur	97.52	1.23	1.18	0.07
Nalanda	98.12	1.09	0.67	0.13
Nawadha	95.50	2.94	1.49	0.06
Patna	88.52	10.08	1.40	0.00
Purnia	74.10	2.13	3.47	20.31
Rohtas	94.57	3.73	1.70	0.00

Orissa 2005-06	% Area under Food grains	% Area under Horticulture	% Area under oilseeds	% Area under Plantation Crops
Angul	50.86	1.08	10.13	0.20
Balasore	63.75	0.35	2.98	0.35
Bhadrak	69.00	0.04	0.28	0.33
Bolangir	63.59	0.02	4.85	0.52
Boudh	65.19	0.26	2.65	0.02
Buragarh	57.61	0.28	8.84	0.23
Cuttack	54.48	1.55	2.74	1.56
Deogarh	47.58	1.62	9.97	0.08
Dhenkanal	56.96	0.59	6.91	0.84
Gajapatti	66.20	0.00	2.58	0.62
Ganjam	62.43	0.12	4.88	0.88
Jagatsingpur	61.93	0.85	1.51	0.52
Jajpur	52.16	0.68	11.02	0.43
Jharsugda	58.01	0.50	7.38	0.09
Kalahandi	66.59	0.18	1.62	0.28
Kandhamal	39.23	3.22	8.03	0.02
Kedrapara	55.37	1.32	4.09	0.86
Keonjhar	67.26	0.20	0.96	0.26
Khurda	66.15	0.35	0.75	0.51
Koraput	62.87	0.38	0.55	3.00
Malkangiri	52.88	0.01	14.81	0.00
Mayurbhanj	67.16	0.06	2.12	0.02
Nawapara	68.05	0.03	1.50	0.02
Naworangpur	67.32	0.17	0.44	0.78
Nayagarh	64.37	0.04	1.66	2.64
Puri	59.08	1.14	2.68	0.19
Rayagada	54.58	0.26	11.54	0.27
Sambalpur	60.16	0.69	4.48	0.05

Saharsa	93.10	5.41	1.28	0.21
Samastipur	93.97	1.64	3.80	0.59
Saran	96.63	1.94	1.42	0.01
Shivhar	98.50	0.35	1.11	0.04
Shkhpura	97.95	0.66	1.39	0.00
Sitamarhi	97.87	1.01	1.02	0.09
Siwan	93.75	5.20	0.90	0.15
Supaul	81.42	2.43	4.55	11.60
Vaishali	97.40	0.31	1.73	0.56
Grand Total	**89.97**	**4.05**	**2.02**	**3.96**

Sonepur	68.10	0.07	1.13	0.09
Sundargarh	61.93	0.86	2.02	0.01
Grand Total	**61.49**	**0.47**	**4.02**	**0.55**

West Bengal 2006-07	**% Area under Food grains**	**% Area under Horticulture**	**% Area under oilseeds**	**% Area under Plantation Crops**
24 Parganas (N)	61.12	1.14	9.74	13.13
24 Parganas (S)	81.58	0.57	2.34	1.75
Bankura	72.81	3.05	7.48	0.10
Birbhum	76.60	1.46	6.79	0.43
Burdwan	71.77	3.18	6.30	1.93
Cooch-Behar	54.80	3.03	4.66	20.06
Darjeeling	68.02	6.68	1.15	3.15
Dinajpur(S)	68.79	0.98	8.57	7.24
Dinajur(N)	64.46	1.38	7.91	11.17
Hooghly	56.01	8.41	6.59	5.87
Howrah	72.67	2.59	4.15	4.35
Jalpaiguri	62.52	4.61	3.31	10.67
Malda	66.43	0.83	11.36	7.14
Midnapur (E)	80.02	0.87	3.87	1.15
Midnapur (W)	68.19	3.91	9.38	0.91
Murshidabad	60.09	1.02	9.68	14.43
Nadia	49.24	1.17	15.82	18.68

2003-04 Jharkhand	**% Area under Food grains**	**% Area under oilseeds**
Bokaro	96.58	0.42
Chatra	95.20	1.80
Deogarh	96.69	0.31
Dhanbad	96.92	0.08
Dumka	96.79	0.21
Garhwa	89.89	7.11
Giridih	96.79	0.21
Godda	96.88	0.12
Gumla	93.77	3.23
Hazaribagh	95.57	1.43
Jamtara	96.74	0.26
Koderma	95.35	1.65
Latehar	92.81	4.19
Lohardaga	87.14	9.86
Pakur	96.29	0.71
Palamau	93.08	3.92
Ranchi	95.89	1.11

Purulia	83.57	0.37	2.48	0.13
Grand Total	**66.99**	**2.42**	**7.49**	**6.97**

Sahibganj	96.72	0.28
Saraikela	96.18	0.82
Simdega	94.38	2.62
Singhbhum (E)	96.62	0.38
Singhbhum (W)	96.77	0.23
Grand Total	**95.33**	**1.67**

Uttar Pradesh 2003-04	**% Area under Food grains**	**% Area under Horticulture**	**% Area under oilseeds**	**% Area under Plantation Crops**	**Uttar Pradesh 2003-04**	**% Area under Food grains**	**% Area under Horticulture**	**% Area under oilseeds**	**% Area under Plantation Crops**
Agra	57.61	16.26	0.25	0.05	**Jalaun**	76.34	7.74	0.17	0.46
Aligarh	89.21	0.00	0.04	2.41	**Jaunpur**	91.11	0.37	0.03	3.04
Allahabad	94.56	0.18	0.05	0.18	**Jhansi**	68.42	2.64	0.07	0.02
Ambedkar Ngr.	90.50	0.94	0.03	3.55	**Kannauj**	66.17	0.00	0.00	0.18
Auraiya	87.09	0.12	0.06	0.46	**Kanpur City**	82.76	0.00	0.00	1.75
Azamgarh	91.58	0.00	0.04	4.37	**Kanpur Dehat**	85.03	0.00	0.00	0.93
Badaun	87.89	0.01	0.03	3.86	**Kaushambi**	92.00	0.00	0.00	1.39
Bagpat	46.51	0.00	0.02	51.88	**Kheri**	58.92	0.00	0.00	32.03
Bahraich	92.12	0.01	0.01	3.97	**Kushi Ngr.**	73.05	0.00	0.00	21.57
Ballia	93.54	0.00	0.09	2.40	**Lalitpur**	79.56	0.00	0.00	0.03
Balrampur	73.04	0.00	0.02	16.88	**Lucknow**	90.96	0.00	0.00	0.25
Banda	96.95	0.10	0.04	0.31	**Maharahganj**	90.02	0.00	0.00	5.84
Barabanki	87.57	0.04	0.03	4.13	**Mahoba**	70.58	0.00	0.00	0.57
Bareilly	77.60	0.03	0.03	16.90	**Mainpuri**	87.86	0.00	0.00	0.21
Basti	82.86	0.00	0.01	11.68	**Mathura**	78.79	0.00	0.00	2.30
Bijnor	43.64	17.12	0.26	54.43	**Mau**	93.03	0.00	0.00	4.28
Bullandshahr	80.96	0.15	0.06	13.76	**Meerut**	40.06	0.00	0.00	54.47
Chandauli	96.95	22.47	0.32	0.35	**Mirzapur**	89.98	0.00	0.00	0.68
Chitrakut	96.04	0.00	0.03	0.34	**Moradabad**	80.86	0.00	0.00	14.23
Deoria	91.94	0.02	0.01	4.07	**Muzaffarnagar**	39.89	0.00	0.00	58.22
Etah	87.63	4.45	0.11	4.98	**Pilibhit**	84.29	0.00	0.00	12.77

Etawah	83.76	0.11	0.02	0.37	**Pratapgarh**	94.61	0.00	0.00	0.51
Faizabad	85.31	0.05	0.02	8.79	**Raebareli**	91.61	0.00	0.00	1.21
Farrukhabad	64.91	0.08	0.01	7.07	**Rampur**	89.74	0.00	0.00	6.65
Fatehpur	87.66	0.04	0.03	2.35	**S.Ravi Das Ngr.**	95.68	0.00	0.00	1.20
Firozabad	78.07	0.00	0.03	0.04	**Saharanpur**	57.48	0.00	0.00	40.03
G.Buddha Ngr.	95.03	13.54	0.22	3.02	**Sant Kabir Ngr.**	92.09	0.00	0.00	1.92
Ghaziabad	61.52	0.00	0.03	33.28	**Shahjahanpur**	83.56	0.00	0.00	8.30
Ghazipur	93.78	0.14	0.03	2.09	**Shivasti**	95.26	0.00	0.00	1.49
Gonda	83.16	0.40	0.06	12.09	**Siddharth Ngr.**	94.45	0.00	0.00	1.37
Gorakhpur	93.98	0.01	0.02	1.02	**Sitapur**	71.82	0.00	0.00	20.57
Hamirpur	85.47	0.02	0.02	1.03	**Sonbhadra**	87.29	0.00	0.00	0.27
Hardoi	85.81	0.00	0.02	4.45	**Sultanpur**	90.35	0.00	0.00	2.57
Hatharas	78.62	0.06	0.02	0.28	**Unnao**	90.20	0.00	0.00	0.30
J.B.Phule Ngr.	61.30	0.10	0.02	35.30	**Varanasi**	90.52	0.00	0.00	3.69
					Grand Total	**81.70**	**0.00**	**0.00**	**9.04**

Source: Calculated based on the data collected from DE&S Min. of Agriculture, GOI

Inter-crop Distribution of Gross Value of Crop Output from Agriculture

At the all India level it is seen that the share of cereals in the value of output from agriculture is the highest (around 30%) followed closely by fruits & vegetables (around 24%) (Table 2.11). The share of various crops have shown marginal decline over the years. However the shares of condiments & spices and fruits & vegetables have shown an increase. In Bihar, the share of food grains especially pulses has shown a sizeable decline over the years. The shares of other crops especially fruits & vegetables have increased and is even more than cereal crops, thereby showing diversification towards fruits & vegetables in Bihar. Jharkhand also shows diversification from cereals toward fruits & vegetables. All other crops except fibre crops and condiments & spices have shown a marginal increase in their shares. The shares of fibre crops and condiments & spices have actually declined in Jharkhand. In Orissa, the share of cereals and fruits & vegetables showed a significant increase from their 1980-81 levels. The share of condiments & spices showed marginal increase, while the shares of pulses, oilseeds, fibre crops and sugarcane showed a decline. In Uttar Pradesh, cereal crops showed higher share compared to fruits & vegetables and both their shares showed an increase over time. The shares of pulses and oilseeds have shown a decline whereas those of fibres and condiments & spices have shown a marginal increase. In West Bengal, the share of cereals declined over the years, while those of fruits & vegetables increased from their 1980-81 levels. The share of condiments & spices showed marginal increase, while the rest of crops showed marginal decline.

Thus, it is seen from the analysis of cropping pattern and value of output of crops that though area diversification away from food grains towards horticultural crops has not been much over the years in the eastern states but in terms of value of output, the share of horticultural crops is very high compared to other crops in all the eastern states except Uttar Pradesh. It is to be noted that Uttar Pradesh is one of the Green Revolution states and hence cultivation of food grains is very important here.

Table 2.11: Share of Crop Sector in the Value of Output from Agriculture (%)

Crops	1980-81	1985-86	1990-91	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Bihar (including Jharkhand till 1999-01)										
Cereals	47.61	41.78	46.71	47.26	35.42	37.37	35.76	34.72	31.00	31.52
Pulses	7.35	6.13	7.10	0.05	0.04	0.04	0.04	0.04	0.04	0.04
Oilseeds	1.43	1.34	1.69	1.19	1.01	1.04	0.87	1.01	1.15	1.25
Sugarcane	2.51	2.08	4.27	2.37	1.81	2.55	2.22	2.56	3.15	3.23
Fibres	0.75	1.61	1.32	1.22	1.01	0.88	0.91	0.99	1.38	1.28
Condiments & Spices	0.40	0.53	0.35	0.26	0.17	0.16	0.12	0.12	0.17	0.19
Fruits & Vegetables	26.28	35.82	28.68	30.83	47.57	44.55	46.30	47.45	47.32	48.13
Jharkhand										
Cereals				45.08	36.91	44.74	36.25	47.59	37.90	32.00
Pulses				0.05	0.03	0.03	0.07	0.06	0.07	0.06
Oilseeds				1.77	1.02	0.96	2.30	1.84	1.87	1.84
Sugarcane				0.30	0.37	0.40	0.39	0.31	0.34	0.32
Fibres				0.06	0.03	0.03	0.03	0.02	0.02	0.02
Condiments & Spices				0.05	0.00	0.00	0.09	0.08	0.00	0.00
Fruits & Vegetables				32.85	39.01	36.56	40.04	30.41	43.39	50.70
Orissa										
Cereals	36.49	36.75	32.77	33.54	30.65	39.40	23.97	38.07	36.89	37.06
Pulses	13.72	11.71	11.68	0.03	0.03	0.03	0.03	0.03	0.03	0.04
Oilseeds	11.44	12.46	14.10	2.51	2.05	2.06	2.18	2.46	2.74	2.76
Sugarcane	3.46	3.41	3.14	1.14	0.95	0.53	0.81	0.72	0.71	0.87
Fibres	1.20	1.06	1.15	0.79	0.81	0.60	0.76	0.87	1.06	1.28
Condiments & Spices	4.95	4.29	4.09	5.43	3.93	3.41	4.74	3.68	3.68	3.58
Fruits & Vegetables	19.35	19.58	21.90	42.22	47.73	41.48	52.71	41.49	42.42	41.43
Uttar Pradesh										
cereals	40.40	42.38	42.18	46.39	46.23	46.32	40.86	46.92	40.92	41.87
pulses	7.38	8.57	9.01	0.06	0.06	0.06	0.05	0.06	0.06	0.05
oilseeds	7.20	3.76	5.81	2.79	2.62	2.38	1.92	2.16	2.22	2.34
sugarcane	17.61	16.21	18.91	16.00	16.09	17.32	18.26	16.71	18.39	18.24
Fibres	0.13	0.13	0.06	0.02	0.02	0.02	0.02	0.02	0.02	0.02

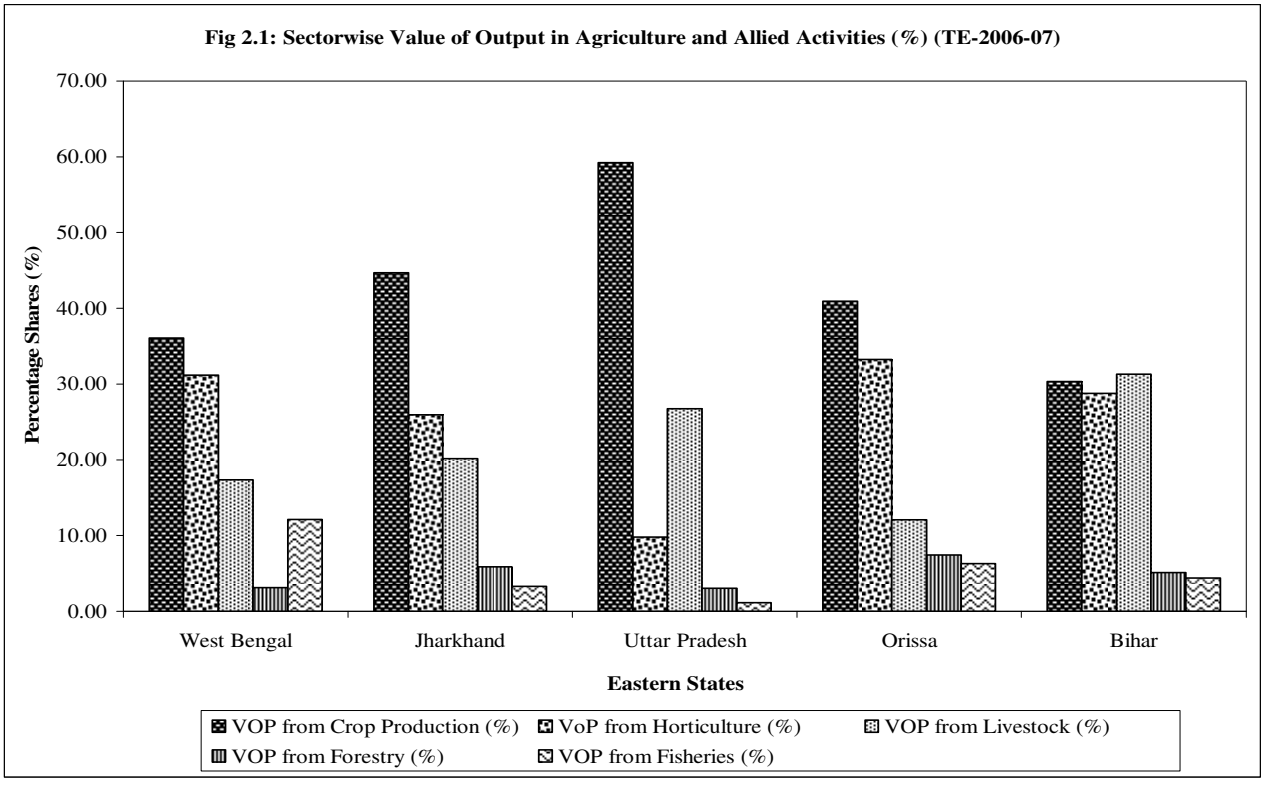
Condiments & Spices	0.56	0.66	0.57	0.52	0.62	0.60	0.64	0.65	0.86	0.72
fruits & vegetables	11.92	14.57	10.63	13.78	14.13	13.21	18.59	13.57	14.52	14.64
West Bengal										
Cereals	52.76	47.59	49.60	34.50	31.95	34.73	33.81	34.06	34.39	32.82
Pulses	1.93	2.42	1.69	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Oilseeds	2.57	3.23	6.00	2.25	3.01	2.42	2.44	3.04	2.67	2.83
Sugarcane	1.18	0.71	0.44	0.64	0.53	0.65	0.42	0.41	0.34	0.41
Fibres	5.26	7.35	5.99	3.57	3.60	3.85	3.82	3.77	3.48	3.58
Condiments & Spices	0.92	1.86	2.08	1.66	1.73	1.60	1.80	1.92	2.02	2.07
Fruits & Vegetables	17.74	18.74	17.64	42.08	44.53	42.96	43.03	43.26	43.43	44.84
India										
Cereals	40.78	41.17	37.65	35.03	32.82	32.92	30.06	30.83	30.05	30.05
Pulses	6.88	7.18	7.28	4.74	4.55	4.98	4.55	4.88	4.33	4.59
Oilseeds	9.20	8.28	14.11	7.48	6.92	7.40	7.46	10.55	10.05	9.56
Sugarcane	8.66	6.78	7.29	6.44	7.26	6.66	6.54	5.05	6.11	6.90
Fibres	4.11	3.88	4.25	3.49	2.97	2.74	2.85	3.95	4.04	3.77
Condiments & Spices	2.27	3.13	2.99	4.03	3.58	3.44	3.49	3.47	3.40	3.23
Fruits & Vegetables	11.24	13.80	12.26	22.55	25.44	25.39	27.64	24.03	24.98	25.76

Source: Central Statistical Organisation, National Accounts Division

Sector wise Distribution of Value of Output in Agriculture and Allied Activities

From Figure 2.1 it is seen that the share of value of output from crop production (excluding horticulture) in the total value of output from agriculture and allied activities is highest compared to the other sectors in all the eastern states, and it is highest in Uttar Pradesh (59.23%) followed by Jharkhand (44.69%), Orissa (40.92%), West Bengal (36.11%) and Bihar (30.34%). The share of value of output from Horticultural crop production is highest in Orissa (33.25%) followed by West Bengal (31.19%), Bihar (28.77%), Jharkhand (25.96%) and Uttar Pradesh (9.81%). The share of value of output from livestock is highest in Bihar (31.32%) followed by Uttar Pradesh (26.76%), Jharkhand (20.18%), West Bengal (17.38%) and Orissa (12.10%). The share of value of output from forestry is highest in Orissa (7.45%) followed by Jharkhand (5.85%), Bihar (5.14%), West Bengal (3.14%) and Uttar Pradesh (3.02%). The share of value of output from fisheries is highest in West Bengal (12.18%) followed by Orissa (6.28%), Bihar (4.43%), Jharkhand (3.32%) and Uttar Pradesh (1.18%).

Figure 2.1: Sectorwise Value of Output in Agriculture and Allied Activities (%) TE (2006-07)



Source: Calculated based on Data Collected from Central Statistical Organisation, National Accounts Division

In the total value of output from agriculture and allied activities in the state of Bihar (Table2.12), the share of value of output from livestock is the highest (31.32%) followed closely by that of crop production (excluding horticulture) (30.34%) and Horticulture (28.77%). The share of value of output from forestry and fisheries is quite low, 5.14% and 4.43% respectively. Amongst all states the share of value of output from crop production was highest in the district of West Champaran (51.47%). Horticulture showed highest share in Araria (66.20%). The highest share for livestock was seen in Patna (50.20%). For forestry, highest share was seen in Zamui (41.34%) and for fisheries; highest share was seen in Saharsa (30.90%)

2.12: Sectorwise Value of Output in Agriculture and Allied Activities in Bihar (%) (TE-2006-07)

Bihar Districts	Crop Production[5]	Horticulture	Livestock	Forestry	Fisheries
Araria	22.26	66.20	4.37	0.20	6.77
Aurangabad	41.17	8.53	37.71	6.34	0.67
Baghalpur	36.41	17.38	43.40	0.03	2.75
Banka	29.51	12.65	25.59	19.22	0.00
Begusarai	24.29	26.50	26.87	0.00	22.34
Bhabha	26.38	6.32	13.61	35.55	1.24
Bhojpur	39.14	27.33	32.69	0.00	0.85
Buxar	39.01	24.34	26.81	0.00	9.84
Champaran.E	29.35	35.27	34.21	0.02	1.13
Champaran.W	51.47	13.88	14.94	10.94	0.00
Darbhanga	33.00	25.30	41.70	0.00	0.00
Gaya	11.83	15.63	41.16	18.61	0.00
Gopalganj	51.18	21.12	23.70	0.00	4.00
Jahanabad	34.62	16.51	47.98	0.44	0.00
Katihar	27.25	39.43	31.90	0.45	0.52
Khagaria	45.12	21.72	31.03	0.00	2.13
Kishanganj	23.57	34.81	38.21	0.17	3.08
Lakhisaria	33.41	6.61	34.36	14.43	0.40
Madhubani	13.42	41.30	34.99	0.00	10.29
Madhupura	35.99	30.79	25.89	0.00	7.33
Monghyr	19.28	16.30	30.54	20.17	0.31
Muzaffarpur	20.55	31.06	35.24	0.00	13.14
Nalanda	24.45	38.50	34.09	1.48	0.04
Nawadha	15.98	11.92	26.89	26.19	3.70
Patna	17.92	26.10	50.20	0.01	5.76
Purnia	22.02	44.61	29.78	0.02	3.55
Rohtas	40.97	17.02	19.15	12.89	0.02
Saharsa	31.34	12.67	25.09	0.00	30.90
Samastipur	17.32	48.90	29.21	0.00	4.58

[5] Excludes value of output from Horticulture

Saran	30.01	29.45	40.47	0.00	0.06
Shivhar	31.01	24.77	44.16	0.00	0.06
Shkhpura	47.82	11.66	40.00	0.00	0.52
Sitamarhi	24.67	26.36	48.97	0.00	0.00
Siwan	40.02	23.69	35.71	0.00	0.58
Sumal	25.35	42.56	21.42	0.00	10.67
Vaishali	18.62	47.39	33.03	0.00	0.96
Zamui	8.84	12.48	20.11	41.34	0.07
Bihar	**30.34**	**28.77**	**31.32**	**5.14**	**4.43**

Source: Calculated based on Data Collected from Central Statistical Organisation, National Accounts Division

In the total value of output from agriculture and allied activities in the state of Orissa (Table 2.13), the share of value of output from crop production is the highest (40.92%) followed closely by that of horticulture (33.25%). Then the share of livestock (12.10%) is followed by forestry (7.45%) and fisheries (6.28%). Amongst all states, the share of value of output from crop production was highest in the district of Bhadrak (69.55%). Horticulture showed highest share in Gajapatti (69.56%). The highest share for livestock was seen in Nawapara (35.78%). For forestry, highest share was seen in Kandhamal (47.42%) and for fisheries, highest share was seen in Puri (39.37%)

2.13: Sectorwise Value of Output in Agriculture and Allied Activities in Orissa (%) (TE-2006-07)

Orissa Districts	Crop Production	Horticulture	Livestock	Forestry	Fisheries
Angul	21.81	47.92	9.91	9.05	3.76
Balasore	52.49	22.27	16.80	1.08	6.31
Bhadrak	69.21	11.51	17.66	0.48	0.65
Bolangir	38.91	39.30	11.39	4.47	1.86
Boudh	34.10	25.14	15.11	11.92	4.35
Buragarh	62.14	19.71	7.80	3.17	4.19
Cuttack	44.83	34.62	10.14	2.33	5.86
Deogarh	19.66	41.24	9.19	14.63	4.40
Dhenkanal	31.87	43.95	10.26	5.93	2.72
Gajapatti	11.56	62.88	5.94	10.62	0.42
Ganjam	30.72	35.02	8.25	4.58	17.25
Jagatsingpur	47.62	32.96	11.24	0.72	6.75
Jajpur	45.97	22.82	18.30	3.47	6.20
Jharsugda	44.43	28.13	13.27	2.56	9.17
Kalahandi	41.60	29.67	10.17	9.80	0.71
Kandhamal	17.60	6.66	11.40	47.42	0.00
Kedrapara	38.33	30.99	9.90	1.01	18.78
Keonjhar	33.23	40.72	8.13	9.71	0.21
Khurda	40.97	10.27	24.96	3.08	17.83
Koraput	38.95	47.13	5.47	4.23	0.34

Malkangiri	24.85	21.68	22.14	18.17	0.58
Mayurbhanj	46.27	27.19	5.46	11.78	0.00
Nawapara	21.45	26.46	32.82	9.02	2.71
Naworangpur	53.21	19.82	7.28	10.23	1.13
Nayagarh	45.69	17.39	14.27	10.03	4.42
Puri	38.58	11.09	10.22	0.46	39.19
Rayagada	23.34	33.19	14.12	16.93	0.40
Sambalpur	35.35	32.72	7.71	13.21	0.89
Sonepur	58.80	22.59	10.15	2.70	3.22
Sundargarh	26.10	36.28	11.61	14.87	0.12
Orissa	**40.92**	**33.25**	**12.10**	**7.45**	**6.28**

Source: Calculated based on Data Collected from Central Statistical Organisation, National Accounts Division

In the total value of output from agriculture and allied activities in the state of Uttar Pradesh (Table 2.14), the share of crop production is the highest (59.23%) followed by that of livestock (26.76%). Then the share of horticulture (9.81%) is followed by forestry (3.02%) and fisheries (1.18%). Amongst all states the share of crop production was highest in the district of Muzaffarnagar (90.03%). Horticulture showed highest share in Kannauj (61.87%). The highest share for livestock was seen in Banda (62.38%). For forestry, highest share was seen in Sonbhadra (48.51%) and for fisheries, highest share was seen in Gorakhpur (41.20%)

2.14: Sectorwise Value of Output in Agriculture and Allied Activities in Uttar Pradesh (%) (TE-2006-07)

Uttar Pradesh Districts	Crop Production	Horticulture	Livestock	Forestry	Fisheries
Agra	15.66	43.69	33.44	3.72	0.03
Aligarh	47.41	14.36	37.47	0.37	0.02
Allahabad	25.75	16.06	49.88	2.50	3.43
Ambedkar Ngr.	51.65	10.23	37.73	0.06	0.26
Auraiya	37.52	14.24	41.33	3.54	0.07
Azamgarh	50.72	7.48	40.76	0.01	1.01
Badaun	49.51	23.62	25.68	0.59	0.02
Bagpat	87.76	0.39	11.55	0.14	0.01
Bahraich	41.44	2.70	38.73	8.85	0.86
Ballia	40.17	19.86	36.85	0.00	3.13
Balrampur	65.97	1.92	18.30	7.32	0.16
Banda	33.81	1.31	61.39	1.62	0.31
Barabanki	38.12	30.63	28.14	0.65	1.81
Bareilly	78.76	4.11	16.36	0.02	0.72
Basti	72.38	3.41	22.75	0.69	0.09
Bijnor	88.25	0.48	7.55	1.76	0.26
Bullandshahr	68.79	5.49	24.40	0.61	0.10

Chandauli	29.50	2.99	27.56	24.92	0.05
Chitrakut	16.28	1.30	49.54	19.52	0.22
Deoria	58.91	5.11	35.19	0.06	0.67
Etah	40.89	16.86	41.41	0.42	0.00
Etawah	22.73	28.16	35.69	7.17	0.05
Faizabad	51.99	7.19	39.19	0.42	0.80
Farrukhabad	22.94	55.35	20.66	0.52	0.01
Fatehpur	34.96	10.07	53.14	0.83	0.18
Firozabad	14.82	52.83	29.77	1.30	0.01
G.Buddha Ngr.	47.02	0.90	49.90	1.11	0.00
Ghaziabad	81.18	3.78	14.39	0.32	0.01
Ghazipur	36.35	16.85	44.57	0.38	1.48
Gonda	63.35	3.30	30.51	1.26	0.35
Gorakhpur	27.72	6.39	23.37	0.84	40.86
Hamirpur	35.27	5.94	42.29	8.80	0.33
Hardoi	50.71	9.25	34.69	0.89	3.59
Hatharas	17.75	56.48	24.99	0.39	0.00
J.B.Phule Ngr.	81.98	3.48	10.94	1.82	0.04
Jalaun	29.51	14.80	43.80	6.24	0.15
Jaunpur	45.21	16.82	37.69	0.01	0.26
Jhansi	20.93	15.79	44.72	8.36	3.14
Kannauj	11.40	60.94	24.63	1.52	0.03
Kanpur City	30.23	18.83	48.19	1.26	0.26
Kanpur Dehat	40.83	8.58	46.23	1.97	0.49
Kaushambi	29.29	10.20	58.61	0.21	1.49
Kheri	78.26	0.37	9.12	5.60	1.63
Kushi Ngr.	81.67	1.41	15.98	0.08	0.78
Lalitpur	16.09	7.58	42.89	19.77	0.43
Lucknow	22.18	13.82	51.02	4.18	4.95
Maharahganj	57.13	3.86	24.05	7.93	0.26
Mahoba	23.68	11.04	49.78	8.10	0.51
Mainpuri	28.04	35.09	35.91	0.47	0.03
Mathura	41.84	17.68	39.96	0.24	0.03
Mau	53.28	5.80	40.23	0.18	0.33
Meerut	84.73	3.50	9.70	1.05	0.01
Mirzapur	20.54	4.87	37.65	21.71	1.26
Moradabad	71.58	11.55	16.64	0.00	0.23
Muzaffarnagar	89.35	0.69	7.99	0.76	0.46
Pilibhit	69.55	0.65	13.17	9.01	0.10
Pratapgarh	31.78	11.66	56.17	0.12	0.15
Raebareli	28.98	6.34	61.38	0.89	1.53
Rampur	67.15	4.26	25.77	1.11	0.63
S.Ravi Das Ngr.	36.24	9.88	53.53	0.07	0.22
Saharanpur	86.51	0.36	9.65	1.67	0.20
Sant Kabir Ngr.	53.22	6.44	35.10	1.83	1.66
Shahjahanpur	68.92	4.20	23.96	1.00	0.94
Shivasti	33.39	1.57	41.42	13.39	0.00
Siddharth Ngr.	49.50	3.58	43.54	0.93	1.55

Sitapur	74.63	1.83	22.51	0.33	0.38
Sonbhadra	7.08	1.49	26.04	48.51	0.07
Sultanpur	40.92	10.45	47.65	0.31	0.36
Unnao	28.97	10.20	52.33	2.85	2.97
Varanasi	36.12	10.69	52.22	0.49	0.00
Uttar Pradesh	**59.23**	**9.81**	**26.76**	**3.02**	**1.18**

Source: Calculated based on Data Collected from Central Statistical Organisation, National Accounts Division

In the total value of output from agriculture and allied activities in the state of Jharkhand (Table 2.15), the share of crop production is the highest (44.69%) followed closely by that of horticulture (25.96%) and livestock (20.18%). Then the share of forestry (5.85%) is followed by fisheries (3.32%). Amongst all states the share of crop production was highest in the district of Gumla (71.35%). Horticulture showed highest share in Dhanbad (55%). The highest share for livestock was seen in Deoghar (38.25%). For forestry, highest share was seen in West Singhbhum (15.18%) and for fisheries, highest share was seen in Sahebganj (32.46%).

2.15: Sectorwise Value of Output in Agriculture and Allied Activities in Jharkhand (%) (TE-2006-07)

Jharkhand Districts	Crop Production	Horticulture	Livestock	Forestry	Fisheries
Bokaro	20.63	35.10	36.68	7.30	0.29
Chatra	52.35	21.91	11.26	14.47	0.01
Deoghar	28.96	29.27	38.25	3.35	0.16
Dhanbad	7.97	55.00	34.21	1.80	1.02
Dumka	43.38	24.40	19.23	1.78	11.21
Singhbhum (E)	9.66	51.27	15.77	9.66	13.65
Garhwa	47.42	19.33	21.29	11.96	0.00
Giridih	30.02	31.38	30.84	7.70	0.07
Godda	42.47	29.68	25.28	2.38	0.19
Gumla	71.35	9.00	14.99	2.66	2.00
Hazaribagh	60.17	19.90	13.70	6.15	0.07
Koderma	32.31	41.51	19.37	6.80	0.00
Lohardaga	50.99	32.42	12.25	4.06	0.27
Pakur	30.39	34.55	32.19	2.84	0.03
Palamu	66.46	13.04	14.12	6.34	0.05
Ranchi	44.88	29.62	17.83	3.18	4.48
Sahebganj	11.41	31.83	20.64	3.66	32.46
Singhbhum (W)	25.29	26.92	32.10	15.18	0.52
Jharkhand	**44.69**	**25.96**	**20.18**	**5.85**	**3.32**

Source: Calculated based on Data Collected from Central Statistical Organisation, National Accounts Division

In the total value of output from agriculture and allied activities in the state of West Bengal (Table 2.16), the share of crop production is the highest (36.11%) followed by that of horticulture (31.19%), livestock (17.38%), fisheries (3.14%) and forestry (12.18%). Amongst all states the share of crop production was highest in the district of Malda (66.81%). Horticulture showed highest share in Hoogly (70.23%). The highest share for livestock was seen in Purulia (37.01%). For forestry, highest share was seen in Darjeeling (24.09%) and for fisheries, highest share was seen in 24 Parganas (40.92%).

2.16: Sectorwise Value of Output in Agriculture and Allied Activities in West Bengal (%) (TE-2006-07)

Districts	Crop Production	Horticulture	Livestock	Forestry	Fisheries
24 Parganas.	9.16	4.41	24.49	10.92	40.92
Bankura	18.86	29.12	19.79	6.70	3.60
Birbhum	37.96	23.98	25.67	1.03	7.00
Burdwan	40.59	37.28	13.85	0.52	5.01
Cooch-Behar	35.66	29.99	18.64	0.24	14.41
Darjeeling	6.46	12.43	24.06	24.09	1.89
Dinajpur. S	51.92	13.06	21.82	0.11	12.63
Dinajur. N	53.86	21.60	20.49	0.06	3.68
Hooghly	15.33	70.17	7.71	0.01	6.71
Howrah	24.40	35.76	16.93	0.00	22.91
Jalpaiguri	21.99	23.09	14.96	8.94	3.49
Malda	66.23	5.43	17.60	0.13	9.99
Midnapur. E	33.03	6.38	22.35	0.06	38.03
Midnapur. W	31.86	35.17	11.18	3.35	3.10
Murshidabad	59.78	11.86	16.50	0.03	11.71
Nadia	50.19	12.06	24.60	0.07	12.80
Purulia	26.61	2.11	37.01	7.02	13.48
West Bengal	**36.11**	**31.19**	**17.38**	**3.14**	**12.18**

Source: Calculated based on Data Collected from Central Statistical Organisation, National Accounts Division

Horticultural Diversification

From Table 2.17, it is seen that in India, between the years 1991-92 to 2007-08, the annual compound growth rate of area under fruits was 4.5 percent, while that of its production was 5.1 percent and productivity growth was 0.6 percent only. In the case of vegetables, area grew at the annual compound rate of 2.1 percent with production rate of 4.9 percent, while the productivity growth was around 2.7 percent. During this period, the area under Flowers increased at the annual rate of 8.3 percent and production of

Loose flowers increased at the rate of 9.9 percent, while that of Cut flowers was as high as 15.8 percent per annum.

Table 2.17: Annual Compound Growth Rates of Area, Production and Yield of Horticultural Crops in India between 1991-92 to 2007-08 (%)

Horticultural Crops	Area	Production	Yield
Fruits	4.5	5.1	0.6
Vegetables	2.1	4.9	2.7
Flowers	8.3	9.9 (Loose), 15.8 (Cut)	-

Source: Directorate of National Horticulture, GOI, Various Issues

Within the eastern states it is seen that Orissa, had relatively higher growth rates of area and production of fruits during 1991-92 to 2007-08, while in the case of vegetables, West Bengal had comparatively higher annual growth rates of area and production (Table 2.18).

Table 2.18: Annual Compound Growth Rates of Area, Production and Yield of Fruits and Vegetables with Eastern States between 1991-92 to 2007-08 (%)

States	Fruits			Vegetables		
	Area	Production	Yield	Area	Production	Yield
Bihar (includes Jharkhand)	0.4	0.9	0.5	-0.1	3.1	3.2
Orissa	4.3	1.7	-2.5	-0.5	0.8	1.2
Uttar Pradesh	0.3	2.7	2.4	3.2	4.6	1.3
West Bengal	3.5	5.7	2.1	6.8	10.3	3.2
India	**4.5**	**5.1**	**0.6**	**2.1**	**4.9**	**2.7**

Source: Directorate of National Horticulture, GOI, Various Issues

From Table 2.19 it is seen that among area under fruits in West Bengal in the year 2004-05, the highest proportion was seen for mango (41.57%) and the district with the highest share was Malda (88.72%). Among vegetables the highest proportion was for cucurbits (18.33%) followed by brinjal (17.08%). The district with the largest share of cucurbits was Darjeeling (25.16%) and that of Brinjal was Purulia (23.60%) (Table 2.20).

Table 2.19: Share of Area under different Fruits as a Percentage of Total Area under different Fruits in West Bengal (2004-05)

Districts	Mango	Banana	Pineapple	Papaya	Guava	Jackfruit	Litchi	Mandarin Orange	Other Citrus	Sapota	Others
Burdwan	50.34	12.86	2.30	6.50	7.71	7.31	3.79	-	3.79	-	5.41
Birbhum	24.57	15.71	1.43	12.86	20.86	4.86	1.43	-	9.71	4.00	4.57
Bankura	18.51	16.57	1.66	16.02	16.85	14.36	-	-	7.46	-	8.56
Midnapore(E)	26.11	22.17	3.82	8.37	7.14	6.28	1.23	-	9.85	9.48	5.54
Midnapore(w)	16.79	14.76	12.72	10.18	14.76	8.91	1.78	-	9.16	5.60	5.34
Hawrah	20.06	33.95	7.41	6.17	6.48	7.41	4.01	-	6.48	4.01	4.01
Hoogly	45.03	36.30	2.43	5.74	1.78	2.02	2.26	-	2.02	1.37	1.05
North 24-pgs	35.53	23.88	3.96	8.91	4.78	7.45	4.14	-	6.99	2.45	1.92
South 24-pgs	12.93	23.92	4.87	8.62	23.92	1.81	6.40	-	4.17	13.35	
Nadia	28.81	32.92	4.53	6.58	5.76	11.11	6.09	-	1.98	0.16	2.06
Murshidabad	69.28	5.85	0.56	1.07	1.58	6.71	11.50	-	1.32	1.07	1.07
Dinajpur - N	18.68	10.85	34.89	5.08	6.46	7.28	4.40	-	1.51	1.65	9.20
Dinajpur - S	34.65	10.50	3.94	6.30	5.77	7.87	8.14	-	3.15	-	19.69
Malda	88.72	2.56	0.53	0.71	1.10	1.17	3.02	-	0.67	0.82	0.71
Jalpaiguri	15.51	21.79	23.65	5.50	5.20	14.92	2.65	0.49	6.97	1.77	1.57
Darjeeling	0.55	1.84	36.55	0.92	1.01	1.56	0.46	31.86	1.29	-	23.97
Coochbehar	18.42	26.97	5.70	6.14	4.82	17.98	4.82	-	5.26	3.07	6.80
Purulia	20.65	1.45	1.45	10.87	16.67	10.14	2.17	-	9.06	7.97	19.57
West Bengal	**41.57**	**16.02**	**7.73**	**5.24**	**5.63**	**6.38**	**4.31**	**2.12**	**3.77**	**2.36**	**4.87**

Source: Calculated from data based on State Statistical Abstracts, Ministry of Agriculture, Government of West Bengal

Table 2.20: Share of Area under different Vegetables as a Percentage of Total Area under different Vegetables in West Bengal (2004-05)

Districts	Tomato	Cabbage	Cauliflower	Peas	Brinjal	Onion	Cucurbits	Ladies Finger	Radish	Others
Burdwan	4.811	5.911	5.874	1.790	14.880	1.473	22.245	7.347	2.666	33.004
Birbhum	3.833	5.265	4.605	1.388	22.384	1.763	20.313	7.667	2.842	29.941
Bankura	6.164	9.334	10.437	1.260	19.063	1.595	22.233	11.186	2.993	15.735
Midnapur (E)	2.491	3.335	3.777	0.422	20.209	1.466	20.872	8.497	1.969	36.963
Midnapur (W)	5.146	8.017	7.973	1.612	21.555	2.186	22.593	6.780	3.865	20.274
Hawrah	4.726	8.192	6.112	1.449	15.375	2.016	8.822	10.334	4.348	38.626
Hoogly	1.808	5.296	6.569	1.310	14.135	5.130	22.716	7.289	2.547	33.198
North - 24 pgs	4.498	7.202	7.706	1.903	13.210	1.651	20.050	7.533	3.334	32.914
South- 24 pgs	6.488	8.608	7.597	11.021	12.553	0.750	16.889	9.945	5.233	20.916
Nadia	6.098	8.879	9.057	3.355	14.377	3.087	13.484	9.006	5.792	26.866
Murshidabad	5.328	12.854	11.853	1.875	21.212	1.776	13.277	4.482	3.242	24.101
Dinajpur (N)	6.550	11.488	8.591	1.613	13.562	1.448	12.409	4.872	6.616	32.851
Dinajpur (S)	0.024	9.515	4.970	1.089	15.550	1.657	22.343	5.207	6.698	32.947
Malda	4.699	7.584	6.317	1.404	22.967	2.496	16.845	5.342	3.860	28.485
Jalpaiguri	7.262	8.987	8.806	7.101	19.619	1.163	12.839	8.867	5.938	19.418
Darjeeling	3.973	4.338	3.379	12.785	4.795	0.502	25.160	2.740	4.475	37.854
Coochbehar	8.044	13.432	9.332	1.230	15.033	0.840	14.721	4.198	4.510	28.661
Purulia	14.983	5.732	3.458	0.849	23.597	1.304	24.264	9.008	2.093	14.710
West Bengal	**5.310**	**8.210**	**7.442**	**2.874**	**17.083**	**1.880**	**18.329**	**7.333**	**4.027**	**27.511**

Source: Calculated from data based on State Statistical Abstracts, Ministry of Agriculture, Government of West Bengal

In Jharkhand in the year 2005-06, vegetables showed greater acerage (206151 Hec) followd by fruits (32988 Hec) and Spices (17086 Hec). The district of Ranchi showed largest area under fruits, vegetables and Spices (Table 2.21).

Table 2.21: Area under Horticultural Crops in Jharkhand in 2005-06 (Hec)

Districts	Fruits	Vegetables	Spices
Ranchi	4311	31158	2233
Lohardaga	1039	7102	799
Gumla	1715	5064	599
Simdega	1183	3362	498
E.Singhbhum	1960	14546	1089
W. Singhbhum	1417	8624	748
Saraikela	598	3417	439
Garhwa	1122	6432	758
Palamu	1991	9617	831
Latehar	978	4920	603
Hazaribagh	2314	18556	963
Chatra	1191	7300	661
Koderma	749	7314	763
Bokaro	952	7693	483
Dhanbad	907	12900	1164
Giridih	1448	14462	582
Deoghar	2020	4945	959
Jamtara	897	6077	457
Dumka	1811	12513	739
Pakur	879	5234	420
Sahebganj	1284	7581	652
Godda	2222	7334	646
Jharkhand	**32988**	**206151**	**17086**

Source: Calculated from data based on Statistical Profile of Jharkhand, Directorate of Statistical Evaluation, Jharkhand, 2006

From Table 2.22 it is seen that among fruits in Bihar in the year 2007-08, the highest proportion and atleast half of the fruits area was under mango with the district of Banka showing the highest share in mango acerage (74.83%). Among vegetables, the highest proportion area was under potato (38.30%) with the district of Sheikhpura showing the highest share in potato acerage (59.16%) (Table 2.23).

Table 2.22: Share of Area under different Fruits as a Percentage of Total Area under different Fruits in Bihar (2007-08)

Districts	Mango	Guava	Litchi	Lemon	Banana	Pineapple	Papaya	Aonla	Others
Patna	50.66	14.01	0.00	7.49	7.52	0.00	0.68	0.29	19.33
Nalanda	43.21	23.29	0.00	6.40	6.87	0.00	0.42	0.37	19.43
Rohtas	55.42	31.68	0.00	3.48	2.74	0.00	0.18	0.78	5.72
Gaya	34.53	18.74	0.00	10.86	6.25	0.00	0.55	1.11	27.96
Aurangabad	32.96	18.61	0.00	13.77	8.99	0.00	0.89	0.69	24.09
E Champaran	56.37	10.09	11.20	9.89	5.38	0.00	0.20	0.27	6.60
W Champaran	49.63	11.08	13.22	11.24	5.93	0.00	0.27	0.39	8.24
Muzaffarpur	38.42	5.53	28.82	2.62	19.56	0.00	0.22	0.32	4.49
Vaishali	45.87	7.10	19.72	3.31	17.31	0.00	0.55	0.38	5.77
Bhagalpur	63.10	5.78	4.17	8.08	9.51	0.00	0.48	0.30	8.56
Banka	74.83	3.69	0.63	5.67	7.81	0.00	0.16	0.19	7.02
Munger	42.64	9.40	9.05	7.69	14.60	0.00	1.40	0.70	14.52
Jamui	44.64	9.72	7.38	8.15	9.36	0.00	0.50	0.86	19.40
Khagaria	40.49	9.40	7.71	5.94	19.39	0.00	0.61	0.38	16.08
Darbhnaga	71.38	3.34	4.48	4.10	9.67	0.00	0.24	0.14	6.65
Madhubani	58.82	4.79	7.78	6.39	9.92	0.00	0.29	0.22	11.79
Samastipur	64.90	3.71	6.92	4.64	12.16	0.00	0.55	0.52	6.60
Begusarai	53.10	6.65	7.83	5.33	12.03	0.00	0.85	0.89	13.32
Purnea	29.68	4.53	15.47	5.21	11.74	20.56	0.75	0.73	11.33
Araria	22.29	7.05	14.71	10.16	15.69	9.74	1.29	1.18	17.89
Kishanganj	14.91	4.50	8.08	5.62	13.00	36.26	0.78	0.57	16.28
Katihar	38.01	6.20	20.69	4.28	12.12	2.80	0.75	0.59	14.56
Saharsha	36.77	9.68	7.39	8.99	16.18	6.96	0.69	0.54	12.80
Bhojpur	55.60	23.07	0.00	5.12	3.86	0.00	0.27	0.42	11.66
Buxar	55.93	25.26	0.00	5.33	3.68	0.00	0.31	0.53	8.96
Kaimur	58.50	24.17	0.00	4.67	3.74	0.00	0.32	0.95	7.65
Jehanabad	20.11	18.55	0.00	14.19	12.00	0.00	1.48	1.25	32.42
Arwal	22.99	20.75	0.00	12.92	10.89	0.00	1.32	1.42	29.70
Nawada	33.01	15.87	0.00	13.59	9.69	0.00	0.92	0.54	26.39
Saran	52.88	8.53	11.19	5.72	7.78	0.00	0.25	0.36	13.29
Siwan	35.80	10.02	16.36	7.98	10.54	0.00	0.38	0.36	18.55

Gopalganj	43.24	8.66	17.63	6.38	9.85	0.00	0.33	0.37	13.53
Sitamarhi	53.49	7.52	21.83	2.99	6.38	0.00	0.25	0.39	7.16
Sheohar	54.09	6.62	20.55	3.23	5.69	0.00	0.30	0.47	9.06
Sheikhpura	53.88	9.22	6.38	5.83	9.15	0.00	0.83	0.76	13.94
Lakhisarai	46.92	11.37	4.53	7.13	13.29	0.00	1.45	1.25	14.07
Madhepura	33.01	10.81	4.63	8.63	22.53	6.56	0.77	0.61	12.43
Supaul	38.13	13.96	5.98	9.19	19.33	0.00	0.43	0.43	12.56
Bihar	**49.68**	**10.02**	**10.43**	**6.14**	**10.64**	**1.62**	**0.45**	**0.46**	**10.57**

Source: Calculated from data based on Department of Horticulture, Government of Bihar

Table 2.23: Share of Area under different Vegetables as a Percentage of Total Area under different Vegetables in Bihar (2007-08)

Districts	Potato	Onion	Tomato	Caulilower	Cabbage	Brinjal	Okra	Chilli	Bottle gourd	Sponge gourd	Cucumber	Ridge gourd
Patna	40.62	6.22	4.62	9.22	5.28	4.65	7.40	6.49	2.29	1.79	0.25	0.70
Nalanda	45.86	9.86	3.16	5.15	2.86	11.00	4.79	6.45	1.47	1.22	0.18	0.54
Bhojpur	44.73	6.14	5.48	5.74	3.69	5.56	8.15	3.24	3.56	2.09	0.42	1.02
Buxar	41.28	7.03	5.93	5.27	3.77	5.27	8.45	3.62	5.21	2.87	0.21	1.20
Rohtas	53.89	5.90	4.11	6.05	3.01	4.91	7.03	3.10	2.42	1.88	0.09	0.75
Kaimur	41.34	8.17	5.57	6.88	3.97	6.52	8.04	3.73	3.69	2.67	0.13	0.90
Gaya	43.73	5.49	3.47	7.36	3.47	6.33	6.82	5.39	4.24	3.39	0.15	1.51
Jehanabad	42.92	5.38	8.53	5.72	3.90	6.92	6.26	4.07	4.82	2.77	0.30	0.96
Arwal	42.03	5.80	6.19	5.93	4.54	5.69	6.46	4.08	5.84	2.81	0.46	1.03
Nawada	35.53	5.87	4.70	8.03	4.47	7.49	11.63	5.16	4.27	3.89	0.17	1.04
Aurangabad	34.92	6.35	9.13	7.85	4.15	6.51	10.52	4.07	3.79	3.01	0.11	0.74
Saran	47.02	3.23	5.55	7.23	3.43	6.28	7.01	4.01	3.23	3.04	0.12	0.74
Siwan	44.62	3.72	5.88	6.87	3.72	6.84	8.73	4.55	3.51	3.18	0.08	0.66
Gopalganj	46.74	3.28	5.75	7.19	3.98	5.33	8.42	3.90	4.32	2.55	0.09	0.72
E.Champaran	37.14	7.46	5.62	6.37	4.93	5.42	8.45	3.59	4.38	4.64	0.12	0.87
W.Champaran	35.96	6.74	5.80	8.41	4.61	5.74	7.83	4.24	4.39	4.35	0.11	0.87
Muzaffarpur	29.34	6.18	8.83	9.27	6.76	6.96	6.57	4.51	4.23	4.78	0.25	0.93
Sitamarhi	35.94	6.84	7.90	6.87	4.95	6.45	5.67	3.83	5.62	4.83	0.11	0.93
Sheohar	39.09	6.35	4.94	7.57	5.95	5.92	5.46	3.97	5.01	4.15	0.17	0.96
Vaishali	30.56	3.84	8.70	11.14	5.40	6.93	7.93	3.73	3.71	4.61	0.26	0.98
Bhagalpur	34.44	6.41	6.64	6.10	4.78	6.50	8.47	3.84	4.58	4.86	0.34	1.42
Banka	50.00	5.55	4.66	5.29	3.18	6.22	7.04	3.97	3.06	3.21	0.14	0.87
Munger	45.16	6.12	4.21	4.48	3.17	4.46	6.31	7.04	3.12	3.24	0.44	1.01
Sheikhpura	59.16	10.90	2.36	2.18	2.03	3.06	3.19	7.04	2.67	2.03	0.16	0.89
Lakhisarai	50.72	4.75	3.61	3.83	3.16	2.93	4.51	6.18	4.17	3.16	0.60	1.29
Jamui	38.95	8.04	4.40	4.41	4.14	6.12	7.49	9.50	3.62	4.29	0.18	1.18
Khagaria	33.24	4.57	6.64	7.36	4.09	8.55	9.11	5.81	3.05	4.52	0.14	2.09
Darbhanga	29.27	4.07	5.59	6.02	6.21	9.19	6.33	5.20	4.15	7.85	0.11	1.14

Madhubani	39.52	4.15	4.77	9.71	5.40	7.44	5.84	4.54	1.99	4.99	0.11	0.93
Samastipur	38.54	3.70	5.46	9.03	5.50	6.87	5.42	4.47	3.24	4.20	0.29	0.61
Begusarai	22.99	7.87	7.52	7.40	4.17	10.78	9.20	5.70	3.97	5.85	0.23	0.91
Poornea	29.96	7.70	3.96	8.43	4.77	4.82	5.41	6.07	4.28	6.89	0.26	1.31
Araria	35.87	11.69	5.72	6.44	4.24	4.88	6.23	3.70	3.03	4.79	0.12	1.54
Kishanganj	41.89	9.74	5.74	5.84	3.84	3.84	5.59	3.99	3.16	4.27	0.11	1.37
Katihar	23.48	12.23	4.52	9.08	5.79	5.63	5.50	6.07	4.30	6.24	0.19	1.44
Saharsha	35.62	2.80	5.45	8.09	4.34	6.15	5.27	3.40	5.12	7.19	0.23	1.85
Madhepura	32.48	4.39	5.36	8.13	6.89	7.28	5.19	3.21	3.84	9.41	0.20	1.84
Supaul	49.11	2.85	4.17	5.21	3.58	4.96	6.03	3.05	1.81	6.12	0.12	1.15
Bihar	**38.30**	**6.23**	**5.61**	**7.36**	**4.55**	**6.62**	**6.95**	**4.73**	**3.63**	**4.17**	**0.19**	**1.02**

Districts	**Bitter gourd**	**Ash gourd**	**Water melon**	**Musk melon**	**Pointed gourd**	**Cow pea**	**Pea**	**Radish**	**Carrot**	**Sweet Potato**	**Colo casia**	**Oal**	**Others**
Patna	0.78	0.06	0.22	0.20	0.91	0.97	1.18	2.18	0.63	0.00	0.06	0.01	3.27
Nalanda	0.70	0.02	0.03	0.03	0.04	1.37	0.69	1.51	0.42	0.00	0.03	0.01	2.62
Bhojpur	1.64	0.06	0.37	0.36	1.05	1.32	2.14	1.43	0.49	0.00	0.02	0.02	1.27
Buxar	1.82	0.08	0.28	0.25	0.89	1.81	1.33	1.55	0.59	0.00	0.02	0.02	1.24
Rohtas	0.86	0.03	0.07	0.02	0.09	0.77	0.66	1.45	0.35	0.00	0.01	0.01	2.54
Kaimur	0.94	0.05	0.00	0.00	0.13	1.28	0.65	1.77	0.52	0.00	0.01	0.01	3.02
Gaya	1.10	0.08	0.14	0.06	0.12	1.00	1.53	1.70	0.53	0.00	0.01	0.01	2.37
Jehanabad	1.23	0.22	0.27	0.21	0.30	1.44	0.54	1.23	0.56	0.00	0.01	0.01	1.46
Arwal	1.54	0.27	0.28	0.25	0.31	1.63	0.82	1.48	0.58	0.00	0.03	0.03	1.90
Nawada	0.72	0.05	0.09	0.05	0.20	1.18	0.73	1.64	0.49	0.00	0.01	0.01	2.57
Aurangabad	0.65	0.07	0.08	0.06	0.17	1.08	0.70	1.57	0.48	0.00	0.01	0.01	3.98
Saran	0.52	0.02	0.28	0.25	0.91	0.86	1.15	1.64	0.39	0.00	0.07	0.02	3.01
Siwan	0.61	0.03	0.15	0.12	0.57	0.98	0.69	1.71	0.47	0.00	0.01	0.01	2.30
Gopalganj	0.70	0.02	0.11	0.09	0.47	0.92	0.62	1.55	0.43	0.00	0.01	0.01	2.81
E.Champaran	0.91	0.03	0.08	0.06	0.62	1.15	0.78	2.14	0.41	0.05	0.07	0.03	4.69
W.Champaran	0.87	0.02	0.06	0.05	0.73	1.21	0.72	2.00	0.57	0.06	0.08	0.03	4.53
Muzaffarpur	0.93	0.05	0.08	0.08	0.83	1.51	1.48	1.71	0.62	0.12	0.12	0.22	3.62
Sitamarhi	0.62	0.05	0.14	0.13	0.34	0.80	0.96	2.12	0.61	0.10	0.04	0.04	4.13

Sheohar	0.66	0.07	0.16	0.09	0.46	1.07	1.38	2.58	0.99	0.10	0.05	0.02	2.80
Vaishali	1.01	0.05	0.23	0.20	1.19	1.61	1.41	2.08	0.62	0.06	0.13	0.07	3.55
Bhagalpur	1.07	0.05	0.22	0.10	0.90	1.19	1.42	1.68	0.53	0.00	0.13	0.03	4.31
Banka	0.89	0.02	0.00	0.00	0.00	1.35	0.49	1.83	0.25	0.00	0.01	0.02	1.93
Munger	1.00	0.06	0.56	0.21	1.84	1.33	1.58	2.19	0.49	0.00	0.23	0.03	1.73
Sheikhpura	0.80	0.02	0.00	0.00	0.00	1.07	0.19	0.88	0.13	0.00	0.01	0.02	1.21
Lakhisarai	1.31	0.05	0.35	0.23	2.12	1.69	1.34	1.46	0.43	0.00	0.03	0.03	2.04
Jamui	1.09	0.04	0.09	0.07	0.30	1.62	0.18	1.43	0.16	0.00	0.01	0.01	2.70
Khagaria	0.66	0.05	0.20	0.11	1.00	1.19	1.00	2.09	0.50	0.00	0.11	0.02	3.90
Darbhanga	1.35	0.03	0.08	0.06	0.60	3.07	1.21	2.22	0.47	0.11	0.15	0.03	5.49
Madhubani	1.21	0.03	0.00	0.02	0.47	1.02	1.05	1.60	0.46	0.06	0.07	0.01	4.61
Samastipur	1.02	0.03	0.09	0.09	0.72	1.21	1.22	2.00	0.62	0.20	0.23	0.43	4.80
Begusarai	0.87	0.04	0.14	0.10	0.80	1.38	1.19	2.10	0.54	0.07	0.22	0.11	5.85
Poornea	1.50	0.02	0.12	0.08	1.17	1.93	1.69	2.14	0.56	0.00	0.15	0.06	6.72
Araria	1.62	0.02	0.00	0.00	0.41	1.42	1.13	2.16	0.62	0.00	0.11	0.02	4.23
Kishanganj	1.15	0.04	0.00	0.00	0.48	1.34	1.13	1.94	0.65	0.00	0.11	0.01	3.74
Katihar	2.32	0.03	0.10	0.05	0.99	3.51	1.33	2.05	0.40	0.00	0.14	0.02	4.58
Saharsha	2.25	0.03	0.09	0.06	1.60	3.15	1.36	2.03	0.56	0.00	0.11	0.02	3.23
Madhepura	2.20	0.02	0.08	0.05	1.06	3.06	1.08	1.71	0.50	0.00	0.14	0.00	1.89
Supaul	1.65	0.02	0.05	0.03	0.73	2.92	1.17	1.92	0.73	0.00	0.07	0.01	2.55
Bihar	**1.08**	**0.04**	**0.13**	**0.10**	**0.68**	**1.50**	**1.09**	**1.84**	**0.51**	**0.03**	**0.08**	**0.05**	**3.49**

Source: Calculated from data based on Department of Horticulture, Government of Bihar

From Table 2.24 it is seen that among area under fruits in Uttar Pradesh in the year 2007-08, the highest proportion was seen for mango (85.53%) with the district of Balrampur showing 100% acerage under the fruit. Among vegetables the highest proportion was for potato (47.72%) and the district with the largest share of the vegetable was Mathura (91.04%) (Table 2.25).

Table 2.24: Share of Area under different Fruits as a Percentage of Total Area under different Fruits in Uttar Pradesh (2007-08)

Districts	Banana	Papaya	Citrus	Litchi	Muskmelon	Watermelon	Jackfruit	Mango	Guava
Saharanpur	0.00	0.00	0.00	0.02	0.10	0.02	0.00	98.84	1.01
Muzaffarnagar	0.10	0.07	0.04	0.59	3.53	0.23	0.00	90.86	4.59
Meerut	0.00	0.00	0.01	0.40	1.49	0.78	0.01	94.70	2.61
Bagpat	0.00	0.07	0.07	0.07	16.81	0.00	0.00	79.73	3.25
Bulandshahar	0.00	0.01	0.04	0.09	2.30	1.78	0.28	92.81	2.69
Ghaziabad	0.00	0.03	0.00	0.17	2.08	0.25	0.00	94.76	2.72
Gauatambudh Nagar	0.00	0.00	1.96	0.00	21.57	0.00	0.00	53.92	22.55
Aligarh	0.01	0.02	0.37	0.00	11.43	14.79	0.01	60.57	12.79
Hathras	0.00	0.00	0.24	0.00	25.26	9.68	0.00	44.41	20.41
Mathura	0.00	0.00	2.07	0.00	60.10	1.55	0.52	18.13	17.62
Agra	0.00	0.00	10.09	0.00	56.48	2.59	0.07	5.82	24.95
Firozabad	0.00	0.15	0.10	0.00	41.77	46.87	0.15	6.45	4.50
Mainpuri	0.00	0.39	0.00	0.00	28.55	56.81	0.19	6.16	7.90
Etah	0.06	0.13	0.00	0.00	9.57	7.50	0.20	64.38	18.15
Bareilly	0.02	0.02	0.00	0.00	15.60	0.00	0.00	77.92	6.43
Badaun	0.05	0.46	0.00	0.00	11.32	5.32	0.08	22.48	60.30
Shahjahnapur	0.00	0.00	0.00	0.00	12.68	2.42	0.33	83.03	1.54
Pilibhit	0.07	0.00	0.00	0.07	7.82	1.10	0.88	87.95	2.12
Bijnor	0.00	0.00	0.02	0.02	2.03	0.00	0.00	96.52	1.41
Moradabad	0.06	0.08	0.00	0.00	6.52	0.00	0.06	81.26	12.02
Jyotiobaphule Nagar	0.00	0.00	0.00	0.00	4.56	0.09	0.00	93.25	2.10
Rampur	0.00	0.16	0.03	0.36	11.88	0.00	0.03	79.11	8.42
Farrukhabad	0.47	0.23	1.01	0.00	20.36	12.05	0.10	49.80	15.98
Kannauj	0.00	0.08	0.00	0.00	55.67	34.39	0.13	7.30	2.42
Etawah	0.00	0.83	0.00	0.00	32.41	47.92	0.55	12.74	5.54
Auraiya	0.00	0.00	0.46	0.00	46.33	30.73	0.92	11.47	10.09

Kanpur Nagar	0.00	0.00	0.22	0.00	42.31	27.92	0.22	15.49	13.85
Kanpur Dehat	0.25	0.00	1.01	0.00	73.67	0.51	0.00	11.39	13.16
Fatehpur	27.72	0.22	3.82	0.00	25.81	0.22	0.45	32.44	9.32
Allahabad	0.62	1.71	0.00	0.00	43.21	6.44	0.00	37.39	10.63
Kaushambi	12.75	1.76	4.92	0.00	8.09	6.53	0.00	39.04	26.91
Pratapgarh	0.00	0.00	0.00	0.00	7.14	0.00	0.17	92.34	0.34
Jhansi	0.00	3.77	0.00	0.00	45.28	0.00	0.00	16.98	33.96
Lalitpur	0.00	0.00	16.67	0.00	29.17	1.04	1.04	12.50	39.58
Jalaun	0.00	0.00	0.00	5.26	22.37	5.26	0.00	21.05	46.05
Banda	0.00	0.00	2.99	0.00	0.00	0.00	0.00	23.88	73.13
Chitrakoot	0.00	0.00	41.38	0.00	0.00	0.00	10.34	17.24	31.03
Hamirpur	0.00	0.00	0.00	0.00	30.00	0.00	0.00	30.00	40.00
Mahoba	0.00	0.00	12.50	0.00	25.00	0.00	0.00	25.00	37.50
Varanasi	0.00	5.35	4.09	0.00	1.26	0.00	0.39	80.16	8.75
Chandauli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.11	16.89
Jaunpur	0.21	0.00	0.08	0.00	3.04	0.00	0.00	95.56	1.10
Gazipur	0.00	0.00	0.00	0.00	9.24	0.00	0.15	86.21	4.39
Mirzapur	0.00	0.17	6.66	0.00	14.81	0.00	0.17	56.74	21.46
Sonbhadra	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Ravi Dash Nagar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	99.36	0.64
Ballia	0.51	0.00	0.17	0.03	3.09	0.00	0.14	85.09	10.97
Azamgarh	0.08	0.00	0.00	0.00	6.19	0.72	0.24	90.51	2.25
Mau	0.00	0.00	0.00	0.00	8.30	0.00	0.00	80.08	11.62
Gorakhpur	15.72	0.00	0.00	0.04	2.52	0.00	0.11	77.62	3.99
Mahrajganj	3.09	0.05	0.00	0.13	1.82	0.00	0.13	94.24	0.53
Deoria	0.00	0.00	0.11	0.00	0.06	0.17	0.00	99.53	0.14
Kushi Nagar	11.04	0.06	0.00	2.58	0.00	0.23	1.83	83.81	0.44
Basti	0.16	0.00	0.00	0.00	1.50	0.59	0.50	96.25	1.00
Sant Kabir Nagar	0.53	0.00	0.00	0.00	1.37	0.03	0.05	98.02	0.00
Siddharth Nagar	0.00	0.00	0.00	0.25	0.21	0.00	0.00	99.18	0.35

Gonda	0.00	0.00	0.00	0.00	0.69	0.00	0.00	99.18	0.14
Balram Pur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Bahraich	1.62	0.09	0.03	0.00	1.19	0.00	0.40	92.63	4.04
Shravasti	0.00	0.00	0.00	0.00	7.22	0.00	0.00	92.78	0.00
Lucknow	0.12	0.00	0.02	0.00	0.67	0.21	0.02	98.31	0.64
Unnao	0.01	0.01	0.03	0.00	3.41	4.48	0.08	89.82	2.16
Raebareli	0.00	0.00	0.00	0.00	25.17	5.69	0.52	66.72	1.90
Sitapur	0.05	0.00	0.00	0.00	0.07	0.10	0.06	98.24	1.48
Hardoi	0.00	0.03	0.00	0.00	6.30	3.77	0.36	87.07	2.47
Lakhimpur Kheeri	0.90	0.00	0.00	0.14	0.50	0.20	0.07	97.70	0.50
Faizabad	0.00	0.00	0.00	0.00	1.85	0.34	0.07	95.97	1.77
Ambedker Nagar	0.00	0.00	0.00	0.00	1.15	0.09	0.02	98.24	0.50
Sultanpur	0.06	0.00	0.01	0.00	0.42	0.00	0.04	99.31	0.16
Barabanki	0.02	0.00	0.00	0.09	3.61	0.04	0.11	95.00	1.14
Uttar Pradesh	**0.77**	**0.07**	**0.18**	**0.10**	**5.52**	**2.91**	**0.12**	**85.53**	**4.82**

Source: Calculated from Sankhyakiya Patrika, Economics & Statistics Division of Planning Department, Government of Uttar Pradesh

Table 2.25: Share of Area under different Vegetables as a Percentage of Total Area under different Vegetables in Uttar Pradesh (2007-08)

Districts	Onion	Tomato	Sweet Potato	Cauliflower	Okra	Brinjal	Carrot	Turnip	Radish	Bitter Gourd
Saharanpur	1.65	0.31	0.4	7.45	3.07	0.05	0.16	0	0.16	0.83
Muzaffarnagar	2.2	0.51	0.63	4.29	1.4	0.27	1.44	0.34	1.27	0.02
Meerut	1.04	1.08	0.03	0.85	3.36	0.08	1.42	0.03	0.11	0
Bagpat	3.17	0.76	0.18	1	1.08	0.35	1.29	0.18	0.26	0.03
Bulandshahar	3.15	0.79	0.55	2.49	1.18	0.61	1.56	0.07	0.54	0.13
Gaziyabad	0.31	1.87	0.05	1.49	1.94	0.06	0.92	0.05	0.59	0.01
Gauatambudh Nagar	4.78	2.31	0.31	0	2.93	2.31	1.39	0.46	4.32	0
Aligarh	0.53	1.11	1.36	1.02	1.14	0.27	1.17	0.02	0.16	0.01
Hathras	0.05	0.33	0.2	0.17	0.47	0.16	0.16	0	0.13	0.01
Mathura	0.1	0.33	0.29	0.25	0.4	0.32	0.2	0.01	0.15	0
Agra	0.15	0.28	0.18	0.98	1.03	0.51	0.45	0	0.12	0.04
Firozabad	0.47	0.08	0.47	0.24	0.31	0.09	0.16	0.01	0.08	0.03
Mainpuri	3.48	1.45	3.8	0.42	1.32	0.1	0.14	0	0.61	0.38
Etah	1.08	1.52	11.75	0.46	0.73	0.27	0.25	0	0.15	0
Bareilly	0.62	0.35	3.74	1.18	0.57	0.31	0.28	0.06	0.1	0.03
Badaun	1.52	0.04	5.48	0.57	0.45	0.18	0.02	0	0.01	0.04
Shahjahanpur	2.47	0.63	2.62	0.5	0.98	0.38	0.37	0.23	0.76	0
Pilibhit	0.68	0.16	0.66	0.66	1.52	0.03	0.03	0.05	0	0.24
Bijnor	1.48	0.15	0.93	3.64	0.61	0.2	0.17	0.06	0.17	0
Muradabad	0.99	0.09	0.62	1.02	0.44	0.07	0.53	0.01	0	0.21
Jyoti-Ba-Phule Nagar	0.06	0.54	1.25	0.7	0.16	0.01	0.13	0	0	0.73
Rampur	0.73	0.58	1.47	1.71	0.64	0.14	0.22	0.01	0.23	0.15
Farrukhabad	1.81	0.4	2.89	0.36	0.73	0.12	0.14	0.01	0.07	0.05
Kannauj	2.65	0.28	1.16	0.09	0.35	0.09	0.04	0	0.05	0
Etawah	0.21	0.23	0.45	0.17	0.42	0.06	0.09	0	0.07	0.02
Auraiya	1.57	0.31	1.26	0.44	1.09	0.16	0.13	0	0.16	0.06
Kanpur N.	2.41	1.3	2.47	1.34	0.95	1.07	0.12	0.02	0.45	0.09
Kanpur D.	6.27	2.07	3.69	0.36	1.14	0.43	0.3	0	0.93	0

Fatehpur	5.91	0.26	10.69	0.48	1.56	0.14	0.07	0.01	0.05	0.06
Allahabad	1.96	0.54	0.3	0.28	0.54	0.28	0.08	0	0.14	0.13
Kushambi	13.46	0.72	7.72	0.65	0.7	0.36	0.42	0	0.59	0.02
Pratapgarh	4.19	1.57	5.04	0.1	0.24	0.18	0.09	0	0.11	0
Jhansi	0.38	0.01	0.01	0.01	0.22	0.02	0.03	0	0.02	0.01
Lalitpur	0.61	0.05	0.18	0.03	0.05	0.05	0.03	0	0.04	0
Jalaun	0.32	0.68	0.02	0	0.05	0.02	0	0	0	0
Banda	6.78	0.77	1.32	0.26	0.64	2.6	0.51	0	0.09	0.55
Chitrakoot	6.54	1.92	1.49	1.99	1.85	2.84	0.92	0	1.71	0.78
Hamirpur	0.71	0.45	0.08	0.01	0.14	0.1	0.01	0.01	0.01	0.08
Mahoba	0.08	0	0.07	0	0.04	0.04	0.05	0	0	0
Varanasi	2	0.62	0.11	1.29	2.59	0.67	0.31	0.01	0.66	0.02
Chandauli	4.05	0	0.08	2.09	0.46	0.59	0	0.04	0.25	0.04
Jaunpur	4.25	0.27	0.58	0.49	0.76	0.08	0.04	0	0.06	0.15
Gazipur	4.63	0.14	0.04	0.56	1.03	0.21	0.05	0.02	0.2	0.02
Mirzapur	3.18	0.03	0.04	0.33	0.54	0.29	0	0.01	0.03	0
Sonbhadra	12.58	3.75	0.87	0.21	0.64	0.46	0.54	0	0.33	0.08
Ravi Dash Nagar	1.44	0.07	0	0.03	0	0.03	0	0	0	0
Ballia	4.85	0.24	0.14	0.82	0.87	0.46	0.1	0.03	0.23	0.1
Azamgarh	3.73	0.25	0.07	0.41	0.49	0.09	0.04	0	0.08	0.05
Mau	6.34	0.07	0.2	0.55	0.34	0.23	0.32	0.16	0.3	0.2
Gorakhpur	1.79	1.1	0.11	2.27	1.46	0.35	0.03	0.15	0.11	0.04
Maharajganj	4.63	0.12	0.05	5.5	1.85	0.38	0.14	0.03	0.06	0.15
Deoria	1.81	0.19	0.5	2.01	1.19	0.62	0.36	0.06	0.06	0.2
Kushi Nagar	1.33	0.87	1.29	6.44	4.09	2.97	0.04	0.04	0.17	2.3
Basti	3.11	0.55	0.09	0.49	0.84	0.14	0.03	0	0.34	0.26
Kabir Nagar	1.45	0.12	1.34	0.83	0.18	0.12	0.04	0	0	0.03
Sid.Nagar	3.42	0.13	0.36	0.42	0.15	0.07	0.01	0	0.06	0
Gonda	4.99	0.16	2	2.03	1.29	1.24	0.01	0.01	0.05	0.07
Balram Pur	3.21	0	0.33	0.25	0.23	0.15	0	0	0.08	0
Bahraich	11.16	0.82	0.94	2.23	3.6	0.58	0.01	0.01	0.36	0.18
Shravasti	28.33	0	1.81	0	1	0	0	0	0	0
Lucknow	0.91	1.63	0.55	1.32	4.32	0.31	0.48	0.03	0.22	0.17

Unnao	2.67	0.48	3.7	2.09	2.35	0.31	0.69	0.01	0.05	0.24
Raebareli	3.45	0.45	3.66	0.82	2.43	1.05	0.06	0.01	0.65	0.09
Sitapur	2.76	0.37	4.6	1.97	3.43	0.08	0.09	0	0.03	0.11
Hardoi	3.15	0.64	5.11	0.55	1.38	0.44	0.16	0	0.04	0.07
Kheeri	2.88	0.86	1.06	2.16	2.28	0.28	0.12	0	0.4	0.02
Faizabad	3.13	1.92	2.63	1.59	1.32	0.15	0.02	0.04	0.11	1.55
Ambedker Nager	1.2	0.17	0.08	0.73	0.41	0.4	0.06	0	0.34	0.18
Sultanpur	4.13	0.22	6.69	0.38	1.09	0.16	0.01	0	0.06	0.03
Barabanki	1.54	0.59	1.62	0.28	0.48	0.14	0.12	0.07	0.12	0.02
Uttar Pradesh	**2.02**	**0.53**	**1.85**	**0.75**	**0.91**	**0.26**	**0.23**	**0.02**	**0.17**	**0.09**

Contd.

Districts	**Bottle Gourd**	**Pumpkin**	**Parwal**	**Petha**	**Arbi**	**Torai**	**Lobia**	**Peas**	**Cabbage**	**Potato**	**Other Veg.**
Saharanpur	1.09	0.03	0	0.21	0.03	0.12	0	3.71	0	11.65	69.07
Muzaffarnagar	0.72	0.06	0.11	0.32	0.16	0.19	0.03	4.49	0	39.71	41.83
Meerut	1.52	0.07	0.49	0.83	0.1	0.33	0.42	11.93	0.38	41.95	33.96
Bagpat	3.49	0.67	0	0.12	0.35	2.37	0	5.16	0.12	7.48	71.94
Bulandshahar	1.09	0.16	0	0.01	0.54	0.74	0.01	10.84	0.83	49.23	25.48
Gaziyabad	1.45	0.22	0	1.73	0.09	0.55	0.1	24.25	0.7	33.41	30.22
Gauatambudh Nagar	2.01	0.93	0	0	1.85	1.08	0.77	8.18	0	37.96	28.4
Aligarh	0.78	0.31	0	0.17	0.29	0.66	0.01	7.13	0.12	72.79	10.96
Hathras	0.37	0.04	0	0	0.04	0.17	0.01	3.69	0.29	83.27	10.44
Mathura	0.02	0.12	0	0	0	0.03	0	0.34	2.17	91.04	4.23
Agra	0.77	0.09	0	0.02	0.16	0.63	0.05	0.76	0.04	81.96	11.8
Firozabad	0.24	0.18	0	0.04	0.26	0.33	0	3.66	0.13	86.55	6.66
Mainpuri	1.07	0.61	0.15	0.03	1.14	0.97	0	8.89	0.33	67.45	7.64
Etah	0.47	0.39	0.01	0.01	3.59	0.54	0	29.9	0.25	32.34	16.29
Bareilly	0.8	0.22	0.06	0.89	1.68	0.78	0.1	6.09	0.16	29.95	52
Badaun	0.26	0.31	0.01	0.04	1.82	0.2	0.01	5	0	58.71	25.33
Shahjahanpur	0.39	0.14	0.01	0	0.73	0.5	0.75	6.24	0.6	55.65	26.04
Pilibhit	0.45	0.08	0.26	0	1.76	0.5	0.03	8.69	0	15.53	68.7
Bijnor	0.23	0.03	0.09	0	2.12	0.03	0	12.69	0	35.35	42.04
Muradabad	0.42	0.02	0	0	2.42	1.09	0.02	18.05	0	51.12	22.88

Jyoti-Ba-Phule Nagar	1.55	0	0	0	7.78	0.69	1.85	2.46	0	57.71	24.37
Rampur	0.55	0.14	0.03	0	0.55	0.56	0	10.51	0	30.57	51.21
Farrukhabad	0.19	0.35	0.01	0	0.78	0.28	0	1.47	0.08	82.83	7.43
Kannauj	0.08	0.68	0	0	0.18	0.09	0.01	2.03	0.01	85.29	6.92
Etawah	0.43	0.29	0.03	0.01	1.97	0.42	0	14.28	0.04	66.09	14.72
Auraiya	0.86	0.43	0	0.01	0.86	1.11	0.03	10.52	0.15	65.41	15.43
Kanpur N.	0.46	0.46	0	0	0.6	0.61	0.18	9.71	0.33	60	17.43
Kanpur D.	0.56	0.38	0	0	0.02	0.55	0.01	31.31	0.01	36.4	15.55
Fatehpur	0.38	0.41	0.14	0.01	0.9	0.54	0.07	12.89	0.01	32.89	32.54
Allahabad	0.2	0.71	0.2	0.03	0.01	0.05	0	12.68	0.06	59.05	22.74
Kushambi	0.01	0.15	0	0.15	0.48	0.01	0.01	20.21	0.1	52.75	1.47
Pratapgarh	0.02	0.03	0.01	0	0	0	0	31.77	0.03	46.75	9.88
Jhansi	0.03	0.01	0	0	0.07	0	0.01	90.43	0	1.92	6.8
Lalitpur	0.01	0	0	0	0.01	0	0.01	91.28	0	1.57	6.08
Jalaun	0.07	0.01	0	0	0.01	0.05	0	92.28	0.01	0.85	5.64
Banda	0.43	0.34	0	0	0	0.34	0.04	31.23	0	1.79	52.3
Chitrakoot	1.49	0.92	0	0	0.14	0.43	0	18.28	0.5	3.98	54.2
Hamirpur	0.05	0.06	0	0	0.01	0.05	0.05	87.8	0.01	1.41	8.98
Mahoba	0	0	0	0	0	0	0	93.8	0	1.38	4.54
Varanasi	0.15	0.24	0.03	0.21	0.01	0.11	0.02	30.55	0.13	34.73	25.54
Chandauli	0.13	0	0	0	0	0	0	16.34	0.25	45.3	30.38
Jaunpur	0.13	0.1	0	0.03	0.02	0.02	0	35.42	0.1	50.77	6.72
Gazipur	0.38	0.02	1.08	0.57	0.02	0.05	0	23.66	0.02	50.53	16.78
Mirzapur	0	0	0	0	0	0	0.01	49.46	0	21.38	24.68
Sonbhadra	0.74	0	0.08	0	0	0	0	47.93	0	19.79	11.99
Ravi Dash Nagar	0.17	0.07	0	0	0	0	0	48.56	0	43.78	5.85
Ballia	0.51	0.01	1.54	0	0	0.07	0	21.11	0.02	54.71	14.18
Azamgarh	0.12	0	0.01	0	0	0.02	0	53.6	0.05	30.37	10.63
Mau	0.8	0	0	0	0	0	0.02	48.61	0.07	37.05	4.75
Gorakhpur	0.35	0	0.94	0	0.34	0.07	0.02	25.03	0.42	43.42	22.02
Maharajganj	0.26	0.02	0.26	0	0.3	0.12	0	22.87	0	39.95	23.31

Deoria	0.42	0.05	0	0	0	0.28	0	43.43	0.03	26.75	22.04
Kushi Nagar	2.72	0.04	2.24	0.02	0.04	0.5	0.04	11.71	0.15	27.55	35.46
Basti	0.54	0.08	1.19	0	1.39	0.81	0.18	56.73	0.2	26.16	6.87
Kabir Nagar	0.07	0.03	0.18	0	0.03	0.03	0	62.33	0	28.5	4.73
Sid.Nagar	0	0	0.01	0	0.01	0	0	73.61	0	18.36	3.4
Gonda	0.04	0.13	0.02	0	1.39	0.09	0	40.27	0.29	40.06	5.86
Balram Pur	1.09	0	0	0	0	0	0.03	62.03	0	26.26	6.36
Bahraich	0.59	0.31	0.7	0.01	2.05	0.91	0.31	25.22	0.27	33.82	15.92
Shravasti	0	0	0	0	0	0	0	16.2	0	52.49	0.18
Lucknow	1.37	0.91	0	0.02	0.69	1.8	0.81	33.55	0.48	26.92	23.53
Unnao	0.74	0.29	0.1	0.04	0.93	1.71	0.53	7.67	0.19	45.46	29.75
Raebareli	0.24	0.76	0.01	0	0.58	0.42	0.14	27.93	0.12	37.24	19.89
Sitapur	0.44	0.71	0.41	0	2.84	1.28	0.99	18.85	0.23	46.7	14.12
Hardoi	0.22	0.22	0.01	0.01	1.99	1.01	0.59	8.63	0.12	61.74	13.91
Kheeri	2.4	0.6	1.1	0	3.96	3.26	0.64	15.36	0.02	25.18	37.42
Faizabad	2.96	0.71	0.19	0	4.02	1.27	0.11	14.94	0.88	40.21	22.24
Ambedker Nager	0.69	0.35	0.93	0	0.85	0.02	0	42.09	0.14	29.01	22.36
Sultanpur	0.05	0.36	0.03	0	0.26	0.01	0	44.68	0.04	29.83	11.97
Barabanki	0.2	0.41	0.02	0	0.93	0.51	0	16.96	0.14	70.1	5.75
Uttar Pradesh	**0.45**	**0.23**	**0.12**	**0.07**	**0.7**	**0.4**	**0.09**	**27.68**	**0.17**	**47.72**	**15.55**

Source: Calculated from Sankhyakiya Patrika, Economics & Statistics Division of Planning Department, Government of Uttar Pradesh

From Table 2.26 it is seen that among area under vegetables in Orissa in the year 2006-07, the highest proportion was during the Rabi season (58.81%) and the district with the largest share of the vegetables was Sundargarh (78.54%). Among area under fruits the highest proportion was seen for mango (41.58%) with the district of Malkangiri showing the highest proportion of acerage under the fruit (65.18%) (Table 2.27).

Table 2.26: Share of Area under Seasonal Vegetables as a Percentage of Total Area under Vegetables in Orissa (2007-08)

Districts	Rabi Vegetables	Kharif Vegetables
Balasore	56.97	43.03
Bhadrak	56.81	43.19
Balangir	62.17	37.83
Sonepur	57.68	42.32
Cuttack	59.03	40.97
Jagatsingpur	53.83	46.17
Jajpur	52.50	47.50
Kendrapara	56.15	43.85
Dhenkanal	57.50	42.50
Angul	66.73	33.27
Ganjam	58.88	41.12
Gajapati	56.63	43.37
Kalahandi	68.29	31.71
Nawapara	58.07	41.93
Keonjhar	55.24	44.76
Koraput	49.37	50.63
Malkangiri	51.79	48.21
Nawarangpur	42.73	57.27
Rayagada	55.97	44.03
Mayurbhanj	57.32	42.68
Phulbani	59.06	40.94
Boudh	57.51	42.49
Puri	62.44	37.56
Khurda	63.90	36.10
Nayagarh	75.61	24.39
Sambalpur	53.29	46.71
Bargarh	71.55	28.45
Deogarh	49.09	50.91
Jharsuguda	56.75	43.25
Sundargarh	78.54	21.46
Orissa	**58.81**	**41.19**

Source: Calculated from Data based on Agricultural Statistics, 2007-08, Government of Orissa

Table 2.27: Share of Area under different Fruits as a Percentage of Total Area under different Fruits in Orissa (2007-08)

Districts	Mango	Guava	Citrus	Litchi	Sapota	Banana	Papaya	Pine apple	Coconut	Cashewnut	Others
Balasore	48.89	3.96	9.78	1.61	0.87	7.67	0.37	0.50	13.61	6.93	5.82
Bhadrak	57.41	10.96	10.21	0.50	0.37	3.49	0.37	0.12	11.46	0.00	5.11
Balangir	41.68	1.96	4.55	0.24	2.28	10.75	0.31	0.08	7.06	0.24	30.85
Sonepur	46.75	7.22	7.94	0.18	0.18	10.29	0.36	0.18	5.60	0.00	21.30
Cuttack	22.43	1.54	3.60	0.17	2.40	4.28	0.34	0.26	42.04	16.01	6.93
Jagatsingpur	27.64	0.93	4.82	0.00	2.04	6.31	0.56	0.19	43.78	0.56	13.17
Jajpur	21.52	1.55	2.32	0.00	1.55	2.45	0.26	0.13	30.28	28.48	11.47
Kendrapara	21.97	1.35	4.24	0.39	1.54	4.82	0.58	0.19	39.11	5.97	19.85
Dhenkanal	55.47	1.90	7.05	0.08	0.55	3.33	0.16	0.16	8.40	13.07	9.83
Angul	52.23	2.62	8.59	2.78	0.31	8.12	0.10	0.16	4.40	4.61	16.08
Ganjam	33.68	0.73	11.57	0.04	1.47	8.12	0.17	0.17	31.87	6.95	5.22
Gajapati	39.96	3.79	18.24	0.10	1.33	3.69	0.20	0.61	19.77	6.05	6.25
Kalahandi	54.74	11.26	8.34	0.50	0.36	6.49	0.29	0.14	2.71	0.43	14.75
Nawapara	50.74	10.18	6.78	0.44	0.15	4.28	0.44	0.15	1.47	0.00	25.37
Keonjhar	50.21	10.46	10.46	0.07	0.50	6.09	0.29	0.36	8.81	8.45	4.30
Koraput	42.41	4.96	3.99	0.61	0.66	4.09	0.15	0.15	0.97	30.91	11.09
Malkangiri	65.18	6.12	7.65	0.24	0.71	5.18	0.35	0.12	2.35	0.00	12.12
Nawarangpur	51.32	9.51	4.66	0.20	0.71	5.26	0.20	0.10	2.33	10.12	15.59
Rayagada	62.21	6.37	7.20	1.25	0.62	7.27	0.21	0.62	2.91	0.00	11.35
Mayurbhanj	46.36	2.63	22.75	0.12	0.18	5.87	0.18	0.18	6.48	7.71	7.52
Phulbani	36.11	3.52	8.26	0.93	0.22	4.67	0.14	0.29	2.51	1.15	42.21
Boudh	43.06	6.52	7.65	0.28	0.28	7.08	0.28	0.28	5.10	0.00	29.46
Puri	21.16	0.66	2.41	0.00	1.75	10.37	0.18	0.12	58.59	2.23	2.53
Khurda	29.21	0.87	3.42	0.36	2.40	7.50	0.29	0.07	25.56	26.44	3.86
Nayagarh	25.47	2.08	2.92	0.00	1.60	8.40	0.09	0.09	44.91	11.51	2.92
Sambalpur	40.58	2.98	7.54	8.24	0.35	5.35	0.26	0.09	2.80	15.07	16.74
Bargarh	29.39	2.63	2.96	0.66	3.28	10.84	0.16	0.16	18.56	0.00	31.36
Deogarh	50.68	2.26	9.28	13.35	0.68	5.20	0.23	0.23	2.94	0.00	15.16
Jharsuguda	39.30	5.64	7.79	0.33	0.66	6.30	0.17	0.17	2.99	21.39	15.26
Sundargarh	36.73	4.34	8.57	4.90	0.11	9.24	0.22	0.06	4.73	14.19	16.92
Orissa	**41.58**	**4.14**	**7.87**	**1.17**	**0.97**	**6.60**	**0.24**	**0.20**	**15.15**	**8.97**	**13.12**

Source: Calculated from Data based on Agricultural Statistics, 2007-08, Government of Orissa

Livestock Diversification

The livestock sector plays an important role in the welfare of India's rural population. It contributes 9% to the GDP and provides employment to 8% of the labour force. As a component of agricultural sector, its share in gross domestic product has been rising gradually, while that of crop sector has been on the decline. In recent years, livestock output has grown at a rate of about 5% a year, higher than the growth in agricultural sector. This enterprise provides a flow of' essential food products, draught power, manure, employment, income, and export earnings.

India has immense resources of livestock and poultry, which play a vital role in improving the socioeconomic conditions of rural masses. India ranks first in respect of buffalos (57% of the world's buffalo population), second in cattle and goats, third in sheep, fourth in ducks, fifth in chickens and sixth in camel population in the world (Annual Report 2007-08, Department of Animal Husbandry and Dairying). From Table 2.28, it is seen that the total livestock population has decreased marginally at an annual rate of growth of -0.08% per annum between 1997 and 2003. Among livestock population, those of mithun and yaks have increased much more compared to other animals.

Table 2.28: Livestock Population (Million Nos)

Species	Livestock Census		Annual Growth Rate (%)
	1997	2003	2003 over 1997
Cattle	198.88	185.18	-6.89
Buffalo	89.92	97.92	8.90
Yaks	0.06	0.07	16.67
Mithuns	0.18	0.28	55.56
Total Bovines	**289.03**	**283.45**	**-1.93**
Sheep	57.49	61.47	6.92
Goat	122.72	124.36	1.34
Pigs	13.29	13.52	1.73
Other Animals	2.85	2.21	-22.46
Total livestock	**485.39**	**485**	**-0.08**
Poultry	347.61	489.01	40.68

Source: Annual Report 2007-08, Department of Animal Husbandry and Dairying

In case of the contribution of livestock output in total value of agriculture & allied activities, its share increased from about 16.7 percent in the 1950's to 27.2 percent during 2000-01 to 2005-06 (Table 2.29).

Table 2.29: Contribution of Livestock Output in Total Value of Agriculture & Allied Activities

Periods	Percentage Share (%)
1950-51 to 1959-60	16.7
1960-61 to 1969-70	14.7
1970-71 to 1979-80	17.3
1980-81 to 1989-90	21.5
1990-91 to 1999-2000	24.8
2000-01 to 2005-06	27.2

Source: Ramesh Chand and S.S. Raju, IJAE, 2008

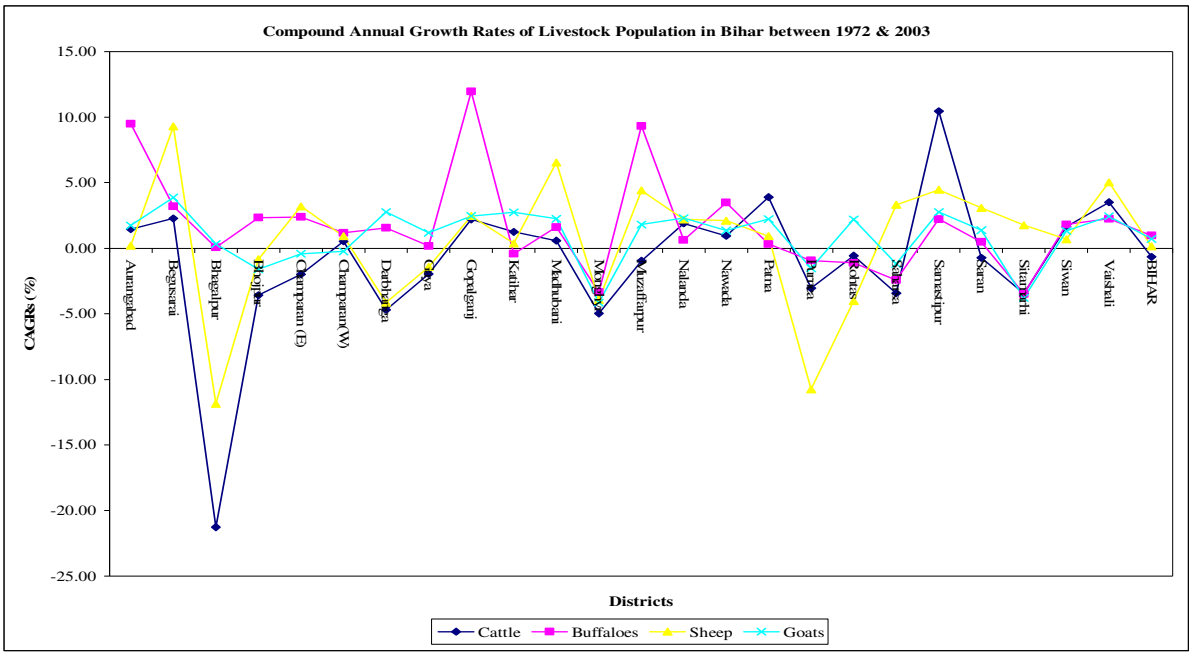
From the following Table 2.30, it is seen that in India sheep, followed by buffaloes and goats grew at a higher rate compared to cattle whose growth rate showed a decline between the years 1992 and 2003. The growth rate of cattle declined in all the eastern states except West Bengal (0.99%). The growth rate of buffaloes was higher in Uttar Pradesh (1.09%) followed by Bihar (0.96%) and West Bengal (0.83%). The growth rate of sheep was higher in Orissa (5.65%) followed by West Bengal (1.87%) and Bihar (0.13%). The growth rate of goats was higher in West Bengal (5.65%) followed by Uttar Pradesh (1.51%), Bihar (0.70%) and Jharkhand (0.70%).

Table 2.30: Annual Growth Rate (Compounded) of different Livestock in Eastern States (1992 to 2003)

States	Cattle	Buffaloes	Sheep	Goats
Bihar	-0.66	0.96	0.13	0.70
Jharkhand	-0.55	-0.23	-0.97	0.29
Orissa	-1.62	-2.30	5.65	-4.19
Uttar Pradesh	-1.56	1.09	-0.59	1.51
West Bengal	0.99	0.83	1.87	4.06
India	**-0.08**	**1.72**	**2.13**	**1.55**

Source: Calculated from Data based on livestock Census (Various Years)

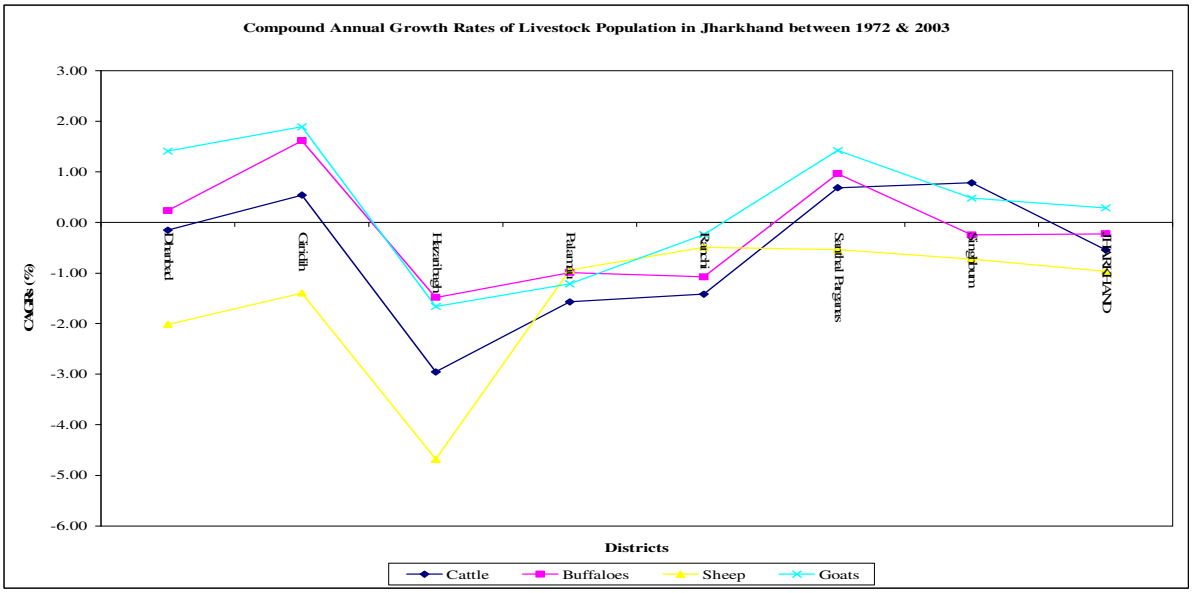
Figure: 2.2: Compound Annual Growth Rates of Livestock Population in Bihar between 1972 & 2003 (%)



Source: Statistical Abstracts, Department of Animal Husbandry, Government of Bihar

Between 1972 and 2003, within the state of Bihar the growth rate (compounded) of cattle was highest in the district of Samastipur (10.45%). The growth rate of buffaloes was highest in Gopalganj (11.94%), while that of sheep was highest in Begusarai (9.30%). The growth rate of goats was highest in Begusarai (3.88%) (Fig 2.2).

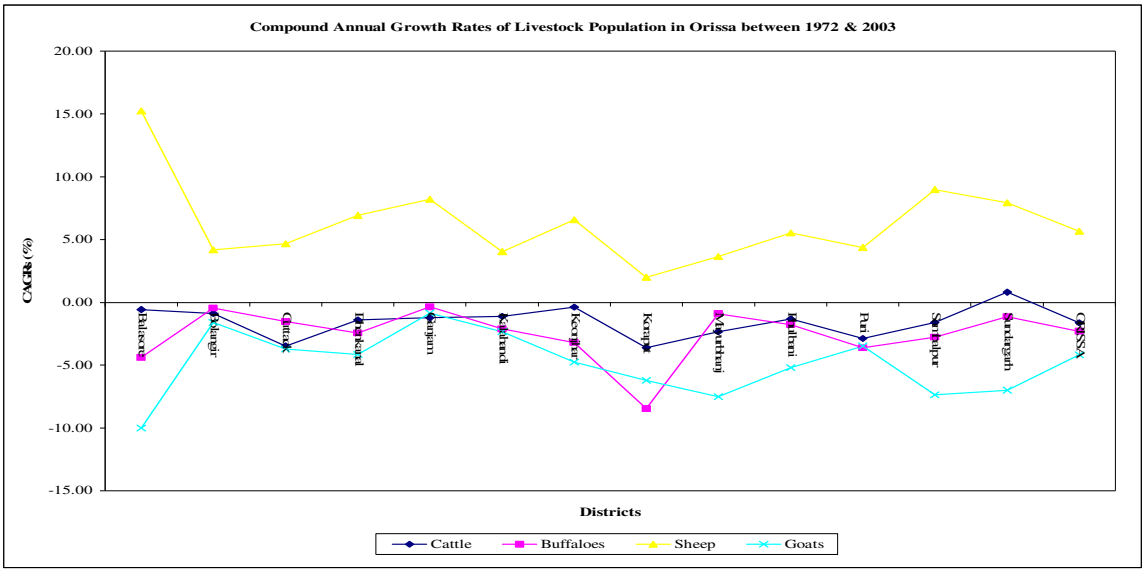
Figure: 2.3: Compound Annual Growth Rates of Livestock Population in Jharkhand between 1972 & 2003 (%)



Source: Statistical Abstracts, Department of Animal Husbandry, Government of Jharkhand

Between 1972 and 2003, within Jharkhand the growth rate of cattle was highest in the district of Singhbhum (0.78%). The growth rate of buffaloes and goats was highest in Giridih 1.62% and 1.89% respectively. The growth rate of sheep was negative in all the districts of Jharkhand (Fig 2.3).

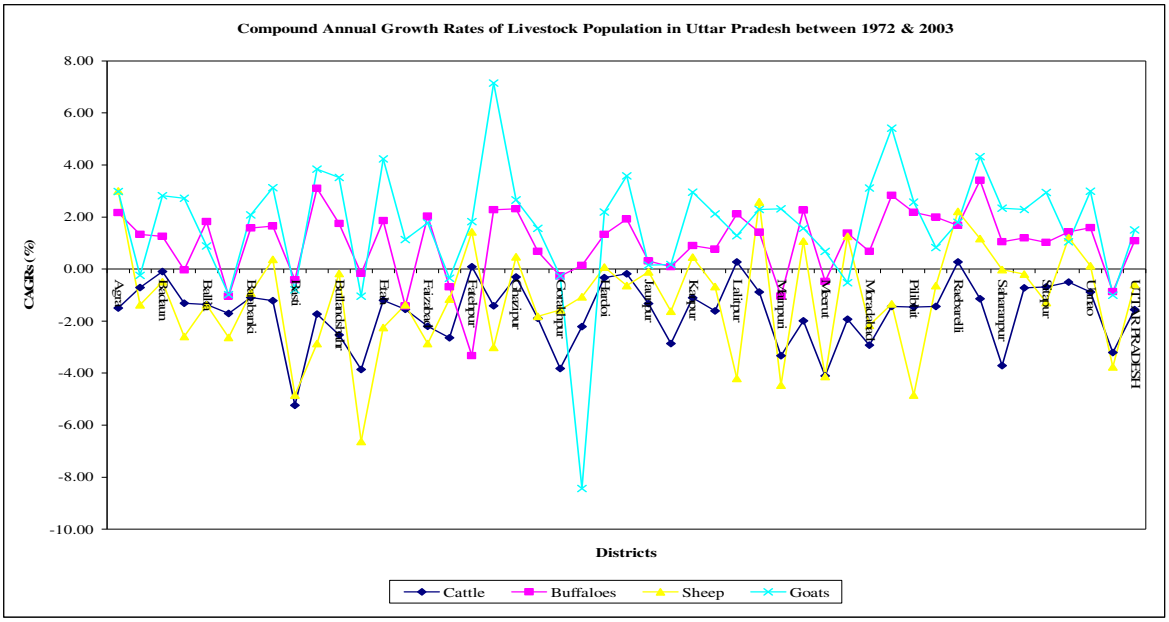
Figure: 2.4: Compound Annual Growth Rates of Livestock Population in Orissa between 1972 & 2003



Source: Statistical Abstracts, Department of Animal Husbandry, Government of Orissa

Between 1972 and 2003, within Orissa the growth rate of cattle was negative in all districts except Sundargarh where it grew at a rate of 0.81%. The growth rate of buffaloes and goats was also negative in all the districts of the state. Positive growth rates were seen for sheep rearing with the highet growth rate in Bolangir (15.24%) (Fig 2.4)

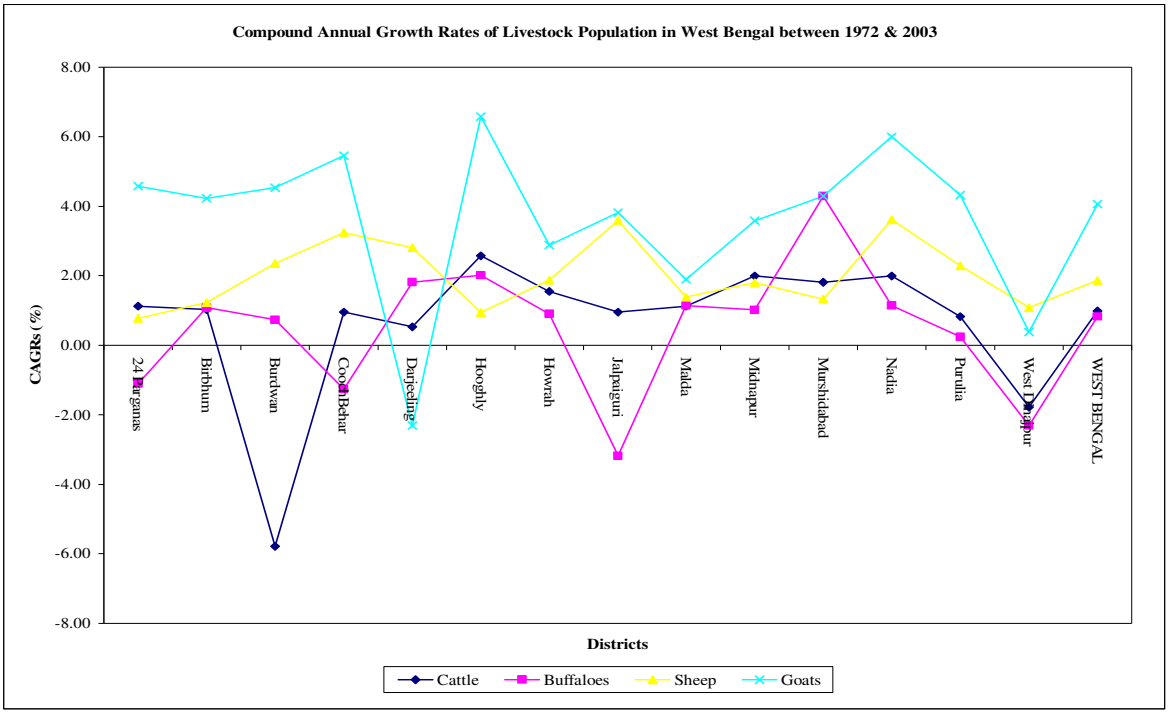
Figure: 2.5: Compound Annual Growth Rates of Livestock Population in Uttar Pradesh between 1972 & 2003



Source: Statistical Abstracts, Department of Animal Husbandry, Government of Uttar Pradesh

Within the state of Uttar Pradesh, between 1972 and 2003, the growth rate of cattle was negative in most districts except Rae Barelli (0.28%), Lalitpur (0.27%) and Fatehpur (0.09%). In case of sheep too, most districts showed a negative growth rate but the highest positive growth rate was seen in highest in the district of Agra (3%). The growth rate of buffaloes was highest in Rampur (3.41%), while that of goats was highest in Ghaziabad (7.16%) (Fig 2.5).

Figure: 2.6: Compound Annual Growth Rates of Livestock Population in West Bengal between 1972 & 2003



Source: Statistical Abstracts, Department of Animal Husbandry, Government of West Bengal

Between 1972 and 2003, within the state of West Bengal the growth rate of cattle was highest in the district of Hooghly (2.57%). The growth rate of buffaloes was highest in Murshidabad (4.29%), while that of sheep was highest in Jalpaiguri (3.59%). The growth rate of goats was highest in Hooghly (6.59%) (Fig 2.6).

Table 2.31: Changes in the Share of Livestock Sector in the Total Value of Output of Agriculture & Allied Activities (TE-2002 to TE-2006)

States	TE-02	TE-06
Bihar	25.22	35.16
Orissa	11.86	13.62
Uttar Pradesh	24.16	27.41
West Bengal	17.56	17.81
Jharkhand	28.38	27.34
India	23.86	25.24

Source: CSO, Govt. of India (2008)

From Table 2.31 it is seen that in all eastern states, the share of ilk in the total value of livestock output is the highest (approximately 50%) amongst all other livestock products. Its share was highest in Uttar Pradesh (approximately 80%) followed by Jharkhand, Bihar, Orissa and West Bengal. The shares have increased for all the eastern states except Jharkhand between TE-2002 and TE-2006. The contribution of meat in the

total value of livestock output is the second highest after milk (approximately 17%). Its share was highest in West Bengal (approximately 45%) followed by Orissa, Bihar, Uttar Pradesh and Jharkhand. The shares have declined marginally for most eastern states except Uttar Pradesh and Jharkhand between TE-2002 and TE-2006.

Table 2.32: Share of Different Items in the Total Value of Livestock Output (TE-2002 to TE-2006)

States	Milk		Egg		Wool & Hair		Dung		Silk & Honey		Meat		Increment in Stock	
	TE-02	TE-06	TE-02	TE-06	TE-02	TE-06	TE-02	TE-06	TE-02	TE-06	TE-02	TE-06	TE-02	TE-06
Bihar	54.34	59.94	1.74	1.32	0.06	0.05	6.93	8.74	0.29	0.09	22.79	17.53	13.84	12.33
Orissa	49.53	52.19	7.19	7.02	0.09	0.07	2.87	1.57	0.55	0.4	34.43	33.92	5.34	4.84
Uttar Pradesh	82.01	82.36	0.51	0.5	0.12	0.11	6.50	5.86	0.03	0.02	11.3	11.45	-0.47	-0.3
West Bengal	44.27	44.65	4.35	4.34	0.07	0.08	4.00	4.14	1.01	1.14	45.04	44.34	1.27	1.3
Jharkhand	67.01	55.44	4.74	6.35	0.18	0.23	19.31	26.47	0.00	0.74	5.74	7.89	3.02	2.89
India	**67.8**	**66.8**	**3.43**	**3.57**	**0.21**	**0.19**	**8.10**	**7.94**	**1.12**	**1.04**	**16.9**	**17.5**	**2.4**	**3.02**

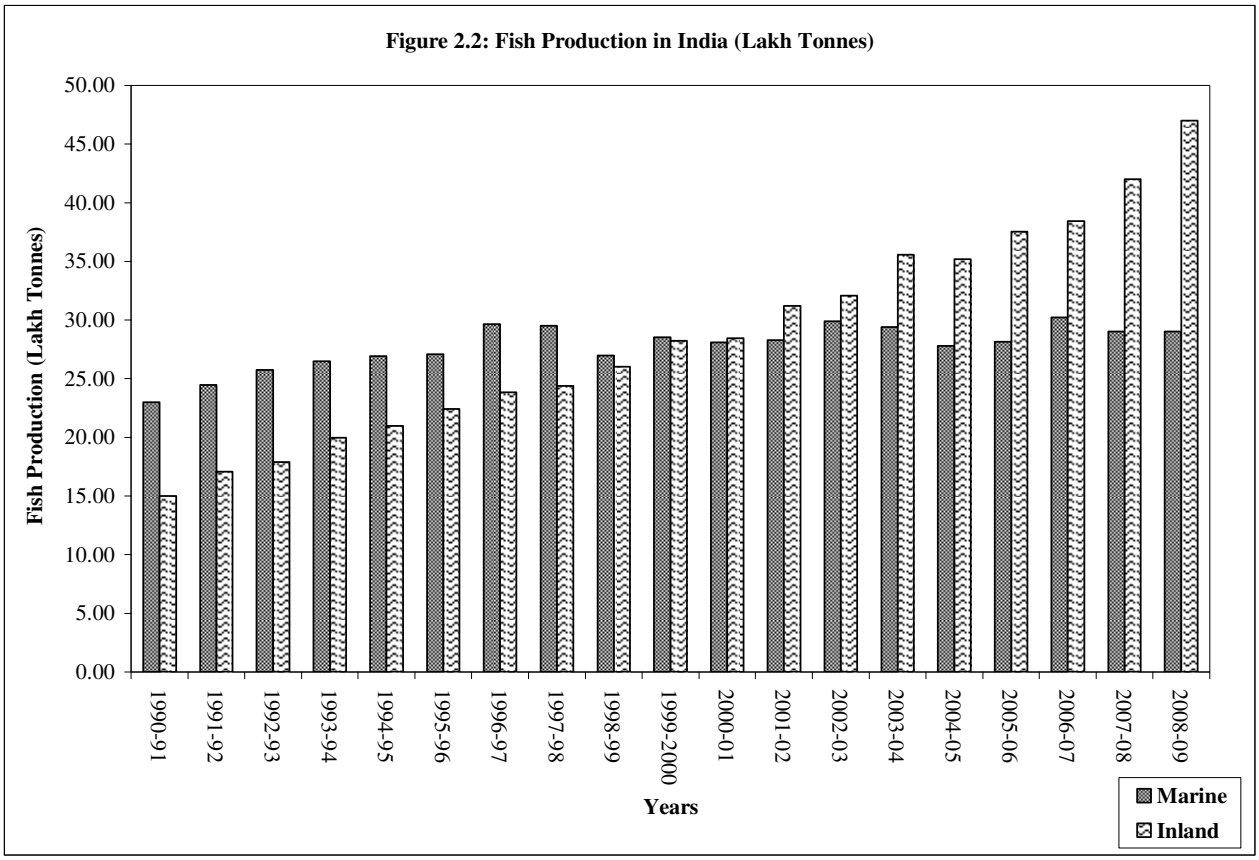
Source: CSO, Govt. of India, 2008

Development of Fisheries

Fish production increased in India from 38 lakh tonnes in 1990-91 to 76 lakh tonnes in 2008-09. Fishing, aquaculture and allied activities are reported to have provided livelihood to over 14 million persons in 2006-07 apart from being a major foreign exchange earner (Economic Survey 2009-10).

Till the year 1999-2000, the contribution of marine fisheries in the total fish production was more than inland fisheries. But its share declined from 60% to 50% between 1990-91 and 1999-2000. Since the year 2000-01 the situation is just reverse i.e., the contribution of inland fisheries is more than marine with the share of the former increasing from 50% in 2000-01 to 62% in 2008-09 (Fig 2.7).

Figure 2.7: Fish Production in India (Lakh Tonnes)



Source: Annual Report 2007-08, Department of Animal Husbandry and Dairying

The major fish producing eastern states are West Bengal and Orissa. From Table 2.33 it is seen that in India the share of inland fish in the total value of output of fisheries increased from 48% to 52% between TE-2002 and TE-2006, while the share of marine fisheries decreased from 52% to 48% in the same period. In the states of Bihar and Uttar Pradesh and Jharkhand the contribution of inland fisheries in total value output from fisheries is 100%. In Orissa, the contribution of marine fisheries is more than inland fisheries, whereas in West Bengal it is just the opposite. Further the contribution of marine fisheries in both Orissa and West Bengal is seen to be declining while that of inland fisheries is increasing.

Table 2.33: Share of Inland and Marine Fish in the Total Value of Fisheries Output (%)

States	Inland Fish		Marine Fish	
	TE-02	TE-06	TE-02	TE-06
Bihar	100	100	0	0
Orissa	41.19	47.08	58.81	52.92
Uttar Pradesh	100	100	0	0
West Bengal	62.71	67.61	37.29	32.39
Jharkhand	100	100	0	0
India	**47.93**	**51.68**	**52.07**	**48.32**

Source: CSO, Govt. of India, 2008

Within agriculture and allied activities, the contribution of fisheries sector has increased marginally from 4.15 to 4.32% between TE-2002 and TE-2006. The share of this sector is highest in the state of West Bengal followed by Orissa, Jharkhand, Bihar and Uttar Pradesh. Further, the contribution of the sector has increased in all the eastern states except Jharkhand where it declined marginally (Table 2.34).

Table 2.34: Changes in the Share of Fisheries Sub-Sector in the Total Value of Output of Agriculture & Allied Activities (%)

States	TE - 2002	TE - 2006
Bihar	3.61	4.4
Orissa	5.95	6.27
Uttar Pradesh	0.92	1.15
West Bengal	11.78	12.01
Jharkhand	5.94	4.34
India	**4.15**	**4.32**

Source: CSO, Govt. of India, 2008

Development of Forestry

The proportion of area under forestry to the total reported area in India increased marginally from 21.55% in 1970-71 to 22.99% in 2006-07 (Table 2.35). It declined in Bihar (including Jharkhand) and Uttar Pradesh from around 16% to 6%. In Orissa it increased from 32% to 37%, while in West Bengal it increased from 12.44 to 13.52% during the same period.

Table 2.35: Forest Area as a Proportion of Reported Area in the Eastern States (%)

States	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2006-07
Bihar (incl Jharkhand)	16.9	16.29	16.31	16.87	17.02	17.02	6.59	6.64
Orissa	32.00	40.93	42.73	38.32	35.24	36.75	37.33	37.33
Uttar Pradesh	16.62	17.23	17.21	17.17	17.33	17.33	6.98	6.83
West Bengal	12.44	13.38	13.38	12.34	12.33	13.76	13.7	13.52
India	**21.55**	**21.82**	**22.17**	**21.91**	**22.29**	**22.57**	**22.81**	**22.99**

Source: Data based on Directorate of Economics and Statistics, Ministry of Agriculture, GOI

The share of forestry & logging in the GDP of Agriculture and Allied Activities (Table 2.36) has shown a gradual decline from 6.38% in TE - 1983 to 3.75% in TE – 2009. The shares have shown a decline in Uttar Pradesh and has remained nearly constant in West Bengal during the same period. The shares have shown an increase in Bihar, Jharkhand and Orissa. The shares are highest in Jharkhand (11.81%) followed by Orissa (8.19%) and Bihar (5.04%).

Table-2.36: Share of Forestry and Logging in the Gross State Domestic Product of Agriculture & Allied Sector at Factor Cost (at Constant Prices)

States	TE - 1983	TE - 2002	TE - 2009
Bihar	4.66	5.03	5.04
Jharkhand	-	7.84	11.81
Orissa	5.74	8.56	8.19
Uttar Pradesh	5.38	2.63	3.28
West Bengal	3.51	2.63	3.72
India	**6.38**	**4.20**	**3.75**

Source: CSO, Ministry of Statistics and Programme Implementation, GOI

The share of forestry & logging in the total value of output of Agriculture and Allied Activities (Table 2.37) has shown a slight decline from 3.64% to 3.50% between TE – 2002 and TE – 2006. The shares are highest in Jharkhand followed by Orissa, Bihar, West Bengal and Uttar Pradesh. The shares have shown marginal increase in the states of Bihar, Uttar Pradesh and West Bengal, while in Orissa and Jharkhand they have shown a marginal decline.

Table 2.37: Changes in the Share of Forestry in the Total Value of Output of Agricultural & Allied Activities

States	Percentage Shares (%)	
	TE - 2002	TE - 2006
Bihar	4.26	4.49
Orissa	7.79	7.25
Uttar Pradesh	2.84	2.99
West Bengal	2.42	3.03
Jharkhand	8.66	7.34
India	**3.64**	**3.5**

Source: CSO, Govt. of India, 2008

From Table 2.38 it is seen that the share of fuel wood in the total value of output from forestry is the highest (approximately 80%), followed by industrial wood and minor forest products (MFP) (approximately 9%) in TE-2002 and TE-2006. Further the share of fuel wood in the total value of output of forestry in the country is also showing an increase between TE–2002 and TE–2006, whereas the shares of the other products are showing a decline. The shares of fuel wood are highest in Bihar (99%), Uttar Pradesh (96%), West Bengal (93%), Orissa (88%) and Jharkhand (73%). The shares of fuel wood have increased in all eastern states except Jharkhand. The shares of industrial wood and MFP have declined in all the eastern states except Jharkhand where the share of MFP increased tremendously in both the periods.

Table 2.38: Share of Various Forest Products in the Total Value of forestry (%)

State/Uts	Industrial Woods		Fuel wood		Minor forest products	
	TE - 2002	TE - 2006	TE – 2002	TE - 2006	TE - 2002	TE - 2006
Bihar	2.34	0.38	97.18	99.46	0.48	0.16
Orissa	1.87	0.89	83.60	88.74	14.52	10.37
Uttar Pradesh	3.23	2.65	94.34	96.76	2.43	0.58
West Bengal	8.93	6.33	90.28	93.42	0.79	0.25
Jharkhand	9.55	9.79	80.06	73.18	10.39	17.04
India	**9.93**	**8.41**	**80.57**	**83.47**	**9.50**	**8.12**

Source: CSO, Govt. of India (2008)

Non-Farm Diversification

In the employment sector, the share of agricultural labour force to total labour force declined from 73 percent in 1965 to 56 percent in 2004-05. The data on non-farm sources of employment and income of rural households has been generated by NSSO. The Table 2.39 provides data on the percentage distribution of persons employed in non-

farm sector in rural India. It is seen that the share of employed persons in agriculture (usual principal status plus usual subsidiary status) in rural India declined from 86.5% in 1972-73 to 74.9% in 2004-05. At the same time non-agricultural employment increased from 13.6% to 25.3%. In fact the non-agricultural employment in rural areas increased from 20.1% to 21.9% during 1993-94 to 1999-00 and to 25.3% in 2004-05 (Table 2.39). Within non-agriculture, manufacturing, construction, trade and services have shown a rise in employment.

Table 2.39: Percentage Distribution of Persons Employed (Usual Principal Status + Usual Subsidiary Status), by Industry Section, Rural India

Industry Section	1972-73	1977-78	1983-84	1987-88	1993-94	1999 - 2000	2004-05
Agriculture	86.5	84.4	82.5	79.6	80.2	78.4	74.9
Mining & Quarrying	0.3	0.4	0.5	0.6	0.6	0.5	0.5
Manufacturing	5.2	6.2	6.7	7.2	7.0	7.5	8.2
Electricity, Gas, Water	0.1	0.1	0.1	0.2	0.2	0.1	0.1
Construction	1.4	1.2	1.5	3.2	2.1	2.8	4.2
Trade	2.3	3.0	3.2	3.6	3.8	4.4	5.4
Transport	0.5	0.7	0.9	1.1	1.2	1.7	2.0
Services	3.8	4.2	4.5	4.6	5.2	4.9	4.9

Source: NSS Various Rounds (27, 32, 38, 43, 50, 55, 61), GOI

The share of employed persons in agriculture (usual principal status plus usual subsidiary status) in Bihar declined from 84.3% in 1993-94 to 77.9% in 2004-05. At the same time non-agricultural employment increased from 15.7% to 22.1%. In Orissa it declined from 80.9% to 69% and non-agricultural employment increased from 19.1% to 31%. In Uttar Pradesh it declined from 80% to 72.8% and non-agricultural employment increased from 20% to 27.2%. In West Bengal it declined marginally from 63.3% in 1993-94 to 62.7% in 2004-05. At the same time non-agricultural employment increased marginally from 36.7% to 37.3% (Table 2.40).

Table 2.40: Percentage Distribution of Persons Employed (Usual Principal Status + Usual Subsidiary Status), by Industry Section in the Eastern States

	Agriculture	Mining & Quarrying	Manufacturing	Electricity, Gas, Water	Construction	Trade	Transport	Services
Bihar including Jharkhand								
1993-94	84.3	0.5	3.4	0.3	1.3	4.5	1	4.7
1999-2000	80.6	0.5	6.1	0.1	2.2	4.5	1.4	4.6
2004-05	77.9	0.1	5.7	0.1	2.5	7.5	2.2	4
Orissa								
1993-94	80.9	1.1	6.4	0.1	1.8	4.4	0.7	4.6
1999-2000	78.2	0.4	8.2	0.1	3.2	4.6	1.1	4.2
2004-05	69	0.8	11.1	0.1	5.5	6.7	2	4.8
Uttar Pradesh								
1993-94	80	0.2	6.4	0.1	2	4.3	1.5	5.5
1999-2000	76.2	0.1	7.8	0.1	3.3	5.4	2.1	5
2004-05	72.8	0.2	8.9	0.1	5.3	6.2	2.1	4.4
West Bengal								
1993-94	63.3	0.2	16.1	0.1	2.4	7.5	2.7	7.7
1999-2000	63.6	0.3	16.6	0.1	2.2	8.5	3.3	5.4
2004-05	62.7	0.2	13.5	0.1	3.9	9.5	3.6	6.5

Source: NSS Rounds 50, 55, 61, GOI

Table 2.41 provides the data on distribution of persons (per 1000) by household type in rural areas. It can be observed that in 2007-08, out of all the states, West Bengal had the higher percentage of self employed rural people in non-agricultural activities (22.8%). Also, the proportion of people employed as wage earners (11.13%) in non-farm sector is found to be smaller than the self employed in that sector (15.2%).

Table 2.41: Percentage Distribution of persons by household type in Rural Areas (2007-08)

Household Type						
States	**Self Employed in**			**Agricultural Labour Households**	**Other Labour Households**	**Others**
	Agriculture	**Non-agriculture.**	**All**			
Bihar	35.3	17.2	52.5	34.7	4.0	8.6
Jharkhand	48.1	17.2	65.3	8.2	17.0	9.5
Orissa	35.3	17.3	52.5	28.8	9.0	9.7
Uttar Pradesh	51.0	15.9	66.8	15.3	9.2	8.7
West Bengal	21.8	22.8	44.5	35.1	11.6	8.7
India	**39.0**	**15.2**	**54.2**	**25.1**	**11.3**	**9.4**

Source: NSS Report No. 531: Employment and Unemployment Situation in India: July, 2007-June, 2008

It can be observed that in 2007-08; out of all the states, West Bengal had the highest percentage of self employed rural people in non-agricultural activities, the

percentage being 22.8% followed by Orissa (17.3%). Bihar and Jharkhand had the same percentage of self employed person in non-agriculture, which was 17.2% followed by Uttar Pradesh with 15.9%. The percentage of persons self employed in agriculture were found to be highest in Uttar Pradesh (51%) followed by Jharkhand (48.1%). Bihar and Orissa had the same distribution of persons self employed in agriculture at 35.3% and West Bengal had the lowest percentage of self employed rural people in agriculture accounting to about 21.8%. Also for all the states except Jharkhand, the percentage of agricultural labour households was higher than that of other labour households (i.e. non-agricultural).

It can be observed from Table 2.42 that in 2002-03, amongst the various sources of household income, the average income from crop cultivation was the highest (Rs. 969) followed by wage earnings other than casual labour (Rs. 434), casual wage labour (Rs. 385) and dairy farming (Rs. 131). The other sources, namely, fish farming and animal farming did not generate any income but resulted in losses (income being negative). Out of the 5 states taken into consideration, the average income generated from animal farming was found positive only in case of West Bengal and Orissa, the average income being Rs.15 and Rs.3 per month respectively.

Table 2.42: Monthly Average Household Income in 2002-03 (Rs.)

States	Crop Cultivation	Fish Farming	Dairy Farming	Animal Farming Other than Dairy and fisheries	Casual Wage Labour	Wage Earnings other than Casual Wage Labour	Non-Farm Business	All Sources
Uttar Pradesh	836	0	122	-69	212	347	185	1633
Bihar	846	0	312	-47	311	186	202	1810
West Bengal	737	-14	76	15	389	498	378	2079
Jharkhand	852	0	97	-11	521	403	207	2069
Orissa	336	0	13	3	312	261	137	1062
India	**969**	**-2**	**131**	**-38**	**385**	**434**	**236**	**2115**

Source: NSS 59th Round, Situation Assessment Survey of Farmers

From the above table, it can also be seen that the average income earned by households (both farm and non-farm) from all the sources at the all India level was

around Rs. 2115 (per month) in 2002-03. Out of the 5 states, the average income earned by households was highest in West Bengal (Rs. 2079) followed by Jharkhand (Rs. 2069). Bihar occupied the third position with average income being Rs 1810 followed by Uttar Pradesh, where it was Rs 1633. The average income was found to be lowest in Orissa (Rs. 1062).

The following two tables (Table 2.43 and 2.44) give the data on average income earned and average expenditure incurred in 2002-03 by farming households on a monthly basis. For farming households having less than 4 hectares of land average income earned was less than their average expenditure. Hence their income was not enough to meet the expenditure on consumption.

Table-2.43: Average Monthly Iincome from Wages, Farm Business and Non-farm Business per Farmer Household by Size Class of Land Possessed during the Agricultural Year 2002-03

States	Average Monthly Income from Wages, Farm Business and Non-farm Business (Rs.)							
	Size Class of Land Possessed (hec.)							
	<0.01	0.01 - 0.4	0.41 - 1.00	1.01-2.00	2.01-4.00	4.01-10.00	>10.00	All Sizes
Bihar	1720	1281	1678	2667	4460	9526	27766	1810
Jharkhand	1427	1901	1840	2713	4901	7990	23433	2069
Orissa	666	875	1035	1425	2456	3724	11451	1062
Uttar Pradesh	1150	1148	1278	2428	3978	7974	7850	1633
West Bengal	1434	1669	2383	3643	5993	3864		2079
India	**1380**	**1633**	**1809**	**2493**	**3589**	**5681**	**9667**	**2115**

Source: NSSO, 59th Round, Farm, Situation Survey.

Table 2.44: Average Monthly Consumption Expenditure per Farmer Household by Size Class of Land Possessed during the Agricultural Year 2002-03

States	Average Monthly Consumption Expenditure (Rs.)							
	Size Class of Land Possessed (hec.)							
	<0.01	0.01 - 0.4	0.41 - 1.00	1.01-2.00	2.01-4.00	4.01-10.00	>10.00	All Sizes
Bihar	1792	2073	2650	3246	3599	5678	8174	2459
Jharkhand	1837	1786	1924	2149	2674	2773	3251	1897
Orissa	1357	1443	1814	2034	2688	2771	5314	1697
Uttar Pradesh	2235	2354	2831	3728	4948	6732	6776	2899
West Bengal	2308	2320	2974	3877	4754	5234		2668
India	2297	2390	2672	3148	3685	4626	6418	2770

Source: NSSO, 59th Round, Farm, Situation Survey.

From the following Table 2.45 it is seen that the wages paid to the casual labourers and the regular wage earners within the rural areas also differed significantly. For casual

labourers, the wages paid (per day) in 2007-08 turned out to be highest in Uttar Pradesh (Rs. 71.45) followed by West Bengal at Rs. 67.35, Jharkhand (Rs. 66.01) and Bihar at Rs. 58.76. The casual labourers earned the lowest wage in Orissa (Rs. 51.79) whereas for regular labourers, Orissa paid the highest wage rate (per day) of Rs. 178.93. The regular labourers in Jharkhand were paid the second highest wage rate of Rs. 141.61 followed by West Bengal (Rs 132.56) and Uttar Pradesh (Rs 132. 30). Bihar paid the lowest rate of Rs. 128.32. Also, the average wage (per day) earned by casual labourers in Bihar, Orissa, Jharkhand and West Bengal was lower than the all-India average wage paid. This indicates that despite the fact that people got engaged in the non-farm sector, it did not help them to earn enough income to get out of the poverty trap.

Table 2.45: Average Daily wage / Earnings of Casual Labourers and Regular Wage earners in Rural India (as of 2007-08)

States	Average Daily Earnings (Rs/Day)	
	Casual Labourers	Regular Labourers
Bihar	58.76	128.32
Jharkhand	66.01	141.61
Orissa	51.79	178.93
Uttar Pradesh	71.45	132.30
West Bengal	67.35	132.56
India	**68.30**	**142.74**

Source: NSSO, 64th Round, 2007-08, GOI

To understand non-farm diversification a set of regression exercises were done with the dependent variable being rural non-farm workers and the independent variables being urban population, rural literacy and wage rates (Appendix II.1)

From the regression analysis in the state of Bihar it was observed that the rural non-farm workers showed a positive relation with urban population and rural literacy rate whereas with respect to agricultural wage rates, the relation was negative. The relationship between rural non-farm workers and rural literacy rate was statistically significant (even at 1% level of significance) which implies that rural literacy rate had a high effect on the rural non farm workers. However, with every unit increase in urban population and rural literacy rate, rural non-farm workers increase by 0.09 units and with a unit increase in agricultural wages, the rural non-farm workers decline by 0.20 units.

The relation with respect to urban population and agricultural wages holds true because as there is increase in urban population it means increase in work opportunities which in turn can lead to increase in rural non-farm workers. And also with increase in agricultural wages, people would like to move to agricultural sector leading to decline in rural non-farm workforce.

For Jharkhand, the relationship with respect to urban population and wage rates was same as that of Bihar, whereas with respect to rural literacy rate the relationship was negative. In this case, the relation between rural non farm workers and urban population was statistically significant (at 1% level of significance) implying that urban population had a high effect on rural non-farm workforce. A unit increase in rural literacy rate and agricultural wages, rural non-farm workers decline by 0.60 and 0.41 units respectively.

In case of Orissa and Uttar Pradesh, the scenario is very much similar; the difference lies in that fact that in Uttar Pradesh, urban population was statistically significant, hence urban population had a high effect on rural non farm workforce over there, whereas a unit increase in urban population increased the rural non-farm workforce by 0.25 and0.35 units in Orissa. However, increase in rural literacy rate and agricultural wage rates lead to an increase in rural non-farm workforce by 0.70 and 0.08 units in Orissa and 0.59 and 0.26 units in Uttar Pradesh.

One reason as to why agricultural wage rates explain contradictory result can be attributed to the exclusion of some of the important variables (like urban wage rate or non farm wage rate) which could have an impact on the rural non-farm workers.

The relationship in West Bengal is similar to that of Bihar. A unit increase in urban population and rural literacy rate leads to an increase in rural non-farm workforce by 0.41 and 0.25 units respectively. While a unit increase in agricultural wage rates results in a decline in rural non-farm workforce by 0.18 units.

Agro-Based Industries

The industries that add value to agricultural raw materials, both food and non food (by processing and preserving them for consumption); and at the same time enhance the income of the producers are called agro based industries. These industries can be characterized into food-processing industry, livestock industry, fisheries industry and forestry industry. Amongst these industries; it is the food processing industry which

provides greater share (in terms of the Gross Value Added (GVA), employment and number of production units) under organized sector whereas it is the non food industry which accounts for greater share in case of unorganized sector.

Despite the relative importance of food processing in organized sector, the industry provided high annual growth rates of output (7.9%), employment (1.3%) and number of production units (1.5%) in unorganized sector than in the organized sector where the shares were 6.55%, 0.5% and 1.2% respectively. Also, the growth rate of fixed capital was high in organized (7.7%) than in unorganized (6.2%) (Rao, Birthal, Joshi & Kar, 2007).

Out of the five states studied in this project; Uttar Pradesh had the highest percentage share (13.40%) in the gross value added of food processing industry in the organized sector for all the states in India, followed by West Bengal with 2.07%. Bihar stood third with a share of 1.22% followed by Orissa at 0.8%. Jharkhand performed poorly with share of 0.28% (Rao, 2009).

Taking employment in organized sector into consideration, Uttar Pradesh again performed best where the percent share in total employment was 11.46% followed by West Bengal with 4.43%. Share of Orissa in case of employment is better (1.57%) than that of Bihar (0.88%). Jharkhand again came last with percentage share of 0.15% (Rao, 2009).

However, with respect to labour productivity (which is GVA/Employment); Jharkhand stood first with productivity of 1.87 followed by Bihar with productivity of 1.38. Uttar Pradesh stood third with productivity of 1.17 followed by Orissa with 1.10. West Bengal performed really badly with respect to labour productivity. This implies that in this industry labour is most efficient in Jharkhand and least efficient in West Bengal.

Table 2.46 provided below shows the annual growth rates of total output in the organized food processing sector. It can be observed that within the organized food processing sector, the annual growth rate for the manufacture of food products and beverages has slightly declined from 6.75% during the period 1981-93 to 6.35% during 1993-2004; whereas for the dairy products, annual growth rate increased from 4.71% to 7.87% respectively. The annual growth rate for meat, fish, fruits, vegetables and oil,

declined by more than 50%, from 3.36 to 1.51; this clearly shows diversification away from the food products towards the dairy products.

Table 2.46: Annual Growth Rates of Total Output in the Organized food Processing Sector

food Processing Sub-Sector	Annual Growth Rate (%)	
	1981-82 to 1992-93	1993-94 to 2003-04
Manufacture of food Products & Beverages	6.75	6.35
Meat, Fish, fruits, vegetables and Oil	3.36	1.51
Dairy Products	4.71	7.87
Grain Mill Products	9.55	6.19
Other food Products	7.45	7.58
Beverages	10.1	8.72

Source: C.N.Rao, CESS, Hyderabad, 2009.

It can also be seen that that the elasticity of employment with respect to the Net Value Added (NVA) (Table 2.47) has declined for all the items except for other food products, beverages and manufacture of food products and beverages. This implies that for these products, there is increase in employment with a unit increase in NVA. The elasticity has increased from -0.20 (in 1983-94) to 0.05 (1993-2004) for other food products; 0.21 (in 1983-94) to 0.51 (1993-2004) for beverages, and -0.03 (in 1983-94) to 0.13 (1993-2004) for manufacture of food products and beverages.

Table 2.47: Elasticities of Employment with respect to Net Value Added in the food Processing Sub-Sector

Sub-Sector	Elasticities of Employment	
	1983-84 to 1993-94	1993-94 to 2003-04
Meat, Fish, Fruits, Vegetables, Oil	0.11	-0.09
Dairy products	0.48	0.10
Grain Mill Products	0.41	0.19
Other food Products	-0.20	0.05
Manufacture of Macaroni, Noodles etc	0.01	-4.81
Beverages	0.21	0.51
Manufacture of food Products and Beverages	-0.03	0.13
All Industries	0.09	-0.21

Source: C.N.Rao, CESS, Hyderabad, 2009.

Diversification of Exports

The following Table 2.48 showing share of agricultural vis-à-vis non-agricultural exports in the total exports from India shows a declining trend since 1970-71 with an

exception of 1980-81. Only the already high shares of non-agricultural exports are seen to be rising.

Table 2.48: Share of Agricultural Vis-à-vis Non-agricultural Exports in India (%)

Years	Agricultural Exports	Non-Agricultural Exports
1970-71	15.98	84.02
1980-81	30.65	69.35
1990-91	19.41	80.59
2000-01	14.04	85.96
2008-09	9.13	90.87

Source: Economic Survey (Various Issues)

Further, the growth rate of agricultural exports between 1980-81 and 2008-09 has been 7.72% and amongst principal agricultural commodities exported the growth rates have been highest for sugar & molasses (11.47%) followed by meat & meat preparations (10.30%), rice (9.96%), oil cakes (9.14%), fruits (8.86%) and spices (8.60%). However, the agricultural export basket in recent years is dominated by fish & fish preparations, rice, oil cakes, raw cotton, spices, sugar & molasses and meat & meat preparations (Table 2.49).

Table 2.49: Share of Commodity Exports in Agriculture (%)

Agriculture & Allied Products	TE-1982	TE-1985	TE-1988	TE-1991	TE-1994	TE-1997	TE-2000	TE-2003	TE-2006	2007 & 2008
Rice	12.70	6.52	8.82	9.18	10.29	17.95	18.34	16.35	16.58	17.50
Coffee	8.94	8.53	8.74	5.41	6.02	7.47	6.42	3.94	3.82	3.13
Tea & Mate	19.42	24.79	18.30	18.33	9.22	6.55	8.87	6.21	4.58	3.57
Oil Cakes	6.32	5.57	8.16	12.10	17.32	14.91	8.26	9.28	11.19	13.93
Tobacco	9.94	6.90	4.60	4.56	3.65	3.63	3.88	3.63	3.52	4.04
Cashew Kernels	7.41	7.21	9.46	8.34	9.30	6.35	8.77	6.69	6.27	3.90
Spices	3.16	7.71	9.16	5.18	4.81	5.46	7.35	5.82	5.90	8.02
Sugar & Mollasses	2.72	3.16	0.23	1.17	1.83	2.99	0.81	5.97	3.29	7.83
Raw cotton	5.14	3.86	3.56	7.44	2.98	4.15	0.75	1.30	7.77	9.25
Fish & Fish Preparations	13.81	15.08	17.38	17.17	23.91	19.12	23.19	23.44	17.76	10.66
Meat & Meat Preparations	3.46	3.00	2.63	2.69	2.77	3.45	4.48	5.32	6.58	6.87
fruits	5.39	4.78	4.63	4.31	4.46	4.34	5.52	6.97	8.85	7.32
Miscellaneous	1.59	2.89	4.33	4.11	3.44	3.65	3.36	5.11	3.88	4.00

Source: Economic Survey (Various Issues)

All these above mentioned statistics do indicate that there is a positive trend towards both horizontal as well as vertical diversification of the rural economy of eastern India.

Appendix A.II.1

Factors Affecting Rural Non-Farm Workers

Bihar				
Multiple R	0.521			
R Square	0.271			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.134	0.159	0.844	0.405
Urban Population (%)	0.099	0.153	0.645	0.523
Rural Literacy Rate (%)	0.614	0.195	3.149	0.003
Agricultural Wage Rates (per person per day)	-0.199	0.180	-1.107	0.276

Jharkhand				
Multiple R	0.690			
R Square	0.476			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.946	0.323	2.931	0.011
Urban Population (%)	0.630	0.183	3.445	0.004
Rural Literacy Rate (%)	-0.599	0.402	-1.490	0.159
Agricultural Wage Rates (per person per day)	-0.409	0.270	-1.516	0.152

Orissa				
Multiple R	0.830			
R Square	0.688			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.050	0.103	-0.486	0.631
Urban Population (%)	0.251	0.097	2.604	0.015
Rural Literacy Rate (%)	0.698	0.111	6.266	0.000
Agricultural Wage Rates (per person per day)	0.080	0.152	0.526	0.603

Uttar Pradesh				
Multiple R	0.672			
R Square	0.451			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.323	0.137	-2.350	0.022
Urban Population (%)	0.352	0.090	3.894	0.000
Rural Literacy Rate (%)	0.589	0.140	4.204	0.000
Agricultural Wage Rates (per person per day)	0.256	0.119	2.160	0.034

West Bengal				
Multiple R	0.728			
R Square	0.530			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.310	0.276	1.123	0.282
Urban Population (%)	0.406	0.135	2.996	0.010
Rural Literacy Rate (%)	0.246	0.357	0.688	0.504
Agricultural Wage Rates (per person per day)	-0.175	0.175	-1.000	0.336

Source: Based on data from Census of India 2001 and Labour Economics, Ministry of Labour, GOI

CHAPTER III

PRODUCTION STRUCTURE, PROFITABILITY, INCOME AND VIABILITY OF SMALL AND MARGINAL FARMS (RESULTS OF FARM LEVEL SURVEY)

A survey of cultivating households was conducted in the states of Uttar Pradesh, Bihar, West Bengal, Jharkhand and Orissa to study their economics of production and resource use efficiency. In this chapter some aspects of the production structure of the selected farming households shall be discussed.

Share of Farming Households Cultivating Different Crops

The following Table 3.1 shows the shares of sample farming households cultivating different crops as a proportion of the total number of households in each farm size category in the different states of eastern India. It was observed that farmers in the study regions mainly cultivated cereals (paddy, maize, wheat, bajra, ragi and jowar), pulses (khesari or grass pea, arhar, masoor, moong, gram, pea and urad), oilseeds (mustard, sesame, linseed), vegetables, jute and sugarcane. The cultivation of fruits and flowers was rarely observed.

It was seen that cereals were cultivated by all sample farming households (100%) across all farm size categories in all the states. In Bihar most sample farming households cultivated cereals followed by pulses, oilseeds, vegetables and jute. The developed district of Rohtas followed a similar pattern, even across farm size categories but in the underdeveloped district of Kishanganj, cultivation of cereals was followed by that of oilseeds, jute, pulses and vegetables. 13% of the sample farming households in the Kishanganj district of Bihar cultivated jute. The district of Kishanganj in Bihar is bordering West Bengal and hence jute cultivation was found among some sample farming households here. Across farm sizes it is seen that the proportion of pulses, oilseeds and vegetables cultivated by small and marginal farmers is lesser when compared with those cultivated by medium and large farmers.

In Jharkhand most sample farming households cultivated cereals followed by pulses, sugarcane, vegetables and oilseeds. Both the developed and underdeveloped districts of Sahebgunj and Lohardaga respectively, followed a similar pattern, except that

in Lohardaga, none of the households cultivated sugarcane. This pattern was similar across farm size categories. Sugarcane was cultivated by 27% of the sample farming households in the relatively developed district of Sahebganj. Across farm sizes it is seen that the proportion of each crop cultivated by marginal farmers is very less when compared to other farm categories. It is 12.15% for pulses, 0.93% for oilseeds and 5.61% for sugarcane ad vegetables. However, in Jharkhand the proportion of medium farmers cultivating each crop was the highest. The proportion of large farmers cultivating each crop was slightly lower than medium farmers. Infact their proportions were nearly similar to those of small farmers.

In Orissa most sample farming households cultivated cereals followed by vegetables, oilseeds, pulses and jute. The developed district of Bhadrak followed a similar pattern, even across farm size categories but in the underdeveloped district of Kandhamal, cultivation of cereals was followed by that of vegetables, pulses, oilseeds and jute. Across farm sizes it is seen that the proportion of pulses, oilseeds jute and vegetables cultivated by small and marginal farmers is lesser than those cultivated by medium and large farmers.

In Uttar Pradesh most sample farming households cultivated cereals followed by vegetables, oilseeds, sugarcane and pulses. The developed district of Varanasi followed a similar pattern, even across farm size categories but in the underdeveloped district of Mirzapur, cultivation of cereals was followed by oilseeds and pulses only. This pattern here too was similar across farming categories. Across farm sizes it is seen that the proportion of pulses, oilseeds and sugarcane cultivated by small and marginal farmers is lesser as compared to those cultivated by medium and large farmers In case of vegetables it is seen that a very small proportion of large farmers are cultivating it (14%).

In West Bengal most sample farming households cultivated cereals followed by oilseeds, vegetables and jute. The developed district of Burdwan followed a similar pattern, even across farm size categories but in the underdeveloped district of Jalpaiguri cultivation of cereals was followed by oilseeds, jute and vegetables. This pattern here too was similar across farming categories. Across farm sizes it is seen that the proportion of oilseeds, jute and vegetables cultivated by small and marginal farmers is much lesser compared with those cultivated by medium and large farmers.

Thus, it is to be noted that a small proportion of small and marginal farming households in all the study regions cultivated high value crops other than Food grains (oilseeds, vegetables and plantation crops). While a high proportion of medium and large farming households cultivated these high value crops.

Table 3.1: Share of Farming Households Cultivating Different Crops (%)

States	Districts	Farm Size Categories	Cereals	Pulses	Oilseeds	Vegetables	Jute	Sugarcane
Bihar	Kishanganj	Marginal	100.00	3.70	24.07	0.00	9.26	0.00
		Small	100.00	5.88	41.18	2.94	11.76	0.00
		Medium	100.00	0.00	66.67	16.67	33.33	0.00
		Large	-	-	-	-	-	-
		Total	**100.00**	**4.00**	**35.00**	**3.00**	**13.00**	**0.00**
	Rohtas	Marginal	100.00	64.44	20.00	15.56	0.00	0.00
		Small	100.00	87.50	28.13	21.88	0.00	0.00
		Medium	100.00	84.21	57.89	31.58	0.00	0.00
		Large	100.00	100.00	75.00	50.00	0.00	0.00
		Total	**100.00**	**77.00**	**32.00**	**22.00**	**0.00**	**0.00**
Bihar Total		Marginal	100.00	31.31	22.22	7.07	5.05	0.00
		Small	100.00	45.45	34.85	12.12	6.06	0.00
		Medium	100.00	51.61	61.29	25.81	12.90	0.00
		Large	100.00	100.00	75.00	50.00	0.00	0.00
		Total	**100.00**	**40.50**	**33.50**	**12.50**	**6.50**	**0.00**
Jharkhand	Lohardaga	Marginal	100.00	8.57	1.43	8.57	0.00	0.00
		Small	100.00	36.36	4.55	9.09	0.00	0.00
		Medium	100.00	71.43	0.00	42.86	0.00	0.00
		Large	100.00	0.00	0.00	0.00	0.00	0.00
		Total	**100.00**	**19.00**	**2.00**	**11.00**	**0.00**	**0.00**
	Sahebganj	Marginal	100.00	18.92	0.00	0.00	0.00	16.22
		Small	100.00	25.93	0.00	0.00	0.00	37.04
		Medium	100.00	46.15	0.00	3.85	0.00	34.62
		Large	100.00	30.00	10.00	10.00	0.00	20.00
		Total	**100.00**	**29.00**	**1.00**	**2.00**	**0.00**	**27.00**
Jharkhand Total		Marginal	100.00	12.15	0.93	5.61	0.00	5.61
		Small	100.00	30.61	2.04	4.08	0.00	20.41
		Medium	100.00	51.52	0.00	12.12	0.00	27.27
		Large	100.00	27.27	9.09	9.09	0.00	18.18
		Total	**100.00**	**24.00**	**1.50**	**6.50**	**0.00**	**13.50**
Orissa	Bhadrak	Marginal	100.00	8.51	8.51	46.81	10.64	0.00
		Small	100.00	10.34	13.79	34.48	13.79	0.00
		Medium	100.00	36.36	45.45	22.73	4.55	0.00
		Large	100.00	50.00	50.00	0.00	0.00	0.00
		Total	**100.00**	**16.00**	**19.00**	**37.00**	**10.00**	**0.00**
	Kandhamal	Marginal	100.00	3.70	1.85	12.96	0.00	0.00
		Small	100.00	0.00	0.00	19.05	0.00	0.00
		Medium	100.00	4.00	0.00	88.00	4.00	0.00
		Large	-	-	-	-	-	-
		Total	**100.00**	**3.00**	**1.00**	**33.00**	**1.00**	**0.00**
Orissa Total		Marginal	100.00	5.94	4.95	28.71	4.95	0.00
		Small	100.00	6.00	8.00	28.00	8.00	0.00
		Medium	100.00	19.15	21.28	57.45	4.26	0.00
		Large	100.00	50.00	50.00	0.00	0.00	0.00
		Total	**100.00**	**9.50**	**10.00**	**35.00**	**5.50**	**0.00**

Uttar Pradesh	**Mirzapur**	Marginal	100.00	0.00	9.09	0.00	0.00	0.00
		Small	100.00	2.04	6.12	0.00	0.00	0.00
		Medium	100.00	0.00	58.33	0.00	0.00	0.00
		Large	100.00	0.00	16.67	0.00	0.00	0.00
		Total	**100.00**	**1.00**	**14.00**	**0.00**	**0.00**	**0.00**
	Varanasi	Marginal	100.00	4.55	27.27	50.00	0.00	9.09
		Small	100.00	10.81	43.24	54.05	0.00	27.03
		Medium	100.00	0.00	66.67	83.33	0.00	61.11
		Large	100.00	100.00	100.00	100.00	0.00	100.00
		Total	**100.00**	**7.00**	**41.00**	**58.00**	**0.00**	**26.00**
Uttar Pradesh Total		Marginal	100.00	2.60	19.48	28.57	0.00	5.19
		Small	100.00	5.81	22.09	23.26	0.00	11.63
		Medium	100.00	0.00	63.33	50.00	0.00	36.67
		Large	100.00	14.29	28.57	14.29	0.00	14.29
		Total	**100.00**	**4.00**	**27.50**	**29.00**	**0.00**	**13.00**
West Bengal	**Burdwan**	Marginal	100.00	0.00	20.00	10.00	0.00	0.00
		Small	100.00	0.00	40.00	26.67	0.00	0.00
		Medium	100.00	0.00	52.00	36.00	0.00	0.00
		Large	100.00	0.00	60.00	80.00	0.00	0.00
		Total	**100.00**	**0.00**	**36.00**	**25.00**	**0.00**	**0.00**
	Jalpaiguri	Marginal	100.00	0.00	10.00	5.00	5.00	0.00
		Small	100.00	0.00	26.67	6.67	20.00	0.00
		Medium	100.00	0.00	26.67	20.00	33.33	0.00
		Large	-	-	-	-	-	-
		Total	**100.00**	**0.00**	**20.00**	**10.00**	**18.00**	**0.00**
West Bengal Total		Marginal	100.00	0.00	15.00	7.50	2.50	0.00
		Small	100.00	0.00	33.33	16.67	10.00	0.00
		Medium	100.00	0.00	38.18	27.27	18.18	0.00
		Large	100.00	0.00	60.00	80.00	0.00	0.00
		Total	**100.00**	**0.00**	**28.00**	**17.50**	**9.00**	**0.00**

Source: Primary Field Survey

Note: The shares do not match up to 100% because each farming households cultivates several types of crops, hence creating an overlap.

Cropping Pattern

Cropping pattern for each farm size category in all sample villages of the selected districts in the four states is presented in Table 3.2. In the sample villages of Uttar Pradesh, highest proportion of area was devoted to paddy (37.42%) followed closely by Wheat (35.24%). Both the selected districts in Uttar Pradesh followed similar cropping patterns except that cultivation of vegetables was seen only in Varanasi district. In the selected districts of West Bengal, paddy occupied the largest proportion of GCA (83.42%) followed by mustard (8.60%), jute (2.65%) and vegetables (2.31%). Jalpaiguri followed the same pattern but in Burdwan, cultivation of jute was not reported. In the selected districts of Bihar, paddy (36.84%) followed by wheat (19.88%) and khesari (grass pea) (12.44%) occupied the largest proportion of area. Here the developed Rohtas districts followed a similar cropping pattern, while in the underdeveloped district of Kishanganj, paddy and wheat was followed by mustard (9.64%). In the selected districts of Jharkhand, paddy occupied the largest proportion of area (39.85%), followed by maize (17.11%), wheat (13.64%). Both the districts showed a similar cropping pattern. In the selected districts of Orissa, paddy occupied the largest proportion of area (64.09%), followed by mustard (16.78%). The developed district of Bhadrak showed a similar trend, while in the under developed district of Kandhamal, highest proportion of area was under paddy (74.60%) followed by vegetables (7.60%) and maize (7.52%).

Table 3.2: Cropping Pattern - Percentage Share of each Crop in Gross Cropped Area

Uttar Pradesh

Districts	Farm Size Categories	Paddy	Bajra	Jowar	Maize	Wheat	Pea	Mustard	Sugarcane	Vegetables
Varanasi (Developed)	**Marginal**	31.77	14.24			36.43	5.84	2.94	6.65	2.14
	Small	26.32	13.28		11.44	17.16	8.15	2.89	18.02	2.74
	Medium	27.29	14.69		7.74	20.52		3.98	19.94	5.85
	Large	24.07	17.43			27.66	3.32	3.46	21.44	2.63
	Total	**26.15**	**15.50**		**4.59**	**24.21**	**3.53**	**3.45**	**19.00**	**3.56**
Mirzapur (Under developed)	**Marginal**	43.65				42.19		14.16		
	Small	36.42		11.04		35.99	11.04	5.52		
	Medium	48.83				43.74		7.43		
	Large	49.57				47.93		2.51		
	Total	**46.65**		**1.88**		**44.28**	**1.88**	**5.31**		**0.00**
Grand Total		**37.42**	**6.98**	**1.03**	**2.07**	**35.24**	**2.62**	**4.47**	**8.56**	**1.60**

Source: Primary Field Survey

West Bengal

Districts	Farm Size Categories	Paddy	Maize	Wheat	Mustard	Sesame	Jute	Vegetables
Burdwan (Developed)	**Marginal**	74.38	0.00	0.00	24.66	0.00	0.00	0.96
	Small	73.63	0.00	0.00	8.02	16.18	0.00	2.16
	Medium	86.00	0.00	2.33	9.76	0.00	0.00	1.91
	Large	91.26	0.00	0.00	5.48	0.00	0.00	3.27
	Total	**86.57**	**0.00**	**0.52**	**7.86**	**2.38**	**0.00**	**2.68**
Jalpaiguri (Under developed)	**Marginal**	65.05	0.00	0.00	10.63	0.00	24.15	0.18
	Small	71.49	5.60	0.00	13.00	0.00	8.94	0.97
	Medium	68.91	4.05	0.00	12.18	0.00	14.31	0.55
	Total	**81.22**	**1.07**	**0.36**	**9.12**	**1.67**	**4.51**	**2.05**
Grand Total		**83.42**	**0.63**	**0.43**	**8.60**	**1.96**	**2.65**	**2.31**

Source: Primary Field Survey

Bihar

Districts	Farm Size Categories	Paddy	Maize	Wheat	Khesari	Masoor	Gram	Pea	Mustard	Sesame	Linseed	Jute	Vegetables
Rohtas (Developed)	**Marginal**	29.76	0.00	22.49	4.76	9.97	2.33	11.11	10.72	0.00	7.91	0.00	0.95
	Small	35.88	0.00	19.80	9.86	9.59	2.08	7.99	7.96	0.00	5.49	0.00	1.36
	Medium	38.77	0.00	16.84	12.02	10.50	2.95	5.32	4.86	0.00	6.57	0.00	2.18
	Large	41.36	0.00	21.25	20.84	6.19	0.95	3.62	0.00	0.00	4.35	0.00	1.43
	Total	**38.91**	**0.00**	**20.07**	**15.66**	**8.07**	**1.72**	**5.34**	**3.31**	**0.00**	**5.36**	**0.00**	**1.56**
Kishanganj (Under developed)	**Marginal**	23.84	16.50	18.24	11.00	0.00	0.00	0.00	11.63	0.00	14.21	4.58	
	Small	28.98	13.76	16.52	12.44	0.00	0.00	0.00	7.82	0.00	14.42	5.86	0.21
	Medium	39.56	0.00	22.09	0.00	0.00	0.00	0.00	10.01	20.28	0.00	6.02	2.03
	Total	**32.90**	**7.85**	**19.50**	**6.29**	**0.00**	**0.00**	**0.00**	**9.64**	**9.55**	**7.59**	**5.67**	**1.02**
Grand Total		**36.84**	**2.70**	**19.88**	**12.44**	**5.30**	**1.13**	**3.50**	**5.49**	**3.28**	**6.12**	**1.95**	**1.37**

Source: Primary Field Survey

Jharkhand

Districts	Farm Size Categories	Paddy	Bajra	Maize	Wheat	Arhar	Masoor	Gram	Pea	Urad	Ragi	Mustard	Sugarcane	Vegetables
Sahebganj (Developed)	**Marginal**	34.01		19.98	24.67		17.98	1.40					1.96	
	Small	28.53	13.70	31.42	17.90		3.64	2.58					2.24	
	Medium	25.82		23.48	24.07		14.31	10.12					1.74	0.46
	Large	27.46		19.09	11.50		9.21	14.45				13.55	3.52	1.22
	Total	**27.12**	**2.19**	**21.87**	**16.42**		**10.05**	**10.26**				**6.71**	**2.68**	**2.68**
Lorhardaga (Under developed)	**Marginal**	22.03		13.84	12.45	4.67			7.73	13.33	19.51	5.80		0.68
	Small	36.55		8.08	10.64	11.05			9.67	9.61	8.20	5.62		0.64
	Medium	44.42		17.81	15.96	7.77			4.40	4.40				5.69
	Large	10												
	Total	**60.63**		**9.34**	**9.08**	**5.30**			**4.44**	**5.14**	**4.16**	**1.90**		**0.00**
Grand Total		**39.85**	**1.36**	**17.11**	**13.64**	**2.05**	**6.23**	**6.36**	**1.69**	**1.95**	**1.58**	**4.88**	**1.66**	**1.66**

Source: Primary Field Survey

Orissa

Districts	Farm Size Categories	Paddy	Maize	Ragi	Moong	Gram	Mustard	Linseed	Jute	Vegetables
Bhadrak (Developed)	**Marginal**	48.03		13.90	1.04		24.22		12.81	7.94
	Small	49.49		18.29			27.14		5.08	3.95
	Medium	55.80		7.52	4.10	1.25	18.13	9.96	3.24	2.69
	Large	74.18			3.66		22.16			
	Total	**61.43**		**7.11**	**2.84**	**0.38**	**22.11**	**3.01**	**3.12**	**2.36**
Kandhamal (Under developed)	**Marginal**	39.25	28.55		0.79	14.27	17.13			1.12
	Small	10								4.71
	Medium	95.69			0.72				3.59	12.73
	Total	**80.74**	**8.13**		**0.55**	**4.07**	**4.88**		**1.63**	**7.60**
Grand Total		**66.65**	**2.20**	**5.19**	**2.22**	**1.37**	**17.45**	**2.20**	**2.72**	**3.83**

Source: Primary Field Survey

The proportion of area under food grains to the gross cropped area is highest amongst all crops in all the five eastern states with the largest share in Jharkhand (91.82%), followed by Uttar Pradesh (85.36%), West Bengal (84.48%), Bihar (81.78%) and Orissa (74.66%). In Uttar Pradesh and West Bengal, cultivation of food grain crops included mainly cereals, while in the other states it included cultivation of some pulses too. Cultivation of pulses occupied 22.36% of GCA in Bihar followed by Jharkhand (19.86%) and Orissa (8.45%). Amongst oilseeds, the proportion of area was highest in Orissa (18.89%) followed by, Bihar (14.89%), West Bengal (10.56%), Jharkhand (4.88%) and Uttar Pradesh (4.47%). Vegetables occupied a higher proportion of GCA in Orissa (3.83%) followed by West Bengal (2.31%), Jharkhand (1.66%), Uttar Pradesh (1.60%) and Bihar (1.37%). Sugarcane was cultivated in two states with the highest proportion of area in Uttar Pradesh (8.56%) and very low proportion of area in Jharkhand (1.66%) Sample farming households in the relatively developed Sahebganj district of Jharkhand reported cultivation of a small proportion of area under sugarcane plantation. Jute was grown in three states with the highest proportion of area in West Bengal (2.65%) and Orissa (2.61%) followed by Bihar (1.95%). In Bihar, jute was cultivated by sample farming households in the Kishanganj district which borders West Bengal.

Table 3.3: Simpson's Index of Diversification

Farm Size Categories	**Bihar**		**Jharkhand**		**Orissa**		**Uttar Pradesh**		**West Bengal**	
	Districts	**SID**	**Districts**	**SID**	**Districts**	**SID**	**Districts**	**SID**	**Districts**	**SID**
Marginal	Rohtas (Developed)	0.20	Sahebganj (Developed)	0.02	Bhadrak (Developed)	0.42	Varanasi (Developed)	0.12	Burdwan (Developed)	0.26
Small		0.15		0.02		0.35		0.24		0.26
Medium		0.14		0.02		0.33		0.30		0.12
Large		0.06		0.18		0.22		0.28		0.09
Total		**0.10**		**0.12**		**0.30**		**0.26**		**0.13**
Marginal	Kishanganj (Under developed)	0.30	Lohardaga (Under developed)	0.06	Kandhamal (Under developed)	0.18	Mirzapur (Under developed)	0.14	Jalpaiguri (Under developed)	0.35
Small		0.28		0.06		0.05		0.06		0.23
Medium		0.38		0.05		0.16		0.07		0.27
Large		-		0.00		-		0.03		-
Total		**0.33**		**0.02**		**0.14**		**0.05**		**0.17**
Marginal	**Bihar**	0.26	**Jharkhand**	0.04	**Orissa**	0.29	**Uttar Pradesh**	0.13	**West Bengal**	0.31
Small		0.22		0.04		0.25		0.14		0.25
Medium		0.26		0.04		0.27		0.18		0.19
Large		0.06		0.13		0.22		0.13		0.09
Grand Total		**0.18**		**0.08**		**0.25**		**0.15**		**0.16**

Source: Derived from Table 3.2

The Simpson's Index of Diversification (SID) (Table 3.3) is the highest in Orissa (0.25) followed by Bihar (0.18), West Bengal (0.16), Uttar Pradesh (0.15), and Jharkhand (0.08). In the states of Orissa, Bihar, West Bengal and Jharkhand the crop diversification away from food grains is mainly towards oilseeds while in Uttar Pradesh it is mainly towards sugarcane. Some diversification towards cultivation of vegetables was observed mainly in the states of Orissa and West Bengal (Table 3.2). It is also seen from the above table that developed districts show greater crop diversification away from food grains towards non-food grain crops compared to under developed districts except for Kishanganj in Bihar and Jalpaiguri in West Bengal which showed diversification towards oilseeds and jute.

Across farm size classes it was also seen from the above index that in the state of Jharkhand where crop diversification away from food grains is the least, small and marginal farmers show lesser crop diversification compared to large farmers in the developed Sahebganj district. While in the relatively under developed Lohardaga district small and marginal farmers showed comparatively greater diversification away from food grains compared to medium and large farmers. In the state of Uttar Pradesh, small and marginal farmers show lesser crop diversification away from food grains compared to large and medium farmers in the developed Varanasi district. While in the relatively under developed district of Mirzapur, marginal farmers show greater crop diversification compared to small, medium and large farmers. In the state of West Bengal, small and marginal farmers show greater crop diversification away from food grains compared to medium and large farmers in the developed Burdwan district while in the relatively under developed Jalpaiguri district marginal farmers show the highest diversification followed by medium and small farmers. In the developed Rohtas district of Bihar, small and marginal farmers show greater crop diversification away from food grains compared to medium and large farmers, while in the relatively under developed district of Kishanganj, medium farmers showed a slightly greater diversification away from food grains compared to small and marginal farmers. In the state of Orissa, where crop diversification away from food grains is the highest, small and marginal farmers show greater crop diversification compared to large farmers in the developed Bhadrak district, while in the

relatively underdeveloped Khandamal district, marginal farmers showed highest crop diversification followed by medium farmers and then small farmers.

Hence overall it is seen that in the selected states where crop diversification away from food grains is the least namely Jharkhand, small and marginal farmers are diversifying less compared to the other categories. In Uttar Pradesh, diversification by medium farmers is the highest followed by small, marginal and large farmers. In Bihar marginal and medium farmers are diversifying the most followed closely by small farmers and diversification by large farmers is the least. In Orissa marginal farmers are diversifying the most followed closely by medium, small and large farmers. In West Bengal highest diversification is by small and marginal farmers. Hence, overall it is seen that small and marginal farmers are diversifying more within the crop sector.

From the Table 3.2 it is seen that in the state of Bihar, marginal, small and medium farmers are mainly diversifying away from food grains by allocating higher proportion of area or diversifying more towards oilseeds (mustard and linseed) followed by jute and then vegetables, while large farmers are diversifying towards oilseeds (sesame) and vegetables. The area devoted by marginal, small and medium farmers towards oilseeds cultivation is 22.7%, 18% and 21% respectively. Towards jute, their proportional area allocation is 2.59%, 3.02% and 3.07% respectively and for vegetables it is 0.41%, 0.76% and 2.10% respectively. The area devoted by large farmers towards oilseeds cultivation is 4.35% and for vegetables it is 1.43% respectively. In Orissa, small and marginal farmers are mainly diversifying towards oilseeds (mustard and linseed) followed closely by jute and vegetables, while large farmers are diversifying only towards oilseeds (mustard). The area devoted by marginal and small farmers towards oilseeds cultivation is 19.49% and 17.39% respectively. Towards jute, their proportional area allocation is 5.62% and 3.26% respectively and for vegetables it is 4.37% and 4.21% respectively. The area devoted by large farmers towards oilseeds cultivation is 22.16%. In West Bengal marginal, small and medium farmers are diversifying mainly towards oilseeds (mustard and sesame) and jute followed by vegetables while large farmers are diversifying only towards oilseeds (mustard) and vegetables. The area devoted by marginal, small and medium farmers towards oilseeds cultivation is 15.87%, 19.41% and 10.98% respectively. Towards jute, their proportional area allocation is 15.12%, 3.82%

and & 7.22% respectively and for vegetables it is 0.47%, 1.65% and 1.23% respectively. The area devoted by large farmers towards oilseeds cultivation is 5.48% and for vegetables it is 3.27% respectively. In Uttar Pradesh, marginal farmers are mainly diversifying towards mustard (8.82%) followed by sugarcane (3.17%) and vegetables (1.02%). Small farmers are devoting a higher proportion of area towards sugarcane (8.85%) followed by mustard (4.23%) and vegetables (1.35%). Medium farmers are also devoting a higher proportion of area towards sugarcane (9.33%) followed by mustard (5.81%) and vegetables (2.74%). Large farmers are diversifying mainly towards sugarcane (8.96%) followed by mustard (2.91%) and vegetables (1.10%). Jharkhand is the only state where large farmers are diversifying the most and they are mainly diversifying towards mustard (9.42%) followed by sugarcane (2.45%) and vegetables (0.85%). Marginal and small farmers taken together are also diversifying into mustard (5.56%) followed by sugarcane (2.17%) and vegetables (0.64%). Medium farmers are mainly diversifying into vegetables (2.77%) and then sugarcane (0.97%).

So, horizontal diversification of small and marginal farms towards high value crops is seen to be more than large farms in the study regions. In case of proportion of area devoted to vegetable crops, a positive relationship is observed, but this relationship is not significant because it is also observed that the proportion area devoted to vegetables by large farmers is less compared to marginal, small and medium farming categories. Cultivation of vegetables is labour intensive and small and marginal farmers have family labour at their disposal which large farmers don't, resulting in constraints imposed by availability of family labour in expanding area under vegetables for large farmers.

This field study shows an in inverse relationship between farm size and high value crop diversification (oilseeds, sugarcane, jute and vegetables). The reasons for this is that, since high value crops gives better yields and earlier returns compared to food grains, small and marginal farmers try to maximize their returns from their small holdings by allocating more acreages to these high value crops whereas large farmers tend to hedge their bets by devoting more area towards food grains and also diversifying more within the allied sectors like livestock and fisheries that shall be seen later in this chapter.

Crop Yields

Yields of crops surveyed in the sample villages of the study region are given in table 3.4. It is seen that amongst all crops per hectare yields for vegetables were highest in Uttar Pradesh 137.27 Qtl/Hec, followed by Jharkhand (98.85 Qtl/Hec), West Bengal (82.45 Qtl/Hec), Orissa (60.88 Qtl/Hec) and Bihar (17.03 Qtl/Hec). Vegetable yields were low in Bihar and Orissa compared to the former states because these states mostly cultivated green leafy vegetables whose yields are usually lower than onions and potatoes which are mostly cultivated in the former states. The yield levels of sugarcane crop were also high i.e., 68.50 Qtl/Hec in Uttar Pradesh and 56.25 Qtl/Hec in Jharkhand (Table 3.4). Amongst the five selected states paddy was cultivated in all of them and the highest yields were seen in Orissa (22.25 Qtl/Hec) and Uttar Pradesh (22.20 Qtl/Hec) followed by Bihar (16.86 Qtl/Hec), West Bengal (13.39 Qtl/Hec) and Jharkhand (12.75 Qtl/Hec). Wheat showed highest yields in Bihar (11.97) followed by UP (8.21 Qtl/Hec), Jharkhand (7 Qtl/Hec) and West Bengal (5.33 Qtl/Hec). Maize was cultivated in all the states with the highest yields reporting from Bihar (19.24 Qtl/Hec), UP (14.35 Qtl/Hec), WB (12.74 Qtl/Hec), Jharkhand (12 Qtl/Hec) and Orissa (3 Qtl/Hec). Bajra was cultivated only in two states Jharkhand (15 Qtl/Hec) and Uttar Pradesh (7.31 Qtl/Hec). Jowar was cultivated only in UP with yields of 8 Qtls/Hec. Ragi was cultivated only in Jharkhand with yields of 2.85 Qtls/Hec. Pea was cultivated in three states with highest yields in Bihar (4.22 Qtl/Hec) followed by Uttar Pradesh (3.65 Qtl/Hec) and Jharkhand (3.17 Qtl/Hec). Mustard was cultivated in all the states with highest yields in Jharkhand (7.44 Qtl/Hec) followed by West Bengal (5.30 Qtl/Hec), Uttar Pradesh (5.07 Qtl/Hec), Bihar (3.32 Qtl/Hec) and Orissa (1.17 Qtl/Hec). Khesari (grass pea) was grown only in Bihar with yield of 4.02 Qtls/Hec. Masoor (Lentil) was cultivated only in Bihar and Jharkhand with yields of 3.51 and 2.78 Qtls/Hec respectively. Gram was cultivated in Bihar, Jharkhand and Orissa with very low yields of less than 1 Qtl/Hec in all three states. Arhar (reg gram) and urad (black gram) was cultivated only in Jharkhand with yields of 2.83 and 2.28 Qtls/Hec respectively. Moong (green gram) was cultivated only in Orissa with yields of 1.16 Qtls/Hec. Sesame was cultivated in Bihar and West Bengal with yields of 3.50 and 4.50 Qtls/Hec respectively. Linseed (tisi) was cultivated in Bihar and Orissa with yields of 1.86 and 3.00 Qtls/Hec respectively. Jute was cultivated in three states with

highest yields in West Bengal (11.99 Qtl/Hec), Orissa (10.74 Qtl/Hec) and Bihar (8.63 Qtl/Hec).

In all the five states it is seen that the yields from high value crops (oilseeds, sugarcane, jute and vegetables) is higher than food grain crops. An exception to this was the relatively under developed districts of Kishanganj in Bihar and the Mirzapur in Uttar Pradesh where yields from food grains were greater than high value crops. Among all the high value crops which were seen in the selected sample regions, the yields of vegetables were the highest.

Across farm size categories it is seen that in the state of Uttar Pradesh, all farm sizes show a positive relationship with the cultivation of food grains (Table 3.4). In case of high value crops (oilseeds, sugarcane and vegetables) the yields in the district of Varanasi are high for marginal followed by small and large farmers. The yields of medium farmers are slightly less. The yields of oilseeds (mustard) show a positive relationship across farm sizes while for sugarcane the yields are high for marginal farmers followed by large farmers. In the relatively under developed Mirzapur districts all categories of farmers are cultivating only oilseeds whose yields show a positive relation with farm size.

In Bihar, all categories of farmers show a positive relationship with the cultivation of food grains especially in the developed Rohtas district. In the relatively under developed Kishanganj district, marginal and medium farmers show high food grain yields while small farmers show slightly lower yields. In case of high value crops, the yields in the district of Rohtas are high for large followed by marginal, medium and small farmers, while in Kishanganj it shows a positive relation. Among high value crops, oilseeds (mustard, sesame and linseed) show a positive relationship with farm sizes in both districts of Bihar. jute yields in Kishanganj district are highest for small followed by marginal and medium farmers. Vegetable yields in Rohtas district are highest for marginal followed by large, medium and small farmers.

In Jharkhand, all categories of farmers show a positive relationship with the cultivation of food grains in both Sahebganj and Lohardaga districts. The farm size and productivity relationship of high value crops (mustard, vegetables and sugarcane) is also positive in the sample villages of both districts.

In Orissa, all categories of farmers show a positive relationship with the cultivation of food grains in the sample villages of both Bhadrak and Khandamal districts. The farm size and productivity relationship of high value crops (mustard, linseed, jute and vegetables) is also positive in the sample villages of both districts.

In West Bengal, all categories of farmers show a positive relationship with the cultivation of food grains in the sample villages of both Burdwan and Jalpaiguri districts. The farm size and productivity relationship of high value crops (mustard, sesame, jute and vegetables) is also positive in the sample villages of both districts.

In all the selected five states, the developed districts showed higher yield levels for most crops than the underdeveloped districts. It is also noticed that most crop yields showed a positive relation with farm size in all the five states surveyed. Further, it is also seen that crop diversification towards high value crops, mainly vegetables and sugarcane suits the need of farmers especially small and marginal holders as the yield levels of these crops are much higher compared to other crops and it was also reported by farmers that the returns especially from vegetables were more regular and earlier compared to food grains.

Table 3.4: Crop Yields

Uttar Pradesh

Districts	Farm Size Categories	Paddy	Bajra	Jowar	Maize	Wheat	Pea	Mustard	Sugarcane	Vegetables
Varanasi (Developed)	**Marginal**	16.71	8.34			3.53	1.68	2.42	73.25	138.28
	Small	20.08	3.68		14.20	5.97	2.88	3.39	63.50	138.59
	Medium	18.06	5.34		14.50	8.00		5.51	66.67	114.33
	Large	31.61	11.90			12.00	8.33	7.00	70.59	157.89
	Total	**21.62**	**7.31**		**14.35**	**7.38**	**4.29**	**4.58**	**68.50**	**137.27**
Mirzapur (Under developed)	**Marginal**	16.57				4.31		4.08		
	Small	21.52		8.00		6.65	3.00	3.33		
	Medium	24.45				10.42		4.91		
	Large	28.63				14.81		9.90		
	Total	**22.79**		**8.00**		**9.05**	**3.00**	**5.56**		
Grand Total		**22.20**	**7.31**	**8.00**	**14.35**	**8.21**	**3.65**	**5.07**	**68.50**	**137.27**

Source: Primary Field Survey

Bihar

Districts	Farm Size Categories	Paddy	Maize	Wheat	Khesari	Masoor	Gram	Pea	Mustard	Sesame	Linseed	Jute	Vegetables
Rohtas (Developed)	**Marginal**	17.06		9.66	3.52	2.38	0.06	1.87	3.17		1.42		40.32
	Small	17.15		10.05	4.15	3.90	0.12	3.58	3.59		2.02		15.44
	Medium	20.32		11.43	3.80	3.54	0.11	5.26	3.42		3.09		27.24
	Large	20.79		17.24	3.41	4.23		6.18			2.40		30.00
	Total	**18.83**		**12.10**	**3.72**	**3.51**	**0.10**	**4.22**	**3.39**		**2.23**		**28.25**
Kishanganj (Under developed)	**Marginal**	14.62	30.15	10.99	3.83				2.83		0.92	8.24	
	Small	13.96	8.33	13.53	4.82				3.84		2.05	9.50	4.17
	Medium	16.08		11.00					3.05	3.50		8.15	7.44
	Total	**14.89**	**19.24**	**11.84**	**4.33**				**3.24**	**3.50**	**1.48**	**8.63**	**5.80**
Grand Total		**16.86**	**19.24**	**11.97**	**4.02**	**3.51**	**0.10**	**4.22**	**3.32**	**3.50**	**1.86**	**8.63**	**17.03**

Source: Primary Field Survey

Jharkhand

Districts	Farm Size Categories	Paddy	Bajra	Maize	Wheat	Arhar	Masoor	Gram	Pea	Urad	Ragi	Mustard	Sugarcane	Vegetables
Sahebganj (Developed)	Marginal	6.05		15.41	2.88		1.83	0.01					50.00	
	Small	11.33	15.00	5.43	4.14		2.00	0.16					55.00	
	Medium	15.27		12.54	12.64		2.88	0.63					60.00	130.00
	Large	20.11		15.43	16.07		4.41	0.40				9.26	60.00	160.00
	Total	**13.19**	**15.00**	**12.20**	**8.93**		**2.78**	**0.30**				**9.26**	**56.25**	**145.00**
Lohardaga (Under developed)	Marginal	11.16		10.70	3.09	2.50			1.08	1.79	2.54	5.00		20.12
	Small	9.71		9.71	4.83	3.00			3.93	1.54	3.17	6.25		42.50
	Medium	13.93		15.00	7.25	3.00			4.50	3.50				95.47
	Large	14.40												
	Total	**12.30**		**11.80**	**5.06**	**2.83**			**3.17**	**2.28**	**2.85**	**5.63**		**52.70**
Grand Total		**12.75**	**15.00**	**12.00**	**7.00**	**2.83**	**2.78**	**0.30**	**3.17**	**2.28**	**2.85**	**7.44**	**56.25**	**98.85**

Source: Primary Field Survey

Orissa

Districts	Farm Size Categories	Paddy	Maize	Moong	Gram	Ragi	Mustard	Linseed	Jute	Vegetables
Bhadrak (Developed)	Marginal	18.18		0.85	0.04		0.83		6.85	72.14
	Small	21.02		1.03			0.94		7.06	74.60
	Medium	25.36		1.60	0.86	1.20	1.60	3.00	11.54	74.59
	Large	26.90			1.00		2.00			
	Total	**22.87**		**1.16**	**0.63**	**1.20**	**1.34**	**3.00**	**8.48**	**73.78**
Kandhamal (Under developed)	Marginal	19.85	3.00		0.02	3.00	1.00			29.19
	Small	23.07								49.03
	Medium	21.97			0.08				13.00	65.76
	Total	**21.63**	**3.00**		**0.05**	**3.00**	**1.00**		**13.00**	**47.99**
Grand Total		**22.25**	**3.00**	**1.16**	**0.34**	**2.10**	**1.17**	**3.00**	**10.74**	**60.88**

Source: Primary Field Survey

West Bengal

Districts	Farm Size Categories	Paddy	Maize	Wheat	Mustard	Sesame	Jute	Vegetables
Burdwan (Developed)	**Marginal**	10.78			2.13			67.42
	Small	14.64			5.03	4.50		91.41
	Medium	16.70		5.33	4.91			115.34
	Large	22.65			8.64			133.67
	Total	**16.19**		**5.33**	**5.18**	**4.50**		**101.96**
Jalpaiguri (Under developed)	**Marginal**	3.56			3.87		10.78	50.91
	Small	13.64	12.12		6.15		12.24	26.30
	Medium	14.57	13.37		6.28		12.95	111.59
	Total	**10.59**	**12.74**		**5.43**		**11.99**	**62.93**
Grand Total		**13.39**	**12.74**	**5.33**	**5.30**	**4.50**	**11.99**	**82.45**

Source: Primary Field Survey

Livestock Diversification

All farming households in the study regions did some form of livestock rearing. Table 3.5 shows the pattern of livestock in the study regions, i.e., the proportion of farming households owning each type of livestock to the total number of farming households in each farm size category. It may be seen that majority of the sample farming households own cattle. The highest proportion of cattle is seen in West Bengal (70%) followed by Uttar Pradesh (65%), Jharkhand (60%), Orissa (54%) and Bihar (52%). The developed districts show a higher proportion of cattle population compared to the relatively underdeveloped districts. In case of buffaloes the highest proportion is seen in Uttar Pradesh (80%). The largest proportion of goats is seen in the Lohardaga district of Jharkhand (38%) and Khandamal district of Orissa (19%). Sheep rearing is seen in only Burdwan district (2%).

Further the ownership of total livestock such as cattle, buffaloes, goats and sheep is directly related to farm size categories in all the surveyed regions. Some exceptions are ownership of buffaloes and goats in the Kishanganj district of Jharkhand, ownership of cattle in the Sahebganj district of Jharkhand, Bhadrak district of Orissa and Burdwan district of West Bengal and ownership of goats in the Khandamal district of Orissa, where the proportion of large farmers owning such livestock was lesser compared to the other categories.

Higher proportion of poultry is seen in most underdeveloped districts except West Bengal. Highest proportion of chicken is seen in Jharkhand's Lohardaga district (30%) and for duck rearing, the highest share is seen in Kishanganj district of Bihar (3%). Further, poultry farming is seen to be inversely related to farm size categories in the Kandhamal district of Orissa and Burdwan district of West Bengal. In the Kishanganj district of Bihar poultry farming is lesser for large farmers compared to the other categories. It showed a positive relationship with farm size in the Lohardaga district of Jharkhand and Bhadrak district of Orissa.

Piggery is found only amongst a small proportion of marginal farmers in the relatively underdeveloped Lohardaga and Kandhamal districts of Jharkhand and Orissa respectively.

Table 3.5 Pattern of Livestock as Percentage of Farming Households

States	Districts	Farm Size Categories	Cattle	Buffaloes	Goats	Sheep	Poultry		Pigs	Others
							Chicken	Duck		
Bihar	**Kishanganj**	**Marginal**	44.44	14.81	14.81	0.00	18.52	1.85	0.00	7.41
		Small	41.18	23.53	29.41	0.00	29.41	5.88	0.00	0.00
		Medium	83.33	16.67	8.33	0.00	16.67	0.00	0.00	25.00
		Total	**48.00**	**18.00**	**19.00**	**0.00**	**22.00**	**3.00**	**0.00**	**7.00**
	Rohtas	**Marginal**	53.33	37.78	0.00	0.00	0.00	0.00	0.00	0.00
		Small	56.25	28.13	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	57.89	47.37	0.00	0.00	0.00	0.00	0.00	5.26
		Large	75.00	75.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**56.00**	**38.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**
Jharkhand	**Lohardaga**	**Marginal**	37.14	4.29	37.14	0.00	32.86	1.43	1.43	55.71
		Small	63.64	4.55	45.45	0.00	18.18	0.00	0.00	63.64
		Medium	85.71	14.29	42.86	0.00	42.86	0.00	0.00	28.57
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**46.00**	**5.00**	**39.00**	**0.00**	**30.00**	**1.00**	**1.00**	**55.00**
	Sahebganj	**Marginal**	59.46	5.41	2.70	0.00	0.00	0.00	0.00	18.92
		Small	62.96	7.41	3.70	0.00	0.00	0.00	0.00	22.22
		Medium	80.77	0.00	0.00	0.00	0.00	0.00	0.00	57.69
		Large	50.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
		Total	**65.00**	**4.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**29.00**
Orissa	**Bhadrak**	**Marginal**	48.94	4.26	10.64	0.00	8.51	0.00	0.00	61.70
		Small	58.62	0.00	6.90	0.00	3.45	0.00	0.00	96.55
		Medium	77.27	0.00	18.18	0.00	13.64	4.55	0.00	95.45
		Large	50.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00
		Total	**58.00**	**2.00**	**11.00**	**0.00**	**8.00**	**1.00**	**0.00**	**79.00**
	Kandhamal	**Marginal**	50.00	20.37	22.22	0.00	22.22	0.00	1.85	57.41
		Small	42.86	28.57	23.81	0.00	14.29	0.00	0.00	61.90
		Medium	60.00	24.00	12.00	0.00	8.00	0.00	0.00	60.00
		Total	**51.00**	**23.00**	**20.00**	**0.00**	**17.00**	**0.00**	**1.00**	**59.00**
Uttar Pradesh	**Mirzapur**	**Marginal**	39.39	84.85	6.06	0.00	0.00	0.00	0.00	0.00
		Small	30.61	75.51	2.04	0.00	0.00	0.00	0.00	0.00
		Medium	50.00	75.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	50.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**37.00**	**80.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Varanasi	**Marginal**	68.18	81.82	0.00	0.00	0.00	0.00	0.00	2.27
		Small	59.46	86.49	0.00	0.00	0.00	0.00	0.00	2.70
		Medium	66.67	83.33	5.56	0.00	0.00	0.00	0.00	11.11
		Large	100.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**65.00**	**84.00**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.00**
West Bengal	**Burdwan**	**Marginal**	60.00	2.50	10.00	2.50	7.50	0.00	0.00	30.00

		Small	76.67	0.00	6.67	0.00	3.33	0.00	0.00	46.67
		Medium	84.00	4.00	4.00	4.00	0.00	0.00	0.00	60.00
		Large	60.00	20.00	20.00	0.00	0.00	0.00	0.00	60.00
		Total	**71.00**	**3.00**	**8.00**	**2.00**	**4.00**	**0.00**	**0.00**	**44.00**
	Jalpaiguri	**Marginal**	52.50	2.50	15.00	0.00	0.00	0.00	0.00	22.50
		Small	70.00	20.00	0.00	0.00	0.00	0.00	0.00	46.67
		Medium	76.67	16.67	10.00	0.00	0.00	0.00	0.00	43.33
		Total	**65.00**	**12.00**	**9.00**	**0.00**	**0.00**	**0.00**	**0.00**	**36.00**

Source: Primary Field Survey
Note: The shares do not match up to 100% because usually farming households rear several kinds of livestock, hence creating an overlap.

Diversification towards Fisheries

It is seen from Table 3.6 that Burdwan district of West Bengal showed the highest proportion of farmers who engaged in fisheries (20%). The Bhadrak district of Orissa also showed a higher percentage of farmers engaged in fisheries (11.27%). The lowest proportions were seen in Jharkhand, Uttar Pradesh and Bihar. In most of the study region, mostly medium farmers engaged in fisheries. Marginal farmers engaged in this sector in high proportions only in the Kishangarh district of Bihar, while large farmers engaged in this sector in high proportions only in the Bhadrak district of Orissa. The proportion of small and marginal farmers engaging in fisheries is very small in all the study regions excepting Bihar. These farmers mostly reported timely credit, accessibility to cold storages and poor road conditions, connectivity and transportation to be the major hindrances for diversifying into this sector.

Table 3.6: Share of Farm Households engaged in Fisheries (%)

States	**Districts**	**Farm Size Categories**	**% Shares**
Bihar	**Kishanganj**	Marginal	7.41
		Small	2.94
		Medium	8.33
		Total	**6.00**
Jharkhand	**Lohardaga**	Medium	42.86
		Total	**2.52**
	Sahebganj	Medium	19.23
		Large	10.00
		Total	**3.87**
Orissa	**Bhadrak**	Marginal	2.13
		Medium	27.27
		Large	50.00
		Total	**11.27**

Uttar Pradesh	**Varanasi**	Medium	16.67
		Total	**3.30**
West Bengal	**Burdwan**	Marginal	5.00
		Medium	44.00
		Large	20.00
		Total	**20.00**
	Jalpaiguri	Small	6.67
		Medium	26.67
		Total	**7.69**

Source: Primary Field Survey

As regards sources of fish in the study region (Table 3.7) it was seen that most farming households fished from ponds rather than paddy fields. However, exceptions were that in Kishanganj district of Bihar marginal farmers fished from both ponds as well as paddy fields in equal proportions. In the Bhadrak district of Orissa, 83% medium farmers fished from ponds while 16.67% of them fished from paddy fields.

Table 3.7: Source of Fisheries Reported by Farming Households (%)

States	Districts	Farm Size Categories	Ponds	Paddy Fields
Bihar	**Kishanganj**	**Marginal**	50.00	50.00
		Small	100.00	0.00
		Medium	100.00	0.00
Jharkhand	**Lohardaga**	**Medium**	100.00	0.00
	Sahebganj	**Medium**	100.00	0.00
		Large	100.00	0.00
Orissa	**Bhadrak**	**Marginal**	100.00	0.00
		Medium	83.33	16.67
		Large	100.00	0.00
Uttar Pradesh	**Varanasi**	**Medium**	100.00	0.00
West Bengal	**Burdwan**	**Marginal**	100.00	0.00
		Medium	100.00	0.00
		Large	100.00	0.00
	Jalpaiguri	**Small**	100.00	0.00
		Medium	100.00	0.00

Source: Primary Field Survey

Two main varieties of fish farming were observed in the village; large and small (Table 3.8). But farmers also practiced a combination of both. It was found that majority of the farming households (100%) in the districts of Bihar, Jharkhand, Orissa and Uttar Pradesh practiced small fish farming. However, exceptions were in Sahebganj district of Jharkhand where 20% medium farmers practiced large fish farming. Similarly 9% of

medium farmers in Burdwan district of West Bengal also practiced large fish farming. In Sahebganj district of Jharkhand 80% farmers practiced a combination of both Large and small fish farming, while in Lohardaga all farmers practiced a combination of both (100%). In West Bengal a large proportion of farmers across all farm size groups practiced a combination of both types of fish farming.

Table 3.8: Varieties of Fish Farming Reported by Farming Households (%)

States	Districts	Farm Size Categories	Large	Small	Both Large & Small
Bihar	**Kishanganj**	**Marginal**	0.00	100.00	0.00
		Small	0.00	100.00	0.00
		Medium	0.00	100.00	0.00
Jharkhand	**Lohardaga**	**Medium**	0.00	100.00	0.00
		Large	0.00	0.00	100.00
	Sahebganj	**Medium**	20.00	0.00	80.00
Orissa	**Bhadrak**	**Marginal**	0.00	100.00	0.00
		Medium	0.00	100.00	0.00
		Large	0.00	100.00	0.00
Uttar Pradesh	**Varanasi**	**Medium**	0.00	100.00	0.00
West Bengal	**Burdwan**	**Marginal**	0.00	0.00	100.00
		Medium	9.09	18.18	72.73
		Large	0.00	0.00	100.00
	Jalpaiguri	**Small**	0.00	0.00	100.00
		Medium	0.00	37.50	62.50

Source: Primary Field Survey

Viability of Small Farms

The total household income includes the net income from crop farming, livestock, fisheries and income from non-farm sources. It may be seen from the Table 3.9 that based on crop farming alone no farmers earned enough to stay viable.

The shares of monthly income from farm and non-farm sources in the sample households of the study regions show that income from farm sources is greater than non-farm sources in all the states of eastern India (Table 3.9). The income from non-farm sources are the relatively less in the under developed districts compared to the developed ones in all the selected states.

It is also seen that in all the selected states, except Jharkhand, the net income from livestock sector is the highest followed by crop farming and then the fisheries. In Jharkhand, the net income from crop farming was the highest followed by livestock and fisheries. Further, the net income from livestock is greater than that of crop farming in all the under developed districts, whereas it is lower than the crop farming in all the developed districts except the Varanasi district in Uttar Pradesh where income from livestock was more than the crop farming.

Both income from agriculture and livestock show a positive relationship with farm size. The income from fisheries was skewed towards medium farmers in the states of Bihar, Jharkhand and Uttar Pradesh, while in Orissa and West Bengal it showed a positive relationship with farm size.

It can be seen from the table below that only in the Kishanganj district of Bihar marginal farmers are earning more income from non-farm sources. In all other states all categories of farmers are earning more from farm sources. This means that the income of marginal farmers only in the Kishanganj district of Bihar have shown more vertical diversification toward non-farm activities whereas overall it is seen that all size classes show horizontal diversification within agriculture and allied activities.

In the states of Bihar and Uttar Pradesh, only medium farmers have shown more horizontal diversification toward livestock rearing and fisheries, while in the rest of the states both medium and large farmers have shown such diversification. Small and marginal farmers have mainly diversified toward livestock. Only in the states of Bihar and West Bengal, they have also diversified towards fisheries. Hence, it can be said that

in most states small and marginal farmers have not shown much horizontal diversification within agriculture and allied activities compared to medium and large farmers.

Table 3.9: Net Income per Household by Farm Size Groups (Rs/HH)

Districts	Farm Size Categories	Total Farm Income (Rs/HH)			Non-Farm Income (Rs/HH)	Total Household Income (Rs/HH)
		Net Income from Crop Farming	Income from Livestock	Income from Fisheries		
Kishanganj	**Marginal**	756.14	1146.49	25.62	2126.76	4055.01
	Small	1203.50	2135.37	6.13	1683.75	5028.76
	Medium	2205.99	2494.47	90.28	1675.00	6465.73
	Large					
	Total	**1082.23**	**1644.47**	**26.75**	**1921.93**	**4675.37**
Rohtas	**Marginal**	1087.48	1600.51		2164.09	4852.09
	Small	1293.40	1305.31		1844.14	4442.85
	Medium	2582.28	1748.42		3329.05	7659.75
	Large	6857.11	3540.63		2229.17	12626.90
	Total	**1668.17**	**1611.75**		**2285.65**	**5565.58**
Bihar	**Marginal**	906.75	1352.86	13.97	2143.73	4417.32
	Small	1247.09	1732.92	3.16	1761.52	4744.68
	Medium	2436.62	2037.21	34.95	2688.77	7197.55
	Large	6857.11	3540.63		2229.17	12626.90
	Total	**1375.20**	**1628.11**	**13.38**	**2103.79**	**5120.47**
Sahebganj	**Marginal**	676.56	1443.37		1875.90	3995.83
	Small	2703.04	1758.37		2026.11	6487.52
	Medium	6301.30	2441.91	864.74	4433.85	14041.80
	Large	10148.61	2859.07	158.33	2583.33	15749.35
	Total	**3633.35**	**1929.61**	**240.67**	**2652.27**	**8455.89**
Lohardaga	**Marginal**	433.50	2098.97		2023.81	4556.28
	Small	1393.25	3939.71		1573.98	6906.93
	Medium	4654.45	4732.75	130.95	3571.43	13089.58
	Large	5163.33				5163.33
	Total	**987.41**	**2667.31**	**9.17**	**2012.94**	**5676.82**
Jharkhand	**Marginal**	517.55	1872.27		1972.66	4362.48
	Small	2114.97	2737.75		1823.11	6675.83
	Medium	5951.97	2927.84	709.09	4250.91	13839.81
	Large	9695.40	2599.15	143.94	2348.48	14786.98
	Total	**2310.38**	**2298.46**	**124.92**	**2332.60**	**7066.36**
Bhadrak	**Marginal**	1384.87	1311.83	0.71	2055.80	4753.21
	Small	2499.67	1679.14		1859.25	6038.06
	Medium	4654.74	3526.29	25.00	3764.00	11970.02
	Large	7456.55	4166.67	333.33	3333.33	15289.88
	Total	**2533.80**	**1962.63**	**12.50**	**2650.15**	**7159.08**
Kandhamal	**Marginal**	927.89	3373.69		368.08	4669.66
	Small	2287.70	3028.60		1242.06	6558.37
	Medium	4289.14	3370.46		338.00	7997.60
	Large					

	Total	**2053.76**	**3300.41**		**544.10**	**5898.27**
Orissa	**Marginal**	1140.55	2414.21	0.33	1153.45	4708.54
	Small	2410.64	2245.92		1600.03	6256.59
	Medium	4460.27	3443.40	11.70	1941.66	9857.03
	Large	7456.55	4166.67	333.33	3333.33	15289.88
	Total	**2293.78**	**2631.52**	**6.25**	**1597.13**	**6528.68**
Varanasi	**Marginal**	1113.07	4667.69		1762.94	7543.70
	Small	2482.57	5749.94		7687.69	15920.20
	Medium	7147.75	5536.81	528.24	6330.21	19543.00
	Large	20724.83	8574.83			29299.67
	Total	**2902.14**	**5263.63**	**95.08**	**4759.58**	**13020.44**
Mirzapur	**Marginal**	807.58	3706.91		1602.27	6116.76
	Small	927.77	3144.80		882.99	4955.56
	Medium	6155.11	4200.87		5445.83	15801.81
	Large	13139.44	5045.14		3666.67	21851.24
	Total	**2248.09**	**3571.05**		**1834.92**	**7654.05**
Uttar Pradesh	**Marginal**	982.14	4255.93		1694.08	6932.15
	Small	1596.70	4265.62		3810.60	9672.91
	Medium	6750.70	5002.43	316.94	5976.46	18046.53
	Large	14223.06	5549.38		3142.86	22915.30
	Total	**2575.12**	**4417.34**	**47.54**	**3297.25**	**10337.24**
Burdwan	**Marginal**	768.20	2028.55	74.79	2412.47	5284.01
	Small	2104.66	2381.88		3406.22	7892.76
	Medium	4540.47	4037.17	481.67	6089.33	15148.63
	Large	20782.54	5488.42	419.17	3233.33	29923.46
	Total	**3112.92**	**2809.69**	**171.29**	**3670.85**	**9764.76**
Jalpaiguri	**Marginal**	336.67	1332.25		1208.94	2877.86
	Small	1341.66	1721.42	94.44	2020.96	5178.49
	Medium	3064.60	3317.24	330.28	5388.75	12100.87
	Large					
	Total	**1456.55**	**2044.50**	**127.42**	**2706.49**	**6334.95**
West Bengal	**Marginal**	552.44	1680.40	37.40	1810.70	4080.93
	Small	1723.16	2051.65	47.22	2713.59	6535.62
	Medium	3735.45	3644.48	399.09	5707.20	13486.22
	Large	20782.54	5488.42	419.17	3233.33	29923.46
	Total	**2284.74**	**2427.10**	**149.35**	**3188.67**	**8049.86**

Source: Primary Field Survey

Therefore, from the field survey data in the selected districts it is seen that small and marginal farmers have shown more horizontal diversification within the crop sector towards high value crops such as oilseeds, sugarcane, jute and vegetables compared to the other categories. Conversely, this category of farmers has shown comparatively lesser horizontal diversification with the allied sectors such as livestock and fisheries compared to the other farm sizes.

Table 3.10 shows the profitability of the crop farming sector across land classes. In terms of output-input ratio, it is seen that in all the districts, except Rohtas in Bihar, the output-input ratio of the marginal and small farmers are lower compared to other farm categories. The scenario is the same for the income-input ratio except, Kishanganj district in Bihar, where the income-input ratio of the marginal and small farmers is the higher compared to other land classes. In the districts where the output-input ratio is the lower for marginal and small farmers, it is observed that the working capital expenses are the highest. This reflects upon the resource use inefficiency of marginal and small farmers.

Table 3.10: Profitability of Crop Farming by Farm Size Group

Districts	Farm Size Categories	Working Capital Expenses (Rs/Hec)	Value of Output (Rs/Hec)	Net Income (Rs/Hec)	Output - Input Ratio	Income - Input Ratio
Kishanganj	**Marginal**	6808.84	12774.87	9916.60	1.88	1.46
	Small	5980.51	13250.29	8499.14	2.22	1.42
	Medium	6125.01	13474.77	7951.49	2.20	1.30
	Large					
	Total	**6297.91**	**13151.59**	**8826.45**	**2.09**	**1.40**
Rohtas	**Marginal**	7648.90	19027.48	12415.20	2.49	1.62
	Small	6647.18	12438.58	6651.48	1.87	1.00
	Medium	6622.50	14746.58	8320.52	2.23	1.26
	Large	7032.20	15804.62	8772.42	2.25	1.25
	Total	**6908.12**	**15049.93**	**8694.05**	**2.18**	**1.26**
BIHAR	**Marginal**	7219.71	15832.97	11138.64	2.19	1.54
	Small	6356.37	12792.66	7457.45	2.01	1.17
	Medium	6442.98	14287.64	8187.35	2.22	1.27
	Large	7032.20	15804.62	8772.42	2.25	1.25
	Total	**6670.21**	**14309.80**	**8745.67**	**2.15**	**1.31**
Sahebganj	**Marginal**	6887.69	16674.33	12881.36	2.42	1.87
	Small	7238.42	26810.56	19981.38	3.70	2.76
	Medium	5687.34	28885.05	23197.71	5.08	4.08
	Large	4394.72	21013.62	16618.91	4.78	3.78
	Total	**5692.90**	**24655.11**	**19362.36**	**4.33**	**3.40**
Lohardaga	**Marginal**	5594.01	11917.40	9648.59	2.13	1.72
	Small	5084.86	16298.61	11508.66	3.21	2.26
	Medium	7148.47	24696.66	17548.19	3.45	2.45
	Large	3814.81	16563.79	12748.97	4.34	3.34
	Total	**5694.32**	**16536.64**	**12235.52**	**2.90**	**2.15**
JHARKHAND	**Marginal**	6088.09	13734.16	10883.25	2.26	1.79
	Small	6330.28	22377.76	16408.51	3.54	2.59
	Medium	5991.50	28013.17	22021.67	4.68	3.68
	Large	4358.65	20736.86	16378.21	4.76	3.76
	Total	**5693.33**	**22213.67**	**17219.13**	**3.90**	**3.02**

Bhadrak	**Marginal**	4677.84	25814.59	22425.18	5.52	4.79
	Small	4142.22	22622.76	18988.95	5.46	4.58
	Medium	3588.45	22020.29	18431.84	6.14	5.14
	Large	3401.65	21831.84	18430.19	6.42	5.42
	Total	**4096.01**	**23026.05**	**19364.16**	**5.62**	**4.73**
Kandhamal	**Marginal**	2481.88	16835.72	18748.85	6.78	7.55
	Small	2229.17	21706.76	20185.57	9.74	9.06
	Medium	2709.08	23293.17	20670.55	8.60	7.63
	Large					
	Total	**2538.24**	**21239.15**	**20056.30**	**8.37**	**7.90**
ORISSA	**Marginal**	3625.16	21510.37	20662.85	5.93	5.70
	Small	3407.56	22270.99	19448.48	6.54	5.71
	Medium	3163.84	22634.91	19512.82	7.15	6.17
	Large	5276.00	21831.84	16555.83	4.14	3.14
	Total	3412.13	22241.58	19668.02	6.52	5.76
Varanasi	**Marginal**	7308.61	15987.58	10738.17	2.19	1.47
	Small	5441.29	17314.85	11995.45	3.18	2.20
	Medium	5821.88	25529.74	19707.86	4.39	3.39
	Large	7746.26	40341.02	32594.76	5.21	4.21
	Total	**6084.48**	**20524.80**	**14973.02**	**3.37**	**2.46**
Mirzapur	**Marginal**	4026.59	10797.71	6771.12	2.68	1.68
	Small	4043.29	8242.25	4198.96	2.04	1.04
	Medium	3729.58	16543.46	12813.88	4.44	3.44
	Large	3625.22	19413.59	15788.37	5.36	4.36
	Total	**3888.06**	**12697.17**	**8809.12**	**3.27**	**2.27**
UTTAR PRADESH	**Marginal**	5788.31	13583.52	8900.55	2.35	1.54
	Small	4622.44	12000.79	7428.84	2.60	1.61
	Medium	4840.76	21315.92	16475.16	4.40	3.40
	Large	4090.70	21777.41	17686.71	5.32	4.32
	Total	**4836.16**	**16076.03**	**11469.81**	**3.32**	**2.37**
Burdwan	**Marginal**	6823.58	12893.76	12367.10	1.89	1.81
	Small	6969.76	19288.00	12844.18	2.77	1.84
	Medium	5925.73	21455.18	15696.48	3.62	2.65
	Large	4347.60	30704.66	26357.06	7.06	6.06
	Total	**5987.18**	**21699.61**	**16758.97**	**3.62**	**2.80**
Jalpaiguri	**Marginal**	5110.74	10109.48	8948.13	1.98	1.75
	Small	4335.15	14275.88	11162.43	3.29	2.57
	Medium	4008.56	16433.91	12461.94	4.10	3.11
	Large					
	Total	**4235.69**	**15048.63**	**11663.27**	**3.55**	**2.75**
WEST BENGAL	**Marginal**	6177.46	11843.46	11077.38	1.92	1.79
	Small	5854.96	17167.18	12132.57	2.93	2.07
	Medium	4957.58	18919.48	14063.07	3.82	2.84
	Large	4347.60	30704.66	26357.06	7.06	6.06
	Total	**5283.02**	**19025.70**	**14710.33**	**3.60**	**2.78**

Source: Primary Field Survey

Small and marginal farmers are diversifying more within the crop sector relative to other farm categories firstly because, the yields from high value crops mainly vegetables and sugarcane are higher than food grain crops. Secondly, the returns are more regular and earlier compared to food grains. Lastly, these farmers, with an abundance of family labour at their disposal try to maximize their returns from their small holdings by allocating more acreages to these high value crops whereas large farmers tend to hedge their bets by devoting more area towards food grains and also diversifying more within the allied sectors like livestock and fisheries. Despite the benefits of high value crop diversification for small and marginal farmers, their net incomes from crop farming is found to be lower than the other farm sizes which indicates inefficient use of resources by them and also inadequate access to markets for their high value products. Further, the income even within agriculture and allied activities was skewed in favour of large farms. It is to be noted that though small and marginal farmers constitute the largest proportion of farming households in India (including the eastern states), their income from crop farming and allied sectors (as seen from this field study) was low compared to medium and large farmers. Further, crop yields also showed a positive relationship with farm size (including horticultural crops). Small and marginal farmers are diversifying horizontally within the crop sector, but at the same time more horizontal diversification within the allied sectors should also be considered to be a viable option for them. Further, their resource use efficiency within the crop sector has to improve. This can be done by removing the typical constraints faced by this category of farmers which have been identified in the next chapter.

CHAPTER IV

CONSTRAINTS AND POTENTIALS FOR AGRICULTURAL DIVERSIFICATION

This chapter attempts to identify the main constraints and potentials underlying agricultural diversification in the eastern states. At the district level, secondary data analysis has been done by carrying out several forms of regression exercises. The primary data analysis for this has been based on farmers' perception about the constraints faced by them for agricultural diversification.

Regression Equations

At the district level certain factors were taken to explain agricultural diversification of value of output from crop production, livestock, forestry and fisheries through multiple regressions for the triennium ending 2006-07. These factors were fertilizer consumption, irrigation, annual rainfall, grazing lands, credit, regulated markets, cold storages, rural roads, rural electrification, veterinary hospitals, forest protection committees, rural literacy and urban population. This set of regressions taking value of output could not be worked out for the previouse years because of non-availability of such data. The regression functions for value of output from various sectors were estimated as follows;

(i) ***VCP = f (F, I, R, C, M, R, E, L, U)***

Where,

VCP = Value of Output from Crop Production (Rs.)

F = Fertilizer Consumption (Tonnes/Hec)

I = Crop Irrigated Area as a percentage of Gross Cropped Area

R = Average Annual Rainfall (mms)

C = Outstanding Credit (Rs/Hec)

M = Number of Regulated Markets per 1000 Hectares of GCA

R = Length of Rural Roads per 1000 Hectares of GCA

E = Percentage of Electrified Villages

L = Rural Literacy Rate

U= Percentage of Urban Population

(ii) ***VH = f (F, I, R, C, H, R, E, L, U)***

Where,

VH = Value of Output from Horticulture (Rs.)

F = Fertilizer Consumption (Tonnes/Hec)

I = Irrigated Area under Horticulture as a percentage of Gross Cropped Area

R = Average Annual Rainfall (mms)

C = Outstanding Credit (Rs/Hec)

H = Number of Village Haats

R = Length of Rural Roads per 1000 Hectares of GCA

E = Percentage of Electrified Villages

L = Rural Literacy Rate

U= Percentage of Urban Population

(iii) ***VL = f (R, G, C, R, H, E, V, L, U)***

Where,

VL = Value of Output from Livestock (Rs.)

R = Average Annual Rainfall (mms)

G = Grazing and Pasture Lands as a percentage of Reported Area

C = Outstanding Credit (Rs/Hec)

R = Length of Rural Roads per 1000 Hectares of GCA

H = Number of Village Haats

E = Percentage of Electrified Villages

V = Number of Veterinary Hospitals

L = Rural Literacy Rate

U= Percentage of Urban Population

(iv) ***VFO = f (R, C, H, R, E, F, L, U)***

Where,

VFO = Value of Output from Forestry (Rs.)

R = Average Annual Rainfall (mms)

C = Outstanding Credit (Rs/Hec)

H = Number of Village Haats

R = Length of Rural Roads per 1000 Hectares of GCA

F = Number of Forest Protection Committees

L = Rural Literacy Rate

U= Percentage of Urban Population

(v) ***VFI = f (R, C, R, S, E, L, U)***

Where,

VFI = Value of Output from Fisheries (Rs.)

R = Average Annual Rainfall (mms)

C = Outstanding Credit (Rs/Hec)

R = Length of Rural Roads per 1000 Hectares of GCA

S = Number of Cold Storages

H = Number of Village Haats

E = Percentage of Electrified Villages

L = Rural Literacy Rate

U= Percentage of Urban Population

Furthermore, for better understanding of agricultural diversification in the previous years at the district level certain factors were taken to explain agricultural diversification of area under horticultural crops, and livestock per 1000 hectares GCA for the trienniums ending 1972-73, 1982-83, 1992-93 and 2002-03. The regressions could not be formulated for the state of Jharkhand due to lack of districtwise data under most heads.

(i) *AFV = f (I, R, C, R, E, L, U)*

Where,

AFV = Area under Fruits and Vegetables as a Percentage of GCA

I = Irrigated Area under Fruits & Vegetables as a percentage of Gross Cropped Area

R = Average Annual Rainfall (mms)

C = Outstanding Credit (Rs/Hec)

R = Length of Rural Roads per 1000 Hectares of GCA

E = Percentage of Electrified Villages

L = Rural Literacy Rate

U= Percentage of Urban Population

(ii) $L = f(R, C, R, E, L,)$

Where,

L = Livestock per 1000 Hec GCA

R = Average Annual Rainfall (mms)

C = Outstanding Credit (Rs/Hec)

R = Length of Rural Roads per 1000 Hectares of GCA

E = Percentage of Electrified Villages

L = Rural Literacy Rate

U= Percentage of Urban Population

Factors Effecting Value of Output of Agriculture & Allied Activities (TE – 2006-07)

Irrigated area as a proportion of GCA showed a positive relationship with the value of output of total crop production and horticultural crops in the states of Bihar and Uttar Pradesh. It affected the value of output of only crop production in Orissa and only horticultural crops in West Bengal. It affected value of output of horticulture and crop production negatively in Orissa and West Bengal respectively, but the relationship was not statistically significant at 1% level of significance. In Jharkhand irrigated area showed a significant negative relationship with both value of output of crop production as well as horticulture, which indicates that irrigated area is acting as a constraint as a result of inappropriate water management and inadequate number of irrigations in the state.

Fertilizer use influenced the value of output of total crop production positively only in the states of Orissa and Uttar Pradesh. In other states its relationship with the value of output of crop production and horticulture was negative, which indicates the constraint of imbalanced fertilizer use in these states.

Average annual rainfall affected the value of output of crop production in Uttar Pradesh and Jharkhand. It showed a positive relationship with the value of output of horticulture in Bihar, Orissa, Jharkhand and West Bengal. Average annual rainfall also affects animal husbandry, forestry and fisheries. Hence it showed a positive relationship with the value of output of livestock in Bihar, Orissa and West Bengal. With respect to value of output of forestry it showed a positive relationship in Bihar, Uttar Pradesh, Jharkhand and West Bengal. In Orissa the relationship was negative but not significant at

1% level of significance, which shows the importance of rainfall as a major factor affecting forest resources in eastern India. Rainfall affected the value of output of the fisheries sector in Bihar, Uttar Pradesh and West Bengal. In the states and sectors where the relation with rainfall is negative indicates the constraint of insufficient rainfall.

Institutional credit affects the value of output of crop production and horticulture in all the eastern states, except that in West Bengal the relationship is negative but not statistically significant at 1% level of significance. This indicates the significance of institutional credit for crop production & horticulture in eastern India. Institutional credit also affects animal husbandry, forestry and fisheries. It is an important variable that positively affects the value of output from livestock. Institutional credit affects the value of output from forestry in Orissa, Jharkhand and West Bengal. In Bihar and Uttar Pradesh the relationship is negative but not statistically significant at 1% level. Institutional credit affects the value of output from fisheries in all the eastern states except Bihar where too the relationship though negative is not statistically significant at 1% level of significance, thereby the relevance of institutional credit in the fisheries sector too.

Market density (number of regulated markets per 1000 hec of GCA) could affect the value of output of only crop production but not the other sectors because the products from other sectors do not come to regulated markets. It is seen that this factor shows a positive relationship only in the states of Orissa and Uttar Pradesh. It shows a negative relationship that is statistically significant at 5% levels in Bihar and Jharkhand and a non-significant relationship at 1% level West Bengal indicating unavailability of associated infrastructural facilities like road connectivity and transportation in these states.

Horticultural produce as well as produce from livestock, forestry and fisheries sector come to village haats rather than regulated markets. Districtwise data on village haats was found only for the states of Uttar Pradesh and West Bengal. Village haats showed a positive relationship with the value of output of horticulture, livestock and fisheries sector in Uttar Pradesh. For the forestry sector in Uttar Pradesh the relationship was negative though statistically not significant at 1% level of significance. In West Bengal this relationship was positive for all sectors, thereby indicating the importance of village haats in agricultural diversification.

Percentage of electrified villages showed a positive relationship with the value of output of crop production in only in the states of Orissa and West Bengal. In Bihar and Uttar Pradesh the relationship is negative but statistically non-significant at 1% level, but in Jharkhand it is statistically significant at 5% level of significance. With respect to horticulture and livestock the relationship is positive only in Orissa, while in the other states the relationship is negative but statistically not significant at 1% level of significance. In case of fisheries the relationship is positive in all states except Uttar Pradesh where too the relationship though negative was statistically not significant at 1% level of significance. States where percentage of electrified villages showed negative relationship indicates lack of accessibility of stakeholders to electricity and can also be a sign of excessive electricity load shedding in these regions.

Rural road density (rural road length per 1000 hec of GCA) shows a positive relationship with the value of crop production only in Jharkhand and West Bengal. In Uttar Pradesh and Orissa the relationship is negative but statistically non-significant at 1% level, but in Bihar it is statistically significant at 5% level of significance. Road density shows a positive relationship with the value of output of horticulture only in Uttar Pradesh and West Bengal, while in the other states the relationship is negative but not significant. It shows a positive relationship with the value of output of livestock in Bihar, and Uttar Pradesh. In West Bengal and Jharkhand the relationship is negative and statistically non-significant while in Orissa the negative relationship is statistically significant at 5% level of significance. With respect to the forestry sector, road density shows a positive relationship only in Orissa, Jharkhand and West Bengal. In Bihar and Uttar Pradesh the relationship is negative and statistically non-significant at 1% level of significance. In case of value of output from fisheries, it is seen that the relationship holds good in Orissa and West Bengal. In Jharkhand the relationship is negative and statistically significant at 5% level while in Uttar Pradesh and Bihar it is statistically not significant. States where rural road density showed negative relationship indicates lack poor road conditions in these states.

Veterinary hospitals and grazing & pasture lands as a percentage of reported area show a positive relationship with the value of livestock output in all the eastern states

except Orissa, where too the relationship though negative is statistically not significant at 1% level of significance.

Percentage of urban population positively affects crop production in Bihar and Uttar Pradesh. For horticulture it shows a positive relationship in Orissa and Jharkhand. With respect to livestock the relationship is positively significant only in Orissa. In the forestry sector it is positive in Orissa, Uttar Pradesh, Jharkhand and West Bengal. In the fisheries sector it is positive in Bihar, Uttar Pradesh and, Jharkhand.

Rural literacy positively affects crop production only in West Bengal. In the horticultural sector it is affecting Jharkhand and west Bengal. In the livestock sector it is positive in Orissa and Jharkhand. In the forestry sector it is positive only in Bihar. In the fisheries sector it is positive only in Uttar Pradesh. Rural literacy is not affecting agricultural diversification presumably due to lack of interest in the part of literate youth in agriculture & allied activities because agriculture is becoming a non-profitable occupation now (Appendix IV.1).

From this factor analysis, it was seen that in the state of Bihar imbalanced use of fertilizers was posing a constraint to horticultural diversification. Hence a balanced use of fertilizers was required, which could be achieved by providing proper training in horticultural management and practices to farmers. In the state of Jharkhand it was found inappropriate water management and inadequate water supply was a major constraint towards horticultural diversification. Thus, in this state proper irrigation facilities are required. Further, it was found that insufficient rainfall was posing a constraint to livestock diversification in the state and hence the importance of enhancing irrigation facilities was needed. Moreover for the fisheries sector poor road conditions, bad road connectivity and transportation problems in the state have to be improved. In Orissa, livestock diversification was hindered by road connectivity and transportation problems. In Orissa, Uttar Pradesh and West Bengal the diversification towards the forestry sector was mainly constrained by rural literacy rate. This means that as rural literates increase there is lack of interest in their part to engage themselves in the forestry sector. They would rather move into the rural non-farm sector (explained in non-farm diversification in Chapter II (Appendix II.1). In Uttar Pradesh livestock diversification was also constrained by rural literacy rate.

Factors Effecting Area under Horticultural Crops and Livestock Population (TE – 1972)

During the triennium ending 1972 irrigated area under horticulture as a proportion of GCA showed a positive relationship with the proportion of horticultural area in all the eastern states. Average annual rainfall showed a positive relationship in Bihar, Orissa and West Bengal. In the state of Uttar Pradesh the relationship was negative but not significant at 1% level of significance. Data on institutional credit was not available for Bihar during this period. Credit showed a positive relationship only in Uttar Pradesh, while in Orissa it showed a statistically significant result at 1% level, but in West Bengal the relationship was negative but non-significant. Percentage of villages with electricity showed a positive relationship only in West Bengal. In the other states it showed a negative but non-significant relationship. However in Uttar Pradesh the negative relationship was statistically significant at 1% level of significance. Rural road density showed a positive relationship in all the states except Orissa where the relationship was negative and statistically significant at 5% level of significance. Rural literacy rate showed a positive relationship only in the state of Orissa, while in the other states it showed a negative though non-significant relationship. Percentage of urban population showed a positive relationship in Bihar and Orissa, whereas in Uttar Pradesh and West Bengal it showed a negative relationship, wherein it was statistically significant at 1% level only in West Bengal.

As regards livestock, during the triennium ending 1972, average annual rainfall showed a positive relationship with the livestock population per 1000 hec of GCA in Bihar and Orissa. In the state of Uttar Pradesh and West Bengal the relationship was negative but not significant at 1% level of significance. Credit showed a positive relationship in Uttar Pradesh and West Bengal, while in Orissa the relationship was negative but non-significant. Percentage of villages with electricity showed a negative but statistically non-significant relationship in all the states. Rural road density showed a positive relationship in all the states excepting Bihar where the relationship was negative but statistically non-significant at 1% level of significance. Rural literacy rate showed a positive relationship in all the states excepting West Bengal where the relationship though negative was non-significant. Percentage of urban population showed a positive

relationship in Bihar and Orissa, whereas in Uttar Pradesh and West Bengal it showed a negative though non-significant relationship at 1% level of significance (Appendix IV.2).

Factors Effecting Area under Horticultural Crops and Livestock Population (TE – 1982)

During the triennium ending 1982 irrigated area under horticulture as a proportion of GCA showed a positive relationship with the proportion of horticultural area in all the eastern states. Average annual rainfall showed a positive relationship in Bihar, Uttar Pradesh and West Bengal. In the state of Orissa the relationship was negative and statistically significant at 1% level of significance. Data on institutional credit was not available for Bihar during this period. Credit showed a positive relationship only in Orissa, while in Uttar Pradesh and West Bengal it showed a statistically non-significant result. Percentage of villages with electricity showed a positive relationship only in Orissa. In the Bihar and West Bengal it showed a negative but non-significant relationship. However in Uttar Pradesh the negative relationship was statistically significant at 1% level of significance. Rural road density showed a positive relationship in all the states. Rural literacy rate showed a positive relationship only in the state of Orissa, while in the other states it showed a negative though non-significant relationship. Percentage of urban population showed a negative relationship in all the states, wherein it was statistically significant at 1% level only in Orissa.

During the triennium ending 1982, average annual rainfall showed a positive relationship with the livestock population per 1000 hec of GCA only in Uttar Pradesh. In the state of Bihar the relationship was negative and significant at 1% level of significance, while in Orissa & West Bengal the negative relationship was not statistically significant. Credit showed a positive relationship only in West Bengal, while in Orissa and Uttar Pradesh, the relationship was negative but non-significant. Percentage of villages with electricity showed a negative but statistically non-significant relationship only in Bihar and West Bengal, while in Uttar Pradesh the relationship was positive. Rural road density showed a positive relationship in all the states. Rural literacy rate showed a positive relationship in Uttar Pradesh and Orissa, while in Bihar and West Bengal the relationship though negative was non-significant. Percentage of urban population showed a positive relationship in all states excepting Uttar Pradesh where it

showed a negative and statistically significant relationship at 1% level of significance (Appendix IV.2).

Factors Effecting Area under Horticultural Crops and Livestock Population (TE – 1992)

During the triennium ending 1992 irrigated area under horticulture as a proportion of GCA showed a positive relationship with the proportion of horticultural area in all the eastern states. Average annual rainfall showed a positive relationship in Bihar, Uttar Pradesh and West Bengal. In the state of Orissa the relationship was negative but not significant at 1% level of significance. Data on institutional credit was not available for Bihar during this period. Credit showed a positive relationship in Orissa and Uttar Pradesh, while in West Bengal it showed a negative but statistically non-significant result. Percentage of villages with electricity showed a positive relationship only in Bihar and West Bengal. In the Orissa the relationship was negative but non-significant while in Uttar Pradesh it was statistically significant at 1% level. Rural road density showed a positive relationship in Bihar and West Bengal while in Orissa and Uttar Pradesh the relationship was negative and not statistically significant. Rural literacy rate showed a positive relationship only in the state of Uttar Pradesh, while in the other states it showed a negative though non-significant relationship. Percentage of urban population showed a positive relationship in all the states except Bihar where it showed a negative but non-significant relationship.

As regards livestock, during the triennium 1992, average annual rainfall showed a positive relationship with the livestock population per 1000 hec of GCA only in the state of Uttar Pradesh. In the state of Bihar and Orissa the relationship was negative and significant at 5% level of significance, whereas in West Bengal it was negative but statistically not significant. Credit showed a positive relationship in Orissa and West Bengal, while in Uttar Pradesh the relationship was negative and statistically significant at 5% level of significance. Percentage of villages with electricity showed a negative but statistically non-significant relationship only in Bihar while it was positive in all the other states. Rural road density showed a positive relationship in all the states excepting Orissa where the relationship was negative but statistically non-significant at 1% level of significance. Rural literacy rate showed a positive relationship in all the states excepting

Bihar where the relationship though negative was non-significant. Percentage of urban population showed a positive relationship only in Orissa, whereas in Uttar Pradesh and West Bengal it showed a significantly negative relationship at 1% and 5% levels of significance respectively. In Bihar however, the negative relationship was not statistically significant (Appendix IV.2).

Factors Effecting Area under Horticultural Crops and Livestock Population (TE – 2002)

During the triennium ending 2002 irrigated area under horticulture as a proportion of GCA showed a positive relationship with the proportion of horticultural area in all the eastern states excepting Orissa where the negative relationship was not statistically significant. Average annual rainfall showed a positive relationship in Bihar and West Bengal. In the state of Orissa and Uttar Pradesh the relationship was negative but not significant at 1% level of significance. Institutional credit showed a positive relationship only in Bihar, while in Orissa it showed a negative and statistically significant result at 1% level, but in Uttar Pradesh and West Bengal the relationship was negative but non-significant. Percentage of villages with electricity showed a positive relationship in all states excepting Orissa where too the negative relationship was not statistically significant at 1% level of significance. Rural road density showed a positive relationship in Orissa and West Bengal, while in Bihar and Uttar Pradesh the relationship though negative was not statistically significant at 1% level of significance. Rural literacy rate showed a positive relationship in the states of Orissa and Uttar Pradesh, while in the other Bihar and West Bengal it showed a negative relationship statistically significant at 1% level of significance. Percentage of urban population showed a positive relationship in West Bengal and Orissa, whereas in Uttar Pradesh and Bihar it showed a negative relationship, wherein it was statistically significant at 1% level only in Uttar Pradesh.

During the triennium ending 2002, the average annual rainfall showed a positive relationship with the livestock population per 1000 hec of GCA in all the states. Institutional credit showed a positive relationship in Bihar and West Bengal, while in Orissa and Uttar Pradesh the relationship was negative but non-significant. Percentage of villages with electricity showed a negative but statistically non-significant relationship only in West Bengal while in all the other states it was positive. Rural road density

showed a positive relationship Uttar Pradesh and West Bengal, while in Bihar and Orissa the relationship was negative but statistically non-significant at 1% level of significance. Rural literacy rate showed a negative relationship in all the states and was statatistically significant at 1% level only in Orissa. Percentage of urban population showed a positive relationship in Bihar and West Bengal, whereas in Uttar Pradesh and Orissa it showed a negative though non-significant relationship at 1% level of significance (Appendix IV.2).

From this regression analysis of factors constraining area under horticultural crops and livestock population during the different trienniums, a shift in constraints was observed over the years. During the triennium ending 1972, in the state of Bihar, lack of electric supply constrained horticulture and livestock diversification, while timely availability of credit was the major issue in Orissa. In Uttar Pradesh, horticultural diversification was constrained by lack of power supply while insufficient rainfall affected livestock diversification. In West Bengal urban population affected both.

During the triennium ending 1982 and 1992, the constraints affecting horticulture and livestock diversification differed from the earlier triennium but during these two trienniums the constraints were nearly the same. In Bihar urban population negatively affected horticulture while insufficient rainfall affected livestock adversely. In Orissa, lack of sufficient rainfall affected both. In Uttar Pradesh, lack of power supply affected the horticulture sector while urban population affected the livestock sector. In West Bengal, horticulture diversification was mainly affected by unavailability of timely credit while lack of electricity affected the livestock sector.

During triennium ending 2002, rural literacy rate negatively affected livestock diversification in all the states. Horticultural diversification was hindered by rural literacy rate in Bihar and West Bengal, by urban population in Uttar Pradesh and unavailability of timely credit in Orissa. Therefore this factor analysis shows that in the present times educated youth are moving out of the traditional sources of income (agriculture and allied sectors) toward the non-farm sources. Further, timely availability of credit is to be emphasised for agricultural diversification. It is to be noted that in all the trienniums irrigation was one of the major factors showing a positive relationship with horticulture diversification while in the livestock sector road connectivity emerged as the most

important factor. Hence the several product and region specific challenges need to be addressed for enhancing agricultural diversification.

Constraints to Crop Diversification – Based on Field Survey

Tables 4.1 to 4.5 show the percentage of farmers listing major constraints to the cultivation of fruits, vegetables, flowers and cash crops in the selected districts of Bihar, Jharkhand, Orissa, Uttar Pradesh and West Bengal.

Constraints to Fruits Cultivation

It can be observed from Table 3.5 that in Bihar (taking both the districts into account), the major constraints that the majority of farmers faced in the cultivation of fruits were regarding the non-availability of land, lack of information and knowledge and lack of timely and proper irrigation. In the Kishanganj district; lack of available land and lack of information and knowledge were reported to be the major problems. Amongst all the land classes, the small farmers complained about the availability of land while it was the marginal farmers who complained about the lack of information and knowledge. In Rohtas district, the only problem was that of irrigation facilities which hindered the cultivation of fruits and it was reported by all the categories of farmers. In the state of Jharkhand, only medium farmers in Lohardaga district complained about the lack of information and knowledge.

In the state of Orissa, almost all the constraints posed problem in the cultivation of fruits. In the Bhadrak district, the poor condition of soil was found to be the major constraint to fruit cultivation followed by the lack of land availability, lack of information and knowledge and high cost of cultivation. Most of the marginal farmers complained about the poor soil condition and land not being available and the rest complained about the lack of information. The small farmers found the high cost of cultivation to be the major constraint while the medium famers again had the problem with the information and knowledge. All the large farmers were not happy with the soil condition. In the Kandhamal district, majority of the farmers reported the lack of information to be the major constraint followed by labour problems, lack of irrigation, high cost of cultivation and non-availability of credit. Most of the marginal, small and medium farmers found lack of information and knowledge to be problematic. Rest of the marginal farmers complained about labour problems while the rest of the small farmers were worried about

the high cost of cultivation and non availability of credit. Amongst the medium farmers, labour problems were found to be the second most important problem followed by the lack of irrigation. In both the districts; small and marginal farmers were found to be facing all the constraints while medium and large farmers complained only about the lack of information and knowledge and poor condition of soil.

In Uttar Pradesh, all the constraints were found to be posing problem except for the availability of credit which was not reported even by a single farmer; the labour problems being the major constraint. Also, the small and marginal farmers in both the districts were hindered by almost all the constraints. It can also be seen that in both the districts, non-availability of land posed a problem only for small and medium farmers. In the Mirzapur district, high cost of cultivation, lack of access to markets, non remunerative prices and labour problems were reported by all the land classes while only marginal and small farmers reported soil condition to be a problem. Lack of irrigation was also reported by all land classes except for large farmers; and most of them who complained about it were found to be medium farmers. Only small and medium farmers complained about the land availability. In the Varanasi district, labour problems were found to be the main problem followed by lack of information and knowledge, high cultivation cost, non-remunerative prices and lack of land availability. Labour problems were reported by all the land classes while only marginal farmers complained about land being not available and only small farmers found non remunerative prices to be a problem. The large farmers were worried only about labour problems.

In West Bengal, the major constraints to fruit cultivation were the lack of land availability, lack of information and knowledge and poor soil condition. Also, only marginal and small farmers were facing the constraints in this state. In the Burdwan district, all of the small farmers and most of the medium farmers complained about the non-availability of land while the rest of the medium farmers were concerned about the poor condition of soil. Whereas in the Jalpaiguri district of West Bengal, the only constraint was that of poor information sources and was reported by all the marginal and medium farmers.

Table 4.1: Proportion of Farmers Listing Major Constraints to Fruits Cultivation (%)

States	Districts	Farm Size Categories	Lack of Land Availability	Lack of Irrigation	Lack of Information & Knowledge	Poor Soil Condition	High Cost of Cultivation	Lack of Market Accessebility	Non-Remunerative Prices	Non-availibility of Credit	Labour Problems
Bihar	**Kishanganj**	**Marginal**	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**50.00**	**0.00**	**50.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Rohtas	**Marginal**	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**100.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Jharkhand	**Lohardaga**	**Marginal**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**100.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Sahebganj	**Marginal**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Orissa	**Bhadrak**	**Marginal**	40.00	0.00	20.00	40.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00
		Total	**22.22**	**0.00**	**22.22**	**33.33**	**22.22**	**0.00**	**0.00**	**0.00**	**0.00**
	Kandhamal	**Marginal**	0.00	0.00	90.91	0.00	0.00	0.00	0.00	0.00	9.09

		Small	0.00	0.00	66.67	0.00	16.67	0.00	0.00	16.67	0.00
		Medium	0.00	11.11	66.67	0.00	0.00	0.00	0.00	0.00	22.22
		Total	**0.00**	**3.85**	**76.92**	**0.00**	**3.85**	**0.00**	**0.00**	**3.85**	**11.54**
Uttar Pradesh	**Mirzapur**	**Marginal**	12.00	16.00	0.00	4.00	12.00	12.00	8.00	0.00	36.00
		Small	7.14	17.86	7.14	0.00	10.71	17.86	14.29	0.00	25.00
		Medium	0.00	37.50	0.00	0.00	25.00	12.50	12.50	0.00	12.50
		Large	0.00	0.00	0.00	0.00	25.00	25.00	25.00	0.00	25.00
		Total	**7.69**	**18.46**	**3.08**	**1.54**	**13.85**	**15.38**	**12.31**	**0.00**	**27.69**
	Varanasi	**Marginal**	7.14	0.00	28.57	0.00	14.29	0.00	0.00	0.00	50.00
		Small	0.00	0.00	17.65	0.00	11.76	0.00	29.41	0.00	41.18
		Medium	0.00	0.00	18.18	0.00	9.09	0.00	0.00	0.00	72.73
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
		Total	**2.33**	**0.00**	**20.93**	**0.00**	**11.63**	**0.00**	**11.63**	**0.00**	**53.49**
West Bengal	**Burdwan**	**Small**	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	60.00	0.00	0.00	40.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**66.67**	**0.00**	**0.00**	**33.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Jalpaiguri	**Marginal**	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	**0.00**	**0.00**	**100.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Source: Primary Field Survey

Constraints to Vegetables Cultivation

From Table 4.2 it is seen that in Bihar, the major constraints that hindered the cultivation of vegetables were lack of timely irrigation, non availability of credit, non-availability of land and lack of information and knowledge and lack of institutional support. The small and large farmers faced all these constraints while medium and large farmers found only lack of available land, lack of institutional support and lack of irrigation to be problematic. In both the districts, lack of irrigation was found to be the major constraint, reported by all the categories of farmers. In the Kishanganj district; majority of the marginal farmers and a small proportion of small farmers found non-availability of credit to be the second major constraint. Another constraint faced by all the land classes was the lack of available land. Only marginal farmers found lack of information and knowledge to be a problem while the constraint related to the lack of institutional support was reported only by small farmers. In the Rohtas district, apart from the constraint of lack of irrigation, only a very small proportion of marginal and medium farmers complained about the non-availability of credit while lack of available land was a problem only among marginal and small famers. Majority of the large farmers complained about the lack of institutional support. It can also be noted that in both the districts; lack of information and knowledge and non-availability of credit was of concern only amongst small and marginal farmers

In Jharkhand, lack of irrigation was found to be the major constraint hindering the cultivation of vegetables followed by lack of information and knowledge, high cost of cultivation and non-availability of land. In the Lohardaga district, all the marginal farmers and majority of the small farmers found lack of irrigation to be problematic while the rest of small farmers complained about the non-availability of credit. Amongst the medium farmers, half of them were worried about the high cost of cultivation and the rest half had problem with the lack of information and knowledge. In the case of Sahebganj district, the only problem was that of lack of irrigation and was reported by all the categories of farmers except for the large farmers. It can also be noticed that in both the districts, large farmers did not complain about any of the constraint. Further, the farm level data of this state again reveals the same fact that the small and marginal farmers were constrained by almost all the factors effecting cultivation of vegetables in this state.

In the state of Orissa, the major constraints effecting the vegetable cultivation were found to be high cultivation cost, lack of available land, lack of information and knowledge and poor soil condition. Also, all these constraints affected the marginal and small farmers while only one or two of them affected the medium farmers and none affected the large farmers. In Bhadrak district, high cost of cultivation was found to be the major constraint affecting the vegetable cultivation reported by most of the small farmers and all the medium farmers. Majority of the marginal farmers complained about the lack of available land and the poor condition of soil. The rest of the marginal farmers and one third of the small farmers were not happy with the irrigation condition. In the Khandamal district, lack of irrigation and lack of information and knowledge were reported to be the major constraints by all the categories of farmers. Lack of available land was also reported by all the farm classes (except large farmers) and only few marginal farmers were not happy with the soil condition.

In Uttar Pradesh, small and marginal farmers were hit by all the constraints that affected the cultivation of vegetables in this state. In the Mirzapur district, all the categories of farmers reported lack of irrigation to be the major constraint affecting the vegetable cultivation. High cultivation cost was found to be the second major constraint (reported by all the land classes) followed by lack of market accessibility and lack of information and knowledge (again reported by all except large farmers). Only marginal farmers found lack of land availability to be a problem while only small farmers reported the crops destroyed by insects or animals to be a concern. In the Varanasi district, all the land classes reported lack of institutional support to be the major constraint while non-remunerative prices was found to be the second major constraint (reported by all the categories of farmers) followed by lack of information and knowledge which was reported only by marginal farmers. Thus in Uttar Pradesh, lack of available land, crops destroyed by insects/ animals and lack of information and knowledge were reported only by small and marginal farmers.

In the state of West Bengal, the small and marginal farmers found non-availability of land, lack of institutional support, lack of irrigation, lack of access to local markets to be the major constraints. In the Burdwan district, non-availability of land was found to be the major constraint reported by all the categories of farmers. All the land classes except

the large farmers found lack of irrigation to be the second major constraint followed by non-availability of credit and lack of market accessibility, both of which were reported only by marginal farmers. Lack of institutional support was found to be the problem only among the marginal farmers. In the Jalpaiguri district, all the marginal and most of the small and medium farmers reported lack of irrigation to be the major constraint followed by non-remunerative prices which was reported only by one-third of the medium farmers. The rest of the small farmers found lack of institutional support to be problematic.

Table 4.2: Proportion of Farmers Listing Major Constraints to Vegetables Cultivation (%)

States	Districts	Farm Size Categories	Lack of Land Availability	Lack of Irrigation	Lack of Information & Knowledge	Poor Soil Condition	High Cost of Cultivation	Non-availibility of Credit	Non-Remunerative Prices	Labour Problems	Lack of Market Accessebility	Crops Destroyed by Insects/Animals	Lack of Institutional Support
Bihar	**Kishanganj**	**Marginal**	22.22	27.78	5.56	0.00	0.00	44.44	0.00	0.00	0.00	0.00	0.00
		Small	27.27	40.91	0.00	0.00	0.00	27.27	0.00	0.00	0.00	0.00	4.55
		Medium	25.00	75.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	25.00	38.64	2.27	0.00	0.00	31.82	0.00	0.00	0.00	0.00	2.27
	Rohtas	**Marginal**	9.52	80.95	0.00	0.00	0.00	4.76	0.00	0.00	0.00	0.00	4.76
		Small	6.67	93.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	92.31	0.00	0.00	0.00	7.69	0.00	0.00	0.00	0.00	0.00
		Large	0.00	33.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	66.67
		Total	5.77	84.62	0.00	0.00	0.00	3.85	0.00	0.00	0.00	0.00	5.77
Jharkhand	**Lohardaga**	**Marginal**	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	83.33	0.00	0.00	0.00	16.67	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	50.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	0.00	80.00	6.67	0.00	6.67	6.67	0.00	0.00	0.00	0.00	0.00
	Sahebganj	**Marginal**	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Orissa	**Bhadrak**	**Marginal**	40.00	20.00	0.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	33.33	0.00	0.00	66.67	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		Total	22.22	22.22	0.00	22.22	33.33	0.00	0.00	0.00	0.00	0.00	0.00
	Kandhamal	**Marginal**	12.50	31.25	50.00	0.00	6.25	0.00	0.00	0.00	0.00	0.00	0.00
		Small	12.50	62.50	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	20.00	40.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	14.71	41.18	41.18	0.00	2.94	0.00	0.00	0.00	0.00	0.00	0.00
Uttar Pradesh	**Mirzapur**	**Marginal**	13.64	31.82	18.18	0.00	9.09	0.00	0.00	0.00	18.18	0.00	9.09
		Small	0.00	40.74	7.41	0.00	22.22	0.00	0.00	0.00	7.41	3.70	18.52
		Medium	0.00	37.50	12.50	0.00	25.00	0.00	0.00	0.00	25.00	0.00	0.00
		Large	0.00	33.33	0.00	0.00	66.67	0.00	0.00	0.00	0.00	0.00	0.00
		Total	5.00	36.67	11.67	0.00	20.00	0.00	0.00	0.00	13.33	1.67	11.67
	Varanasi	**Marginal**	0.00	37.50	12.50	0.00	0.00	0.00	6.25	0.00	0.00	0.00	43.75
		Small	0.00	22.22	0.00	0.00	0.00	0.00	11.11	0.00	0.00	0.00	66.67
		Medium	0.00	36.36	0.00	0.00	0.00	0.00	27.27	0.00	0.00	0.00	36.36
		Total	0.00	31.11	4.44	0.00	0.00	0.00	13.33	0.00	0.00	0.00	51.11
West Bengal	**Burdwan**	**Marginal**	25.00	25.00	0.00	0.00	0.00	12.50	0.00	12.50	0.00	0.00	25.00
		Small	50.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	50.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	38.46	30.77	0.00	0.00	0.00	7.69	0.00	7.69	0.00	0.00	15.38
	Jalpaiguri	**Marginal**	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
		Medium	0.00	66.67	0.00	0.00	0.00	0.00	33.33	0.00	0.00	0.00	0.00
		Total	0.00	84.62	0.00	0.00	0.00	0.00	7.69	0.00	0.00	0.00	7.69

Source: Primary Field Survey

Constraints to Flowers Cultivation

From Table 4.3 it is seen that in Bihar, lack of irrigation and lack of information and knowledge were observed to be the major constraints hindering flower cultivation. The small and marginal farmers were found tot be suffering from both the constraints. In the Kishanganj district, only marginal farmers reported and they complained about the lack of information and knowledge. In the Rohtas district, all the small and medium farmers found lack of irrigation to be the major concern.

In Jharkhand, poor soil condition was found to be the most important constraint followed by lack of information and knowledge and high cultivation cost. In the Lohardaga district, only medium farmers reported and all of them were not happy with the condition of soil. In the Sahebganj district, all the small farmers found lack of information and knowledge to be problematic while all the medium farmers complained about the lack of access to local markets.

In Orissa; lack of irrigation was found to be the major constraint affecting flower cultivation in both the districts. Further, all the constraints were reported by marginal and small farmers while large farmers did not face even a single constraint. In the Bhadrak district, majority of the marginal farmers complained about the non-availability of land and poor soil condition while the rest of them reported lack of information and knowledge to be a concern. All the small farmers found the high cost of cultivation to be a problem while all the medium farmers complained about the lack of information and knowledge. In the Khandamal district, lack of information and knowledge to be the major constraint (reported by all the marginal, small and most of the medium farmers) followed by lack of access to local markets (reported by the rest of the medium farmers).

In the state of Uttar Pradesh,; all the constraints posed problem for the small and marginal farmers except for the poor soil condition which was not reported even by a single farmer. In the Mirzapur district, high cultivation cost and labour problems were found to be the major constraints reported by all the categories of farmers. Most of the marginal farmers and small farmers complained about the lack of information and knowledge. Only marginal farmers had problem with non-availability of land and non-availability of credit. Lack of market accessibility and lack of institutional support were reported only by marginal and small farmers. All the land classes except for large farmers

complained about the lack of irrigation. Another constraint that troubled all the land classes was that of the non-remunerative prices. In the Varanasi district, lack of information and knowledge was found to be the major constraint reported by all the land classes. A very small proportion of medium farmers complained about the labour problems. Lack of institutional support was found to be the problem by all except large farmers. Only marginal farmers complained about the lack of irrigation and non-remunerative prices, while high cultivation cost and lack of access to markets were reported only by small farmers. Taking both the districts into account, the small and marginal farmers were slightly better off in Varanasi, where they complained only about four constraints compared to the Mirzapur district. Even though the small and marginal farmers were slightly better off in Varanasi, they still lagged behind medium and large farmers in both the districts.

In West Bengal; in the Burdwan district, lack of information and knowledge, lack of market accessibility and lack of available land were found to be the major constraints affecting flower cultivation. Most of the marginal farmers complained about the lack of information and knowledge while the rest one-third of them reported lack of access to markets to be a problem. Majority of the medium farmers reported lack of available land and lack of market accessibility to be problematic while the rest of them complained about the lack of information and knowledge. In the Jalpaiguri district, lack of access to markets was observed to be the major constraint followed by lack of information and knowledge and lack of irrigation. Most of the marginal farmers and around one-fifth of the medium farmers reported lack of information and knowledge to be a problem. Rest of the marginal farmers complained about the lack of irrigation. Lack of access to local markets was reported by most of the medium farmers.

Table 4.3: Proportion of Farmers Listing Major Constraints to Flowers Cultivation (%)

States	Districts	Farm Size Categories	Lack of Land Availability	Lack of Irrigation	Lack of Information & Knowledge	Poor Soil Condition	High Cost of Cultivation	Lack of Market Accessibility	Non-availibility of Credit	Lack of Institutional Support	Labour Problems	Non-remunerative Prices
Bihar	**Kishanganj**	**Marginal**	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Rohtas	**Marginal**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jharkhand	**Lohardaga**	**Marginal**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
	Sahebganj	**Marginal**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	0.00	0.00	50.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00
Orissa	**Bhadrak**	**Marginal**	40.00	0.00	20.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		Total	25.00	0.00	25.00	25.00	25.00	0.00	0.00	0.00	0.00	0.00
	Kandhamal	**Marginal**	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	75.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00
		Total	0.00	0.00	91.67	0.00	0.00	8.33	0.00	0.00	0.00	0.00
Uttar Pradesh	**Mirzapur**	**Marginal**	5.26	5.26	21.05	0.00	21.05	10.53	5.26	5.26	21.05	5.26
		Small	0.00	8.00	24.00	0.00	20.00	12.00	0.00	8.00	8.00	20.00
		Medium	0.00	28.57	0.00	0.00	14.29	0.00	0.00	0.00	42.86	14.29
		Large	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	50.00	25.00
		Total	1.82	9.09	18.18	0.00	20.00	9.09	1.82	5.45	20.00	14.55
	Varanasi	**Marginal**	0.00	5.56	83.33	0.00	0.00	0.00	0.00	5.56	0.00	5.56
		Small	0.00	0.00	76.47	0.00	5.88	5.88	0.00	11.76	0.00	0.00
		Medium	0.00	0.00	90.91	0.00	0.00	0.00	0.00	0.00	9.09	0.00
		Total	0.00	2.17	82.61	0.00	2.17	2.17	0.00	6.52	2.17	2.17
West Bengal	**Burdwan**	**Marginal**	0.00	0.00	66.67	0.00	0.00	33.33	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	40.00	0.00	20.00	0.00	0.00	40.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	25.00	0.00	37.50	0.00	0.00	37.50	0.00	0.00	0.00	0.00
	Jalpaiguri	**Marginal**	0.00	33.33	66.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	20.00	0.00	0.00	80.00	0.00	0.00	0.00	0.00
		Total	0.00	12.50	37.50	0.00	0.00	50.00	0.00	0.00	0.00	0.00

Source: Primary Field Survey

Constraints to Cash Crops Cultivation

From Table 4.4 it is seen that in the state of Bihar, the only constraint to cash crop cultivation was found to be lack of irrigation and it was reported by all the small farmers from the Rohtas district.

In Jharkhand, labour problems, lack of information and knowledge and non remunerative prices were reported to be the major constraints affecting the cash crop cultivation. In the Lohardaga district, all the marginal farmers complained about the non remunerative prices while all the medium farmers found the lack of information and knowledge to be problematic. In the Sahebganj district, all the large farmers complained about the labour related problems.

In the state of Orissa, in the Bhadrak district, lack of irrigation was found to be the major constraint reported by half of the marginal and small farmers. Rest half of the small farmers and approximately one-third of the medium farmers found high cultivation cost to be problematic. Lack of available land and poor soil condition were reported by rest of the marginal farmers. Only medium farmers complained about the lack of information and knowledge and non-remunerative prices. All the large farmers reported about the labour related problems. In the Khandamal district, lack of information and knowledge were found to be the major constraint. It was reported by most of the marginal, half of the medium and all the small farmers. Rest of the marginal farmers complained about the lack of land availability. For the medium farmers, lack of irrigation was the second major constraint followed by non-availability of land and non-remunerative prices.

In the state of Uttar Pradesh, the small and marginal farmers were constrained by all the factors except for non-remunerative prices. In the Mirzapur district, lack of market accessibility was of major concern followed by lack of information and knowledge and lack of institutional support reported by all the land classes. High cost of cultivation was found to be affecting all the land classes except the large farmers. Only medium farmers had problem with the labour and the poor condition of soil while only marginal farmers complained about the land not being available. Non-availability of credit was found to be the second major constraint for marginal and small farmers. In the Varanasi district, lack of institutional support was found to be the most important constraint affecting majority of the marginal farmers and one-fifth of the small farmers. Most of the small farmers also

found lack of information and knowledge and non-availability of credit to be problematic while all the medium farmers complained about the lack of access to markets. It can further be noted that in both the districts, only small and marginal farmers did not have enough land and enough credit to cultivate cash crops.

In the state of West Bengal, in the Burdwan district, lack of available land was reported to be the major problem affecting cash crop cultivation. It was reported by majority of the small farmers and all the medium farmers. Half of the marginal farmers complained about the non-availability of credit while the rest half were worried about the non remunerative prices. Lack of irrigation and lack of access to markets were reported only by small farmers. In the Jalpaiguri district, non-availability of credit and the institutional related problems were the major constraints reported by the marginal and the medium farmers. All the small farmers complained about the non-remunerative prices while lack of irrigation was reported only by one-third of the medium farmers.

Table 4.4: Proportion of Farmers Listing Major Constraints to Cash Crops Cultivation (%)

States	Districts	Farm Size Categories	Lack of Land Availability	Lack of Irrigation	Lack of Information & Knowledge	Poor Soil Condition	High Cost of Cultivation	Non-availibility of Credit	Lack of Market Accessibility	Non-Remunerative Prices	Labour Problems	Lack of Institutional Support
Bihar	**Kishanganj**	**Marginal**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Rohtas	**Marginal**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jharkhand	**Lohardaga**	**Marginal**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00
		Medium	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	0.00	0.00	50.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00
	Sahebganj	**Marginal**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
Orissa	**Bhadrak**	**Marginal**	30.00	50.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	50.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00
		Medium	0.00	0.00	33.33	0.00	33.33	0.00	0.00	33.33	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00

		Total	16.67	38.89	5.56	11.11	16.67	0.00	0.00	5.56	5.56	0.00
	Kandhamal	**Marginal**	16.67	0.00	83.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Small	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Medium	10.00	30.00	50.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
		Total	11.11	11.11	74.07	0.00	0.00	0.00	0.00	3.70	0.00	0.00
Uttar Pradesh	**Mirzapur**	**Marginal**	5.88	5.88	17.65	0.00	11.76	17.65	23.53	0.00	11.76	5.88
		Small	0.00	12.50	16.67	0.00	8.33	16.67	25.00	0.00	0.00	20.83
		Medium	0.00	12.50	25.00	12.50	12.50	0.00	12.50	0.00	12.50	12.50
		Large	0.00	25.00	25.00	0.00	0.00	0.00	25.00	0.00	0.00	25.00
		Total	1.89	11.32	18.87	1.89	9.43	13.21	22.64	0.00	5.66	15.09
	Varanasi	**Marginal**	16.67	0.00	0.00	16.67	0.00	33.33	0.00	0.00	0.00	33.33
		Small	0.00	0.00	40.00	0.00	0.00	40.00	0.00	0.00	0.00	20.00
		Medium	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
		Total	8.33	0.00	16.67	8.33	0.00	33.33	8.33	0.00	0.00	25.00
West Bengal	**Burdwan**	**Marginal**	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00	0.00	0.00
		Small	33.33	33.33	0.00	0.00	0.00	0.00	33.33	0.00	0.00	0.00
		Medium	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Large	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Total	42.86	14.29	0.00	0.00	0.00	14.29	14.29	14.29	0.00	0.00
	Jalpaiguri	**Marginal**	0.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	50.00
		Small	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00
		Medium	0.00	33.33	0.00	0.00	0.00	33.33	0.00	0.00	0.00	33.33
		Total	0.00	16.67	0.00	0.00	0.00	33.33	0.00	16.67	0.00	33.33

Source: Primary Field Survey

Constraints to Livestock Diversification

Table 4.5 lists out the major constraints towards diversification of livestock in the study regions. It is observed that non-availability of credit in time is reported to be the major constraint towards diversification of livestock by majority of the small and marginal farming households in the Kishangarh district of Bihar and Bhadrak district of Orissa. Lack of proper veterinary services is the major constraint towards Livestock diversification by small and marginal farmers in the Kandhamal district of Orissa, and in both districts of Uttar Pradesh. Lack of proper feed is the major constraint for small and marginal farmers in both districts of Jharkhand, Uttar Pradesh and Jalpaiguri district of West Bengal. Non-remunerative prices are the major constraint for small and marginal farmers in the Rohtas district of Bihar and Burdwan district of West Bengal. The constraint of non-availability of credit on time and non-availability of proper feed is found to be usually inversely related to farm size in the study regions. Medium and large farmers also reported non-remunerative prices to be a constraint.

Table 4.5: Proportion of Farmers Listing Major Constraints to Livestock Diversification (%)

States	Districts	Farm Size Categories	Non-Availability of Credit	Lack of Marketing Facilities	Non-remunerative Prices	Lack of Veterinary Services	Non-Availability of Proper Feed	Others
Bihar	**Kishanganj**	**Marginal**	36.36	27.27	9.09	0.00	27.27	0.00
		Small	41.18	11.76	5.88	11.76	29.41	0.00
		Medium	25.00	50.00	0.00	0.00	25.00	0.00
		Total	**37.50**	**21.88**	**6.25**	**6.25**	**28.13**	**0.00**
	Rohtas	**Marginal**	26.09	17.39	21.74	17.39	17.39	0.00
		Small	20.00	10.00	30.00	10.00	20.00	10.00
		Medium	14.29	14.29	21.43	21.43	21.43	7.14
		Large	0.00	0.00	100	0.00	0.00	0.00
		Total	**20.83**	**14.58**	**22.92**	**16.67**	**18.75**	**6.25**
Jharkhand	**Lohardaga**	**Marginal**	9.09	0.00	0.00	18.18	63.64	9.09
		Small	10.00	0.00	0.00	30.00	60.00	0.00
		Medium	40.00	10.00	0.00	30.00	20.00	0.00
		Large	0.00	0.00	0.00	100.00	0.00	0.00
		Total	**19.35**	**3.23**	**0.00**	**25.81**	**48.39**	**3.23**
	Sahebganj	**Marginal**	10.00	30.00	0.00	30.00	30.00	0.00
		Small	20.00	0.00	0.00	40.00	40.00	0.00
		Medium	0.00	0.00	0.00	28.57	71.43	0.00
		Large	0.00	0.00	0.00	100.00	0.00	0.00
		Total	**8.70**	**13.04**	**0.00**	**34.78**	**43.48**	**0.00**
Orissa	**Bhadrak**	**Marginal**	33.82	7.35	8.82	20.59	27.94	1.47
		Small	29.17	12.50	12.50	20.83	20.83	4.17
		Medium	26.19	9.52	19.05	28.57	16.67	0.00
		Large	25.00	25.00	0.00	25.00	25.00	0.00
		Total	**30.25**	**9.88**	**12.35**	**22.84**	**22.84**	**1.85**
	Kandhamal	**Marginal**	17.98	19.10	14.61	32.58	15.73	0.00
		Small	20.59	8.82	20.59	29.41	20.59	0.00
		Medium	34.88	11.63	13.95	30.23	9.30	0.00
		Total	**22.89**	**15.06**	**15.66**	**31.33**	**15.06**	**0.00**
Uttar Pradesh	**Mirzapur**	**Marginal**	15.00	11.67	21.67	25.83	25.83	0.00

		Small	15.63	13.13	21.25	26.25	23.13	0.63
		Medium	12.50	2.50	27.50	30.00	27.50	0.00
		Large	0.00	6.25	25.00	37.50	31.25	0.00
		Total	**14.29**	**11.01**	**22.32**	**27.08**	**25.00**	**0.30**
	Varanasi	**Marginal**	19.21	18.08	20.90	22.03	19.77	0.00
		Small	20.42	15.49	21.13	21.83	20.42	0.70
		Medium	13.24	22.06	25.00	26.47	11.76	1.47
		Large	20.00	20.00	20.00	20.00	20.00	0.00
		Total	**18.62**	**17.86**	**21.68**	**22.70**	**18.62**	**0.51**
West Bengal	**Burdwan**	**Marginal**	25.00	12.50	31.25	6.25	25.00	0.00
		Small	0.00	0.00	40.00	60.00	0.00	0.00
		Medium	0.00	25.00	16.67	0.00	33.33	25.00
		Large	0.00	0.00	40.00	20.00	40.00	0.00
		Total	**10.53**	**13.16**	**28.95**	**13.16**	**26.32**	**7.89**
	Jalpaiguri	**Marginal**	33.33	0.00	0.00	33.33	33.33	0.00
		Small	14.29	14.29	0.00	14.29	57.14	0.00
		Medium	0.00	6.25	18.75	18.75	43.75	12.50
		Total	**7.69**	**7.69**	**11.54**	**19.23**	**46.15**	**7.69**

Source: Primary Field Survey

Appendix IV.I

Factors Affecting Value of Output from Agriculture & Allied Sectors (TE – 2007)

BIHAR

Value of Output from Crop Production				
Multiple R	0.607			
R Square	0.368			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.603	0.853	-0.706	0.486
Irrigated Area under Other Crops as a %age of GCA	0.977	0.918	1.064	0.297
Fertilizer Consumption (Tonnes/Hec)	-0.016	0.131	-0.121	0.905
No. of Regulated Markets per Unit GCA	-0.167	0.119	-1.399	0.173
Annual Rainfall (mms)	-0.022	0.176	-0.123	0.903
Outstanding Credit (Rs. Lakh)	0.377	0.151	2.498	0.019
Rural Roads per 1000 Hec GCA	-0.243	0.131	-1.848	0.076
% Villages with Electricity	-0.089	0.171	-0.523	0.605
Rural Literacy Rate (%)	-0.144	0.292	-0.492	0.627
Urban Population (%)	0.069	0.174	0.396	0.696

Value of Output from Horticulture				
Multiple R	0.836			
R Square	0.699			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.136	0.277	0.493	0.630
Irrigated Area under Horticulture as a %age of GCA	0.638	0.183	3.482	0.001
Fertilizer Consumption (Tonnes/Hec)	-0.225	0.139	-1.619	0.134
Annual Rainfall (mms)	0.376	0.198	1.895	0.123
Outstanding Credit (Rs. Lakh)	0.260	0.162	1.606	0.081
Rural Roads per 1000 Hec GCA	-0.170	0.143	-1.183	0.373
% Villages with Electricity	-0.063	0.202	-0.314	0.628
Rural Literacy Rate (%)	-0.169	0.314	-0.540	0.133
Urban Population (%)	-0.073	0.214	-0.341	0.459
No. of Cold Storages	0.198	0.171	1.154	0.628

Value of Output from Livestock				
Multiple R	1.000			
R Square	1.000			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.005	0.007	-0.681	0.502
Annual Rainfall (mms)	0.005	0.005	0.937	0.357
Outstanding Credit (Rs. Lakh)	0.003	0.006	0.535	0.597
Rural Road Length per Unit GCA	0.0028	0.004	0.693	0.494
% Villages with Electricity	-0.0002	0.006	-0.034	0.973
Rural Literacy Rate (%)	-0.001	0.008	-0.133	0.895
Urban Population (%)	-0.003	0.006	-0.525	0.604
%age of Vetrinary Service Establishments	1.0065	0.008	118.765	0.000
Grazing & Pasture Land as a %age of Reported Area	0.0003	0.003	0.081	0.936

Value of Output from Forestry				
Multiple R	0.550			
R Square	0.303			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.365	0.391	-0.933	0.358
Annual Rainfall (mms)	0.182	0.284	0.642	0.526
Outstanding Credit (Rs. Lakh)	-0.034	0.217	-0.158	0.875
Rural Road Length per 1000 Hec GCA	-0.122	0.226	-0.539	0.594
Rural Literacy Rate (%)	0.623	0.438	1.422	0.165
Urban Population (%)	-0.153	0.286	-0.535	0.597
Forest Protection Committees	0.578	0.176	3.278	0.003

Value of Output from Fisheries				
Multiple R	0.467			
R Square	0.218			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.007	0.407	-0.016	0.987
Annual Rainfall (mms)	0.145	0.298	0.486	0.631
Outstanding Credit (Rs. Lakh)	-0.070	0.233	-0.299	0.767
% Villages with Electricity	0.626	0.319	1.960	0.060
Rural Road Length per 1000 Hec GCA	-0.282	0.229	-1.231	0.228
Rural Literacy Rate (%)	-0.264	0.442	-0.598	0.555
Urban Population (%)	0.040	0.338	0.117	0.908
No. of Cold Storages	-0.197	0.265	-0.744	0.463

ORISSA

Value of Output from Crop Production				
Multiple R	0.826			
R Square	0.682			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.164	0.346	0.473	0.641
Irrigated Area under Other Crops as a %age of GCA	0.039	0.331	0.118	0.907
Total Fertilizer Consumption (Tonnes/Hec)	0.340	0.157	2.172	0.042
Annual Rainfall (mms)	-0.084	0.277	-0.304	0.764
Outstanding Credit (Rs. Lakh)	0.644	0.205	3.143	0.005
No. of Regulated Markets per 1000 Hec GCA	0.268	0.201	1.333	0.198
Rural Roads per 1000 Hec GCA	-0.165	0.204	-0.809	0.428
% Villages with Electricity	0.204	0.245	0.835	0.413
Rural Literacy Rate (%)	-0.276	0.198	-1.395	0.178
Urban Population (%)	-0.128	0.133	-0.963	0.347

Value of Output from Horticulture				
Multiple R	0.792			
R Square	0.627			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.413	0.266	1.553	0.136
Total Fertilizer Consumption (Tonnes/Hec)	-0.222	0.157	-1.415	0.173
Irrigated Area under Horticulture as a %age of GCA	-0.174	0.174	-1.001	0.329
Annual Rainfall (mms)	0.131	0.244	0.536	0.598
Outstanding Credit (Rs. Lakh)	0.734	0.231	3.177	0.005
Rural Roads per 1000 Hec GCA	-0.182	0.209	-0.871	0.394
% Villages with Electricity	0.383	0.263	1.459	0.160
Rural Literacy Rate (%)	-0.614	0.217	-2.825	0.010
Urban Population (%)	0.339	0.178	1.912	0.070
No. of Cold Storages	-0.438	0.210	-2.087	0.050

Value of Output from Livestock				
Multiple R	0.693			
R Square	0.480			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.585	0.275	2.131	0.045
Annual Rainfall (mms)	0.061	0.252	0.244	0.810
Outstanding Credit (Rs. Lakh)	0.583	0.429	1.360	0.188
Rural Roads per 1000 Hec GCA	-0.420	0.216	-1.943	0.066
% Villages with Electricity	0.394	0.295	1.336	0.196
Rural Literacy Rate (%)	-0.318	0.278	-1.142	0.266
Urban Population (%)	0.199	0.165	1.205	0.242
Vetrinary Service Establishments	-0.395	0.420	-0.940	0.358
Grazing & Pasture Land as a %age of Reported Area	-0.356	0.225	-1.581	0.129

Value of Output from Forestry				
Multiple R	0.775			
R Square	0.601			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.409	0.247	1.654	0.112
Annual Rainfall (mms)	-0.073	0.255	-0.287	0.777
Outstanding Credit (Rs. Lakh)	0.280	0.230	1.218	0.236
Rural Roads per 1000 Hec GCA	0.238	0.233	1.020	0.318
Rural Literacy Rate (%)	-0.575	0.253	-2.270	0.033
Urban Population (%)	0.208	0.161	1.293	0.209
Forest Protection Committees	0.527	0.178	2.958	0.007

Value of Output from Fisheries				
Multiple R	0.792			
R Square	0.627			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.185	0.250	0.743	0.465
Annual Rainfall (mms)	-0.687	0.238	-2.882	0.009
Outstanding Credit (Rs. Lakh)	0.949	0.225	4.215	0.000
% Villages with Electricity	0.213	0.255	0.837	0.412
Rural Roads per 1000 Hec GCA	0.473	0.198	2.392	0.026
Rural Literacy Rate (%)	-0.222	0.203	-1.091	0.287
Urban Population (%)	-0.131	0.170	-0.769	0.450
No. of Cold Storages	0.209	0.202	1.031	0.314

UTTAR PRADESH

Value of Output from Crop Production				
Multiple R	0.430			
R Square	0.185			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.916	0.631	-1.451	0.152
Irrigated Area under Crops as a %age of GCA	0.961	0.549	1.752	0.085
Total Fertilizer Consumption (Tonnes/Hec)	0.332	0.153	2.165	0.034
Annual Rainfall (mms)	0.095	0.162	0.585	0.561
Outstanding Credit (Rs. Lakh)	0.256	0.202	1.265	0.211
No.of Regulated Markets per 1000 Hec GCA	0.055	0.122	0.455	0.650
% Villages with Electricity	-0.050	0.183	-0.275	0.785
Rural Road Length per 1000 Hec GCA	-0.066	0.110	-0.599	0.551
Rural Literacy Rate (%)	-0.141	0.213	-0.663	0.510
Urban Population (%)	0.210	0.134	1.561	0.124

Value of Output from Horticulture				
Multiple R	0.846			
R Square	0.716			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.344	0.175	1.963	0.054
Irrigated Area under Horticulture as a %age of GCA	1.009	0.094	10.710	0.000
Total Fertilizer Consumption (Tonnes/Hec)	-0.078	0.106	-0.734	0.466
Annual Rainfall (mms)	-0.300	0.121	-2.473	0.016
Outstanding Credit (Rs. Lakh)	0.094	0.145	0.650	0.518
% Villages with Electricity	-0.074	0.129	-0.571	0.570
Rural Road Length per 1000 Hec GCA	0.054	0.082	0.658	0.513
Rural Literacy Rate (%)	-0.153	0.148	-1.036	0.304
Urban Population (%)	-0.175	0.098	-1.781	0.080
Village Haats	0.188	0.098	1.911	0.061

Value of Output from Livestock				
Multiple R	0.767			
R Square	0.588			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.682	0.173	3.950	0.000
Annual Rainfall (mms)	-0.250	0.118	-2.106	0.039
Outstanding Credit (Rs. Lakh)	0.065	0.139	0.467	0.642
% Villages with Electricity	-0.027	0.127	-0.212	0.833
Rural Road Length per 1000 Hec GCA	0.089	0.079	1.118	0.268
Rural Literacy Rate (%)	-0.452	0.145	-3.111	0.003
Urban Population (%)	-0.079	0.095	-0.836	0.406
Village Haats	0.024	0.125	0.195	0.846
%age of Vetrinary Service Establishments	0.562	0.104	5.423	0.000
Grazing & Pasture Land as a %age of Reported Area	0.168	0.077	2.193	0.032

Value of Output from Forestry				
Multiple R	0.288			
R Square	0.083			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.291	0.160	1.818	0.074
Annual Rainfall (mms)	0.038	0.125	0.305	0.762
Outstanding Credit (Rs. Lakh)	-0.051	0.148	-0.347	0.730
Rural Road Length per 1000 Hec GCA	-0.024	0.082	-0.292	0.771
Rural Literacy Rate (%)	-0.270	0.150	-1.797	0.077
Urban Population (%)	0.012	0.097	0.121	0.904
Village Haats	-0.072	0.102	-0.704	0.484

Value of Output from Fisheries				
Multiple R	0.422			
R Square	0.178			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.172	0.150	-1.146	0.256
Annual Rainfall (mms)	0.191	0.103	1.847	0.069
Outstanding Credit (Rs. Lakh)	0.057	0.121	0.470	0.640
% Villages with Electricity	-0.111	0.110	-1.017	0.313
Rural Road Length per 1000 Hec GCA	-0.003	0.068	-0.045	0.964
Rural Literacy Rate (%)	0.100	0.125	0.802	0.425
Urban Population (%)	0.090	0.080	1.131	0.262
Village Haats	0.160	0.084	1.916	0.060

JHARKHAND

Value of Output from Crop Production				
Multiple R	0.8107			
R Square	0.6572			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1.2223	0.9888	1.2361	0.2477
Total Fertilizer Consumption (Tonnes/Hec)	-0.2401	0.2376	-1.0103	0.3387
Irrigated Area under Crops as a %age of GCA	-0.7666	0.4498	-1.7044	0.1225
Annual Rainfall (mms)	0.0680	0.4200	0.1619	0.8749
Outstanding Credit (Rs. Lakh)	0.4148	0.3919	1.0586	0.3174
No. of Regulated Markets per 1000 Hec GCA	-0.6034	0.3841	-1.5709	0.1506
% Villages with Electricity	-0.7468	0.4810	-1.5526	0.1549
Rural Road Length per 1000 Hec GCA)	0.6675	0.3611	1.8483	0.0976
Rural Literacy Rate (%)	-0.3335	0.9245	-0.3607	0.7266

Value of Output from Horticulture				
Multiple R	0.9838			
R Square	0.9678			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.0713	0.1557	-0.4578	0.6593
Irrigated Area under Horticulture as a %age of GCA	-0.1670	0.0694	-2.4071	0.0427
Total Fertilizer Consumption (Tonnes/Hec)	-0.0567	0.0476	-1.1912	0.2677
Annual Rainfall (mms)	0.0806	0.0951	0.8468	0.4217
Outstanding Credit (Rs. Lakh)	0.6316	0.1254	5.0361	0.0010
Rural Road Length per 1000 Hec GCA)	-0.0229	0.0759	-0.3010	0.7711
% Villages with Electricity	-0.0575	0.1271	-0.4525	0.6629
Rural Literacy Rate (%)	0.3849	0.1983	1.9408	0.0882
Urban Population (%)	0.0796	0.1035	0.7685	0.4642
No. of Cold Storages	0.2103	0.0799	2.6307	0.0301

Value of Output from Livestock				
Multiple R	0.9883			
R Square	0.9766			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.0474	0.1200	0.3951	0.7020
Annual Rainfall (mms)	-0.1498	0.0782	-1.9159	0.0876
Outstanding Credit (Rs. Lakh)	0.8411	0.0878	9.5824	0.0000
Rural Road Length per 1000 Hec GCA)	-0.0311	0.0639	-0.4864	0.6383
% Villages with Electricity	-0.0844	0.1117	-0.7558	0.4691
Rural Literacy Rate (%)	0.0691	0.1373	0.5029	0.6271
Urban Population (%)	-0.0286	0.0826	-0.3458	0.7374
Vetirinary Services (%)	0.5328	0.0558	9.5490	0.0000
Grazing & Pasture Land as a %age of Reported Area	0.0019	0.0470	0.0402	0.9688

Value of Output from Fisheries				
Multiple R	0.5992			
R Square	0.3590			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.7539	0.8133	0.9270	0.3757
Annual Rainfall (mms)	-0.0231	0.5613	-0.0412	0.9679
Outstanding Credit (Rs. Lakh)	0.2324	0.7341	0.3165	0.7581
Rural Road Length per 1000 Hec GCA)	-0.8222	0.4594	-1.7897	0.1038
% Villages with Electricity	0.5270	0.7477	0.7048	0.4970
Rural Literacy Rate (%)	-0.8328	0.9437	-0.8825	0.3982
Urban Population (%)	0.1513	0.5749	0.2631	0.7978
No. of Cold Storages	0.4825	0.4926	0.9794	0.3505

Value of Output from Forestry				
Multiple R	0.5800			
R Square	0.3363			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.1875	0.7731	-0.2425	0.8128
Annual Rainfall (mms)	0.5908	0.5833	1.0128	0.3329
Outstanding Credit (Rs. Lakh)	-0.3249	0.6296	-0.5160	0.6161
Rural Road Length per 1000 Hec GCA)	0.8706	0.4269	2.0392	0.0662
Rural Literacy Rate (%)	0.0269	0.9741	0.0276	0.9785
Urban Population (%)	-0.4244	0.4267	-0.9946	0.3413
Forest Protection Committees	0.2779	0.2897	0.9592	0.3581

WEST BENGAL

Value of Output from Crop Production				
Multiple R	0.744			
R Square	0.554			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2.135	2.285	0.934	0.381
Irrigated Area under Crops as a %age of GCA (Hec)	-1.707	1.879	-0.908	0.394
Total Fertilizer Consumption (Tonnes/Hec)	-1.287	0.893	-1.442	0.193
Annual Rainfall (mms)	-0.846	0.509	-1.663	0.140
Outstanding Credit (Rs. Lakh)	0.603	0.400	1.507	0.176
No.of Regulated Markets per 1000 Hec GCA	-0.119	0.386	-0.307	0.768
Rural Road Length per 1000 Hec GCA	0.156	0.444	0.351	0.736
% Villages with Electricity	0.652	0.607	1.074	0.319
Rural Literacy Rate (%)	0.228	0.977	0.234	0.822
Urban Population (%)	-0.008	0.429	-0.020	0.985

Value of Output from Horticulture				
Multiple R	0.970			
R Square	0.942			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.045	0.305	-0.147	0.888
Irrigated Area under Horticulture as a %age of GCA (Hec)	0.138	0.245	0.562	0.594
Total Fertilizer Consumption (Tonnes/Hec)	-0.260	0.323	-0.805	0.451
Annual Rainfall (mms)	0.068	0.280	0.242	0.817
Outstanding Credit (Rs. Lakh)	-0.112	0.221	-0.507	0.630
% Villages with Electricity	-0.001	0.260	-0.005	0.996
Rural Road Length per 1000 Hec GCA	0.046	0.166	0.280	0.789
Rural Literacy Rate (%)	0.221	0.379	0.584	0.581
Urban Population (%)	-0.046	0.155	-0.301	0.774
No. of Cold Storages	0.926	0.210	4.413	0.005
Village Haats	0.002	0.176	0.011	0.991

Value of Output from Livestock				
Multiple R	0.952			
R Square	0.907			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.121	0.313	0.387	0.710
Annual Rainfall (mms)	0.189	0.162	1.170	0.280
Outstanding Credit (Rs. Lakh)	0.345	0.308	1.121	0.299
% Villages with Electricity	-0.060	0.227	-0.265	0.798
Rural Road Length per 1000 Hec GCA	-0.184	0.177	-1.042	0.332
Rural Literacy Rate (%)	-0.055	0.299	-0.184	0.859
Urban Population (%)	-0.102	0.150	-0.676	0.521
Village Haats	0.025	0.225	0.113	0.913
%age of Vetrinary Service Establishments	0.620	0.289	2.146	0.069
Grazing & Pasture Land as a %age of Reported Area	0.151	0.198	0.761	0.472

Value of Output from Forestry				
Multiple R	0.966			
R Square	0.933			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.377	0.194	1.949	0.083
Annual Rainfall (mms)	0.516	0.132	3.923	0.003
Outstanding Credit (Rs. Lakh)	0.359	0.146	2.468	0.036
Rural Road Length per 1000 Hec GCA	0.452	0.125	3.628	0.006
Rural Literacy Rate (%)	-1.346	0.279	-4.815	0.001
Urban Population (%)	0.207	0.119	1.741	0.116
Village Haats	0.380	0.148	2.568	0.030
Forest Protection Committees	0.576	0.103	5.603	0.000

Value of Output from Fisheries				
Multiple R	0.921			
R Square	0.848			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.169	0.338	-0.501	0.630
Annual Rainfall (mms)	0.112	0.200	0.560	0.591
Outstanding Credit (Rs. Lakh)	0.790	0.206	3.836	0.005
% Villages with Electricity	0.018	0.229	0.080	0.938
Rural Road Length per 1000 Hec GCA	0.035	0.181	0.193	0.852
Rural Literacy Rate (%)	-0.094	0.367	-0.256	0.805
Urban Population (%)	-0.004	0.175	-0.024	0.982
No. of Cold Storages	-0.196	0.155	-1.266	0.241
Village Haats	0.239	0.206	1.158	0.280

Appendix A.IV.2

Factors Affecting Area under Horticultural Crops and Livestock Population in Different Trienniums

Triennium Ending 1972

Bihar - Area under Horticulture as %age of GCA				
Multiple R	0.876			
R Square	0.767			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.195	0.156	1.250	0.228
Irrigated Area under Horticulture as % of GCA	0.939	0.201	4.665	0.000
Annual Rainfall (mms)	0.041	0.143	0.291	0.775
% Villages with Electricity	-0.167	0.231	-0.720	0.481
Rural Road Length per 1000 GCA	0.146	0.118	1.238	0.233
Rural Literacy Rate (%)	-0.119	0.179	-0.662	0.517
Urban Population (%)	0.038	0.145	0.260	0.798

Bihar - Livestock Population per 1000 Hec GCA				
Multiple R	0.329			
R Square	0.108			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.248	0.279	0.889	0.386
Annual Rainfall (mms)	0.211	0.259	0.816	0.425
% Villages with Electricity	-0.274	0.290	-0.945	0.357
Rural Road Length per 1000 GCA	-0.154	0.216	-0.714	0.484
Rural Literacy Rate (%)	0.134	0.329	0.408	0.688
Urban Population (%)	0.135	0.266	0.510	0.616

Orissa - Area under Horticulture as %age of GCA				
Multiple R	0.991			
R Square	0.982			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.196	0.166	-1.182	0.290
Irrigated Area under Horticulture as % of GCA	0.868	0.095	9.094	0.000
Annual Rainfall (mms)	0.196	0.188	1.042	0.345

Orissa - Livestock Population per 1000 Hec GCA				
Multiple R	0.724			
R Square	0.524			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.335	0.457	0.733	0.491
Annual Rainfall (mms)	0.161	0.534	0.301	0.774
Outstanding Credit (Rs. Lakh)	-0.243	0.262	-0.928	0.389

Outstanding Credit (Rs. Lakh)	-0.209	0.095	-2.207	0.078
% Villages with Electricity	-0.203	0.169	-1.202	0.283
Rural Road Length per 1000 GCA	-0.298	0.193	-1.547	0.183
Rural Literacy Rate (%)	0.540	0.215	2.513	0.054
Urban Population (%)	0.378	0.170	2.219	0.077

% Villages with Electricity	-0.273	0.484	-0.563	0.594
Rural Road Length per 1000 GCA	0.249	0.554	0.449	0.669
Rural Literacy Rate (%)	0.308	0.554	0.555	0.599
Urban Population (%)	0.351	0.497	0.706	0.507

Uttar Pradesh - Area under Horticulture as %age of GCA				
Multiple R	0.908			
R Square	0.824			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.206	0.117	1.753	0.087
Annual Rainfall (mms)	-0.015	0.134	-0.112	0.911
Irrigated Area under Horticulture as % of GCA	0.844	0.075	11.301	0.000
Outstanding Credit (Rs. Lakh)	0.013	0.116	0.109	0.913
% Villages with Electricity	-0.303	0.097	-3.126	0.003
Rural Road Length per 1000 Hec GCA	0.017	0.113	0.151	0.881
Urban Population	-0.020	0.102	-0.198	0.844
Rural Literacy Rate (%)	-0.129	0.109	-1.179	0.245

Uttar Pradesh - Livestock Population per 1000 Hec GCA				
Multiple R	0.217			
R Square	0.047			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.208	0.124	1.681	0.100
Annual Rainfall (mms)	-0.151	0.151	-1.001	0.323
Outstanding Credit (Rs. Lakh)	0.043	0.133	0.322	0.749
% Villages with Electricity	-0.029	0.112	-0.258	0.797
Rural Road Length per 1000 Hec GCA	0.004	0.128	0.033	0.974
Urban Population	-0.072	0.110	-0.651	0.519
Rural Literacy Rate (%)	0.061	0.127	0.480	0.634

West Bengal - Area under Horticulture as %age of GCA				
Multiple R	0.989			
R Square	0.978			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.016	0.091	0.171	0.869
Irrigated Area under Horticulture as % of GCA	0.991	0.070	14.210	0.000
Annual Rainfall (mms)	0.045	0.088	0.504	0.630
Outstanding Credit (Rs. Lakh)	-0.062	0.065	-0.948	0.375
% Villages with Electricity	0.060	0.058	1.044	0.331
Rural Road Length per 1000 Hec GCA	0.456	0.098	4.640	0.002
Urban Population (%)	-0.258	0.141	-1.829	0.110
Rural Literacy Rate (%)	-0.113	0.151	-0.750	0.478

West Bengal - Livestock Population per 1000 Hec GCA				
Multiple R	0.764			
R Square	0.584			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.854	0.280	3.051	0.016
Annual Rainfall (mms)	-0.138	0.279	-0.496	0.633
Outstanding Credit (Rs. Lakh)	0.274	0.193	1.423	0.193
% Villages with Electricity	-0.126	0.181	-0.696	0.506
Rural Road Length per 1000 Hec GCA	0.868	0.308	2.816	0.023
Urban Population (%)	-0.526	0.445	-1.183	0.271
Rural Literacy Rate (%)	-0.367	0.449	-0.819	0.437

Triennium Ending 1982

Bihar - Area under Horticulture as %age of GCA				
Multiple R	0.782			
R Square	0.612			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.291	0.390	0.747	0.466
Irrigated Area under Horticulture as a %age of GCA	0.967	0.233	4.150	0.001
Annual Rainfall (mms)	0.424	0.239	1.773	0.094
% Villages with Electricity	-0.178	0.255	-0.700	0.494
Rural Road Length per 1000 Hec GCA	0.121	0.159	0.764	0.456
Rural Literacy Rate (%)	-0.279	0.447	-0.625	0.540
Urban Population (%)	-0.265	0.214	-1.238	0.233

Bihar - Livestock Population per 1000 Hec GCA				
Multiple R	0.451			
R Square	0.204			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1.161	0.441	2.631	0.017
Annual Rainfall (mms)	-0.532	0.284	-1.875	0.077
% Villages with Electricity	0.000	0.270	0.000	1.000
Rural Road Length per 1000 Hec GCA	0.206	0.188	1.097	0.287
Rural Literacy Rate (%)	-0.517	0.484	-1.067	0.300
Urban Population (%)	0.147	0.253	0.579	0.570

Orissa - Area under Horticulture as %age of GCA				
Multiple R	0.978			
R Square	0.957			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.189	0.211	0.895	0.412
Irrigated Area under Horticulture as a %age of GCA	0.365	0.177	2.059	0.095
Annual Rainfall (mms)	-0.937	0.282	-3.317	0.021
Outstanding Credit (Rs. Lakh)	0.125	0.126	0.992	0.367
% Villages with Electricity	0.141	0.266	0.529	0.619

Orissa - Livestock Population per 1000 Hec GCA				
Multiple R	0.755			
R Square	0.570			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.718	0.210	3.416	0.014
Annual Rainfall (mms)	-0.291	0.307	-0.947	0.380
Outstanding Credit (Rs. Lakh)	-0.112	0.136	-0.824	0.442
% Villages with Electricity	0.071	0.278	0.256	0.806
Rural Road Length per 1000 Hec GCA	0.379	0.191	1.978	0.095

Rural Road Length per 1000 Hec GCA	0.466	0.182	2.555	0.051
Rural Literacy Rate (%)	0.917	0.335	2.742	0.041
Urban Population (%)	-0.406	0.187	-2.173	0.082

Rural Literacy Rate (%)	0.263	0.299	0.880	0.413
Urban Population (%)	0.104	0.173	0.603	0.569

Uttar Pradesh - Area under Horticulture as %age of GCA				
Multiple R	0.885			
R Square	0.784			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.028	0.120	0.233	0.817
Irrigated Area under Horticulture as a %age of GCA	0.823	0.080	10.263	0.000
Annual Rainfall (mms)	0.288	0.116	2.486	0.017
Outstanding Credit (Rs. Lakh)	-0.041	0.079	-0.525	0.603
% Villages with Electricity	-0.177	0.087	-2.042	0.048
Rural Road Length per 1000 Hec GCA	0.008	0.117	0.064	0.949
Rural Literacy Rate (%)	-0.079	0.106	-0.750	0.458
Urban Population (%)	-0.027	0.084	-0.320	0.750

Uttar Pradesh - Livestock Population per 1000 Hec GCA				
Multiple R	0.752			
R Square	0.565			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.232	0.113	2.049	0.047
Annual Rainfall (mms)	0.149	0.112	1.333	0.190
Outstanding Credit (Rs. Lakh)	-0.060	0.080	-0.744	0.461
% Villages with Electricity	0.253	0.088	2.878	0.006
Rural Road Length per 1000 Hec GCA	0.620	0.112	5.539	0.000
Rural Literacy Rate (%)	0.067	0.107	0.627	0.534
Urban Population (%)	-0.228	0.077	-2.956	0.005

West Bengal - Area under Horticulture as %age of GCA				
Multiple R	0.978			
R Square	0.957			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.055	0.191	0.287	0.782
Irrigated Area under Horticulture as a %age of GCA	1.030	0.114	9.024	0.000

West Bengal - Livestock Population per 1000 Hec GCA				
Multiple R	0.715			
R Square	0.511			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.860	0.367	2.344	0.047
Annual Rainfall (mms)	-0.244	0.215	-1.134	0.290

Annual Rainfall (mms)	0.033	0.097	0.343	0.742
Outstanding Credit (Rs. Lakh)	-0.128	0.128	-1.005	0.348
% Villages with Electricity	-0.006	0.136	-0.048	0.963
Rural Road Length per 1000 Hec GCA	0.398	0.194	2.053	0.079
Rural Literacy Rate (%)	-0.159	0.239	-0.664	0.528
Urban Population (%)	-0.105	0.177	-0.594	0.571

Outstanding Credit (Rs. Lakh)	0.103	0.280	0.370	0.721
% Villages with Electricity	-0.342	0.284	-1.203	0.263
Rural Road Length per 1000 Hec GCA	0.282	0.413	0.682	0.514
Rural Literacy Rate (%)	-0.097	0.416	-0.234	0.821
Urban Population (%)	0.161	0.393	0.409	0.694

Triennium Ending 1992

Bihar - Area under Horticulture as %age of GCA				
Multiple R	0.589			
R Square	0.346			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.382	0.370	1.031	0.317
Irrigated Area under Horticulture as a %age of GCA	0.399	0.192	2.081	0.053
Annual Rainfall (mms)	0.075	0.235	0.321	0.752
% Villages with Electricity	0.169	0.343	0.492	0.629
Rural Road Length per 1000 Hec GCA	0.254	0.202	1.254	0.227
Rural Literacy Rate (%)	-0.282	0.315	-0.895	0.383
Urban Population (%)	-0.334	0.275	-1.214	0.241

Bihar - Livestock Population per 1000 Hec GCA				
Multiple R	0.463			
R Square	0.214			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.984	0.334	2.951	0.009
Annual Rainfall (mms)	-0.320	0.216	-1.480	0.156
% Villages with Electricity	-0.194	0.283	-0.686	0.501
Rural Road Length per 1000 Hec GCA	0.167	0.189	0.883	0.389
Rural Literacy Rate (%)	-0.319	0.294	-1.087	0.291
Urban Population (%)	-0.020	0.248	-0.079	0.938

Orissa - Area under Horticulture as %age of GCA				
Multiple R	0.982			
R Square	0.964			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.191	0.209	0.912	0.403
Irrigated Area under Horticulture as a %age of GCA	0.983	0.092	10.631	0.000
Annual Rainfall (mms)	-0.224	0.242	-0.928	0.396
Outstanding Credit (Rs. Lakh)	0.054	0.159	0.340	0.747
% Villages with Electricity	-0.041	0.436	-0.093	0.929

Orissa - Livestock Population per 1000 Hec GCA				
Multiple R	0.653			
R Square	0.426			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.797	0.570	1.399	0.211
Annual Rainfall (mms)	-1.112	0.684	-1.625	0.155
Outstanding Credit (Rs. Lakh)	0.293	0.437	0.671	0.527
% Villages with Electricity	0.171	1.176	0.146	0.889
Rural Road Length per 1000 Hec GCA	-0.096	0.436	-0.221	0.833

Rural Road Length per 1000 Hec GCA	-0.074	0.155	-0.480	0.651
Rural Literacy Rate (%)	-0.047	0.263	-0.179	0.865
Urban Population (%)	0.015	0.137	0.106	0.920

Rural Literacy Rate (%)	0.274	0.732	0.374	0.721
Urban Population (%)	0.504	0.385	1.307	0.239

Uttar Pradesh - Area under Horticulture as %age of GCA				
Multiple R	0.838			
R Square	0.703			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.149	0.110	1.359	0.182
Irrigated Area under Horticulture as a %age of GCA (Hec)	0.811	0.103	7.840	0.000
Annual Rainfall (mms)	0.082	0.125	0.660	0.513
Outstanding Credit (Rs. Lakh)	0.005	0.117	0.040	0.968
% Villages with Electricity	-0.227	0.103	-2.202	0.034
Rural Road Length per 1000 Hec GCA	-0.042	0.106	-0.391	0.698
Urban Population (%)	0.033	0.105	0.312	0.756
Rural Literacy Rate (%)	0.009	0.098	0.094	0.925

Uttar Pradesh - Livestock Population per 1000 Hec GCA				
Multiple R	0.746			
R Square	0.557			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.116	0.110	1.052	0.299
Annual Rainfall (mms)	0.275	0.115	2.378	0.022
Outstanding Credit (Rs. Lakh)	-0.184	0.125	-1.474	0.148
% Villages with Electricity	0.108	0.110	0.984	0.331
Rural Road Length per 1000 Hec GCA	0.704	0.113	6.214	0.000
Urban Population (%)	-0.219	0.102	-2.159	0.037
Rural Literacy Rate (%)	0.064	0.103	0.617	0.541

West Bengal - Area under Horticulture as %age of GCA				
Regression Statistics				
Multiple R	0.986			
R Square	0.973			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.044	0.146	-0.302	0.771

West Bengal - Livestock Population per 1000 Hec GCA				
Regression Statistics				
Multiple R	0.511			
R Square	0.261			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.450	0.510	0.881	0.404

Irrigated Area under Horticulture as a %age of GCA (Hec)	0.931	0.084	11.105	0.000
Annual Rainfall (mms)	0.063	0.101	0.622	0.554
Outstanding Credit (Rs. Lakh)	-0.122	0.124	-0.981	0.359
% Villages with Electricity	0.044	0.124	0.353	0.735
Rural Road Length per 1000 Hec GCA	0.068	0.101	0.677	0.520
Urban Population (%)	0.142	0.124	1.147	0.289
Rural Literacy Rate (%)	-0.142	0.188	-0.757	0.474

Annual Rainfall (mms)	-0.187	0.352	-0.532	0.609
Outstanding Credit (Rs. Lakh)	0.166	0.434	0.382	0.713
% Villages with Electricity	0.317	0.424	0.746	0.477
Rural Road Length per 1000 Hec GCA	0.389	0.328	1.184	0.271
Urban Population (%)	-0.546	0.364	-1.499	0.172
Rural Literacy Rate (%)	0.094	0.654	0.144	0.889

Triennium Ending 2002

Bihar - Area under Horticulture as %age of GCA				
Multiple R	0.963			
R Square	0.928			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.235	0.139	1.694	0.110
Irrigated Area under Horticulture as a %age of GCA	0.855	0.079	10.893	0.000
Annual Rainfall (mms)	0.029	0.081	0.357	0.726
Outstanding Credit (Rs. Lakh)	0.123	0.088	1.406	0.179
% Villages with Electricity	0.113	0.108	1.043	0.313
Rural Roads per 1000 Hec GCA	-0.025	0.078	-0.320	0.753
Urban Population (%)	-0.048	0.081	-0.597	0.559
Rural Literacy Rate (%)	-0.433	0.139	-3.107	0.007

Bihar - Livestock Population per 1000 Hec GCA				
Multiple R	0.792			
R Square	0.627			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.281	0.237	-1.186	0.252
Annual Rainfall (mms)	0.265	0.133	1.989	0.063
Outstanding Credit (Rs. Lakh)	0.153	0.142	1.075	0.297
% Villages with Electricity	0.752	0.171	4.388	0.000
Rural Roads per 1000 Hec GCA	-0.043	0.135	-0.321	0.752
Urban Population (%)	0.324	0.139	2.323	0.033
Rural Literacy Rate (%)	-0.280	0.239	-1.173	0.257

Orissa - Area under Horticulture as %age of GCA				
Multiple R	0.942			
R Square	0.887			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.503	0.337	-1.491	0.196
Irrigated Area under Horticulture as a %age of GCA	-0.392	0.341	-1.152	0.301
Annual Rainfall (mms)	-0.051	0.636	-0.080	0.939
Outstanding Credit (Rs. Lakh)	-0.567	0.255	-2.226	0.077

Orissa - Livestock Population per 1000 Hec GCA				
Multiple R	0.844			
R Square	0.712			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.024	0.294	-0.082	0.937
Annual Rainfall (mms)	0.691	0.591	1.168	0.287
Outstanding Credit (Rs. Lakh)	-0.041	0.231	-0.176	0.866
% Villages with Electricity	2.044	0.837	2.442	0.050

% Villages with Electricity	-0.014	0.982	-0.014	0.989
Rural Roads per 1000 Hec GCA	0.129	0.315	0.409	0.699
Urban Population (%)	1.150	0.274	4.198	0.009
Rural Literacy (%)	0.895	0.919	0.974	0.375

Rural Roads per 1000 Hec GCA	-0.075	0.240	-0.310	0.767
Urban Population (%)	-0.246	0.252	-0.975	0.367
Rural Literacy (%)	-1.957	0.770	-2.541	0.044

Uttar Pradesh - Area under Horticulture as %age of GCA				
Multiple R	0.723			
R Square	0.523			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.022	0.159	-0.141	0.889
Irrigated Area under Horticulture as a %age of GCA	0.625	0.111	5.642	0.000
Annual Rainfall (mms)	-0.089	0.122	-0.728	0.471
Outstanding Credit (Rs. Lakh)	-0.027	0.126	-0.214	0.831
% Villages with Electricity	0.043	0.126	0.343	0.733
Rural Roads per 1000 Hec GCA	-0.002	0.125	-0.015	0.988
Urban Population (%)	-0.159	0.102	-1.552	0.128
Rural Literacy (%)	0.145	0.176	0.821	0.416

Uttar Pradesh - Livestock Population per 1000 Hec GCA				
Multiple R	0.441			
R Square	0.194			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.292	0.214	1.368	0.179
Annual Rainfall (mms)	0.125	0.167	0.750	0.458
Outstanding Credit (Rs. Lakh)	-0.048	0.172	-0.281	0.780
% Villages with Electricity	0.286	0.162	1.761	0.086
Rural Roads per 1000 Hec GCA	0.335	0.170	1.971	0.055
Urban Population (%)	-0.032	0.125	-0.257	0.798
Rural Literacy (%)	-0.108	0.242	-0.447	0.658

West Bengal - Area under Horticulture as %age of GCA				
Multiple R	0.919			
R Square	0.845			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.397	0.438	0.905	0.396

West Bengal - Livestock Population per 1000 Hec GCA				
Multiple R	0.699			
R Square	0.489			
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.934	0.396	2.358	0.046

Irrigated Area under Horticulture as a %age of GCA (Hec)	1.206	0.204	5.904	0.001
Annual Rainfall (mms)	0.340	0.271	1.255	0.250
Outstanding Credit (Rs. Lakh)	-0.002	0.157	-0.014	0.989
% Villages with Electricity	0.532	0.288	1.848	0.107
Rural Roads per 1000 Hec GCA	0.328	0.213	1.542	0.167
Rural Literacy Rate (%)	-1.355	0.535	-2.532	0.039
Urban Population (%)	0.093	0.197	0.474	0.650

Annual Rainfall (mms)	0.157	0.246	0.639	0.541
Outstanding Credit (Rs. Lakh)	0.089	0.147	0.606	0.562
% Villages with Electricity	-0.183	0.268	-0.681	0.515
Rural Roads per 1000 Hec GCA	0.521	0.198	2.628	0.030
Rural Literacy Rate (%)	-0.526	0.424	-1.241	0.250
Urban Population (%)	0.046	0.184	0.248	0.810

CHAPTER V

CONCLUSIONS AND POLICY IMPLICATIONS

This study analyzed the trends and patterns of agricultural diversification and related development in the Eastern states of India comprising the states of Bihar, Uttar Pradesh, Jharkhand, Orissa and West Bengal. The main objectives of this study were to analyse the trends and patterns of rural diversification, including both horizontal and vertical diversification in eastern India, to analyse the constraints and potentials of diversified rural growth in the different eastern states, considering various agro-climatic, socio-economic, technological, infrastructural, institutional and policy factors, to analyse the various economic aspects including production, profitability, equity and viability of small and marginal farms in the context of diversification and lastly to identify potential sources and suggest appropriate strategies and policies for accelerated and diversified agricultural growth as well as sustainability of small/marginal farms in these regions.

In India the share of GDP from agriculture declined from 35% in 1980-81 to 18.11% in 2007-08, while that of non-agriculture increased from 64.30% to 81.89% in the same period. The eastern states followed the same trend as that of India. Further, the share of GSDP from agriculture and allied activities was relatively higher in Uttar Pradesh (29.40%) followed by Bihar (25.34%), Orissa (22.97%), West Bengal (21.39%) and lastly Jharkhand (9.49%).

Within the agriculture & allied activities sector the share of agriculture including livestock in recent years was highest in Uttar Pradesh (95.2%) followed by Bihar, West Bengal, Orissa and Jharkhand (approximately 80%). The share of forestry & logging was highest in Jharkhand (12.08%), followed by Orissa and Bihar (approximately 7%). In Uttar Pradesh and West Bengal the shares were very low (approximately 3%). The share of fisheries was highest in West Bengal (10.23%) followed by Orissa and Bihar (approximately 5%). The fisheries sector showed very low shares in Jharkhand and Uttar Pradesh i.e., 3.93% and 1.28% respectively.

There has been a significant change in the cropping pattern in the past few decades. In India as a whole as well in all the eastern states the area share of cereals in the GCA has been highest amongst other crops from 1970-71 to 2007-08. It was also

observed that the area devoted to food grains was much higher in all the eastern states compared to horticultural crops. The proportionate area under horticultural crops was relatively high only in West Bengal and Bihar.

Cropping pattern in each state was compared between 1999-2000 and 2006-07 by using the index of crop diversification formulated by Bhatia (1965). It was seen that crop diversification had reduced from their 1999-2000 levels in the state of Bihar, Orissa and Jharkhand, while it increased slightly in Uttar Pradesh and a lot in West Bengal. Further, from the Simpson's index of crop diversification it was seen in Bihar crop diversification away from food grains increased since 1970-71 but after 2000-01 it showed a decline. In Jharkhand it decreased. In Orissa crop diversification away from food grains reduced especially since 1995-96. In Uttar Pradesh crop diversification away from food grains increased slightly, whereas in West Bengal crop diversification away from food grains increased tremendously.

There have also been significant changes in the relative shares of various crops in the gross value of crop output from agriculture (crop sector) in the past few decades. In Bihar the share of food grains, especially pulses have shown a sizeable decline over the years. The shares of other crops especially fruits & vegetables have increased and are even more than cereal crops, thereby showing diversification towards fruits & vegetables in Bihar. Jharkhand also shows diversification from cereals toward fruits & vegetables. All other crops except fibre crops and condiments & spices have shown a marginal increase in their shares. In Orissa the share of cereals and fruits & vegetables showed significant increase from their 1980-81 levels. The share of condiments & spices showed marginal increase, while the shares of pulses, oilseeds, fibre crops and sugarcane showed a decline. In Uttar Pradesh cereal crops showed higher share compared to fruits & vegetables and both their shares showed an increase over time. The shares of pulses and oilseeds showed a decline whereas those of fibres and condiments & spices have shown a marginal increase. In West Bengal the share of cereals declined over the years while those of fruits & vegetables increased from their 1980-81 levels. The share of condiments & spices showed marginal increase, while the rest of crops showed marginal decline. It was seen from the analysis of cropping pattern and value of output of crops that though area diversification away from food grains towards horticultural crops was significant

over the years in the eastern states but in terms of value of output, the share of horticultural crops was very high compared to other crops in all the eastern states except Uttar Pradesh. It is to be noted that Uttar Pradesh is one of the Green Revolution states and hence cultivation of food grains is very important here.

The sector wise distribution of value of output in agriculture and allied activities showed that in Bihar the share of livestock was highest (31.32%) followed closely by the crop sector (excluding horticulture) (30.34%) and horticultural sector (28.77%). The share of forestry and fisheries was very low (around 5%). In West Bengal the share of crop sector was the highest (36.11%) followed closely by the horticulture (31.19%), livestock (17.38%), fisheries (12.18%) and lastly forestry (3.14%). The pattern was similar in Orissa and Jharkhand. In Uttar Pradesh the share of crop sector was the highest (59.23%) followed by livestock (26.76%). The shares of horticulture, forestry and fisheries were very low (less than 10%).

In all the eastern states a high proportion of fruits area was under mango. In West Bengal, a high proportion of vegetables area was under cucurbits and brinjal. In Bihar and Uttar Pradesh, it was under potato and in Orissa, it was under rabi vegetables.

Amongst livestock population in India sheep, followed by buffaloes and goats showed a higher growth rate between the years 1992-93 and 2003-04 compared to cattle whose growth rate showed a decline (-0.08%). The growth rate of cattle declined in all the eastern states except West Bengal (0.99%). The growth rate of buffaloes was highest in Uttar Pradesh (1.09%) while that of sheep was highest in Orissa (5.65%). The growth rate of goats was highest in West Bengal (5.65%).

In all eastern states, the share of milk in the total value of livestock output was the highest (approximately 50%) amongst all other livestock products. Its share was highest in Uttar Pradesh (approximately 80%) followed by Jharkhand, Bihar, Orissa and West Bengal. The shares have increased for all the eastern states except Jharkhand between TE-2002 and TE-2006. The contribution of meat in the total value of livestock output was the second highest after milk (approximately 17%). Its share was highest in West Bengal (approximately 45%) followed by Orissa, Bihar, Uttar Pradesh and Jharkhand. The shares have declined marginally for most eastern states except Uttar Pradesh and Jharkhand between TE-2002 and TE-2006.

The major fish producing eastern states were West Bengal and Orissa. In India the share of inland fish in the total value of output of fisheries increased from 48% to 52% between TE-2002 and TE-2006 while the share of marine fisheries decreased from 52% to 48% in the same period. In the states of Bihar and Uttar Pradesh and Jharkhand the contribution of inland fisheries in total value output from fisheries was 100%. In Orissa, the contribution of marine fisheries was more than inland fisheries whereas in West Bengal it was just the opposite. Further the contribution of marine fisheries in both Orissa and West Bengal declined while that of inland fisheries was increased.

The proportionate area under forestry to the total reported area, in India increased marginally from 21.55% in 1970-71 to 22.99% in 2006-07. It declined in Bihar (including Jharkhand) and Uttar Pradesh from around 16% to 6%. In Orissa it increased from 32% to 37%, while in West Bengal it increased from 12.44 to 13.52% during the same period.

The share of forestry & logging in the total value of output of agriculture and allied activities showed a slight decline from 3.64% to 3.50% between TE – 2002 and TE – 2006. The shares were highest in Jharkhand followed by Orissa, Bihar, West Bengal and Uttar Pradesh. The shares showed marginal increase in the states of Bihar, Uttar Pradesh and West Bengal, while in Orissa and Jharkhand they showed a marginal decline. The share of fuel wood in the total value of output from forestry was the highest (approximately 80%), followed by industrial wood and minor forest products (MFP) (approximately 9%) in TE-2002 and TE-2006. The shares of fuel wood were highest in Bihar (99%), Uttar Pradesh (96%), West Bengal (93%), Orissa (88%) and Jharkhand (73%). The shares of Fuel Wood have increased in all eastern states except Jharkhand. The shares of industrial wood and MFP have declined in all the eastern states except Jharkhand where the share of MFP increased tremendously in between both periods.

In the employment sector, it was seen that the share of employed persons in agriculture (usual principal status plus usual subsidiary status) in rural Bihar declined from 84.3% in 1993-94 to 77.9% in 2004-05. At the same time non-agricultural employment increased from 15.7% to 22.1%. In Orissa it declined from 80.9% to 69% and non-agricultural employment increased from 19.1% to 31%. In Uttar Pradesh it declined from 80% to 72.8% and non-agricultural employment increased from 20% to

27.2%. In West Bengal it declined marginally from 63.3% in 1993-94 to 62.7% in 2004-05. At the same time non-agricultural employment increased marginally from 36.7% to 37.3%.

In 2002-03, amongst the various sources of household income, the average income from crop cultivation was the highest (Rs. 969) followed by wage earnings other than casual labour (Rs. 434), casual wage labour (Rs. 385) and dairy farming (Rs. 131). The other sources, namely, fish farming and animal farming did not generate any income but resulted in losses (income being negative). Out of the 5 states taken into consideration, the average income generated from animal farming was found positive only in case of West Bengal and Orissa, the average income being Rs.15 and Rs.3 per month respectively. Out of the 5 states, the average income earned by households was highest in West Bengal (Rs. 2079) followed by Jharkhand (Rs. 2069), Bihar (Rs.1810), Uttar Pradesh (Rs.1633) and Orissa (Rs. 1062).

From the data on average income earned and average expenditure incurred in 2002-03 by farming households on a monthly basis, it was seen that for farming households having less than 4 hectares of land, average income earned was less than their average expenditure in all the eastern states. Hence their income was not enough to meet the expenditure on consumption.

To understand non-farm diversification a set of regression exercises were done with the dependent variable being rural non-farm workers and the independent variables being urban population, rural literacy and wage rates. In the state of Bihar it was observed that the rural non-farm workers showed a positive relation with urban population and rural literacy rate whereas with respect to agricultural wage rates, the relation was negative. For Jharkhand, the relationship with respect to urban population and wage rates was same as that of Bihar, whereas with respect to rural literacy rate the relationship was negative. In case of Orissa and Uttar Pradesh, the scenario was very much similar.

Amongst agro-processing industries; it was the food processing industry which provided greater share (in terms of GVA, employment and number of production units) under organized sector whereas it was the non food industry which accounted for greater share in case of unorganized sector. Out of the five states studied in this project; Uttar

Pradesh had the highest percentage share (13.40%) in the gross value added of food processing industry in the organized sector for all the states in India, followed by West Bengal with 2.07%. Bihar stood third with share of 1.22% followed by Orissa at 0.8%. Jharkhand performed poorly with share of 0.28%. Taking employment in organized sector into consideration, Uttar Pradesh again performed best where the percent share in total employment was 11.46% followed by West Bengal with 4.43%. Share of Orissa in case of employment was better (1.57%) than that of Bihar (0.88%). Jharkhand again came last with percentage share of 0.15%. However, with respect to labour productivity (which was GVA/Employment); Jharkhand stood first with productivity of 1.87 followed by Bihar with productivity of 1.38. Uttar Pradesh stood third with productivity of 1.17 followed by Orissa with 1.10. West Bengal performed really badly with respect to labour productivity. This implied that in this industry labour was most efficient in Jharkhand and least efficient in West Bengal.

The share of agricultural vis-à-vis non-agricultural exports in the total exports from India showed a declining trend since 1970-71. Only the already high shares of non-agricultural exports are seen to be rising. Further, the growth rate of agricultural exports between 1980-81 and 2008-09 has been 7.72% and amongst principal agricultural commodities exported the growth rates have been highest for Sugar & Molasses (11.47%) followed by Meat & Meat Preparations (10.30%), Rice (9.96%), Oil cakes (9.14%), fruits (8.86%) and spices (8.60%).

All these above mentioned statistics do indicate that there was a positive trend towards both horizontal as well as vertical diversification of the rural economy of eastern India.

In the field survey agriculture and allied activities included the crop, livestock and fisheries sectors only. The forestry sector was not observed. Within the crop sector, from the field survey it was observed that sample farming households in the selected study regions mainly cultivated cereals, pulses, oilseeds, vegetables, jute and sugarcane. Cultivation of fruits and flowers was rarely observed. It was seen that cereals were cultivated by majority households across all farm size categories in all the states. Further cereals also occupied a large proportion of the gross cropped area in all the states. The Simpson's Index of Diversification (SID) was the highest in Orissa (0.25) followed by

Bihar (0.18), West Bengal (0.16), Uttar Pradesh (0.15), and Jharkhand (0.08). In the states of Orissa, Bihar, West Bengal and Jharkhand the crop diversification away from food grains was mainly towards oilseeds while in Uttar Pradesh it was mainly towards sugarcane. Some diversification towards cultivation of vegetables was observed mainly in the states of Orissa and West Bengal. It was also found that developed districts showed greater crop diversification away from food grains towards non-food grain crops compared to under developed districts except for Kishanganj in Bihar and Jalpaiguri in West Bengal which showed diversification towards oilseeds and jute. From the SID compared using both primary and secondary data it is seen that the state of Orissa showed more diversification away from food grains and Jharkhand showed least diversification.

From the field survey data in the selected districts it was seen that small and marginal farmers showed more horizontal diversification within the crop sector towards high value crops such as oilseeds, sugarcane, jute and vegetables compared to the other categories. Conversely, this category of farmers has shown comparatively lesser horizontal diversification with the allied sectors such as livestock and fisheries compared to the other farm sizes. The reasons for this is that, since high value crops gave higher yields and earlier returns compared to food grains, small and marginal farmers tried to maximize their returns from their small holdings by allocating more acreages to these high value crops whereas large farmers tended to hedge their bets by devoting more area towards food grains and also diversifying more within the allied sectors like livestock and fisheries.

In all the selected five states, the developed districts showed higher yield levels for most crops than the underdeveloped districts. It was also noticed that most crop yields both for food grain crops and high value crops showed a positive relation with farm size. Further, it was also seen that crop diversification towards high value crops mainly vegetables and sugarcane suits the need of farmers especially small and marginal holders as the yield levels of these crops are much higher compared to other crops and it was also reported by farmers that the returns, especially from vegetables, were more regular and earlier compared to food grains.

In all the five states the developed districts showed higher yield levels than the underdeveloped districts. It was also noticed that most crop yields showed a positive relation with farm size in all the five states surveyed.

From the pattern of livestock in the study regions it was seen that majority of the sample farming households owned cattle. The highest proportion of cattle was seen in West Bengal (70%) followed by Uttar Pradesh (65%), Jharkhand (60%), Orissa (54%) and Bihar (52%). The developed districts show a higher proportion of cattle population compared to the relatively underdeveloped districts. In case of buffaloes the highest proportion was seen in Uttar Pradesh (80%). The largest proportion of goats was seen in the Lohardaga dstrict of Jharkhand (38%) and Khandamal district of Orissa (19%). Sheep rearing was seen in only Burdwan district (2%). Further the ownership of such livestock was directly related to farm size categories in all the regions.

Higher proportion of poultry was seen in most underdeveloped districts excepting West Bengal. Highest proportion of chicken was seen in Jharkhand's Lohardaga district (30%) and for duck rearing, the highest share was seen in Kishanganj district of Bihar (3%). Further, poultry farming was seen to be inversely related to farm size categories in the Kandhamal district of Orissa and Burdwan district of West Bengal. Piggery was found only amongst a small proportion of marginal farmers in the relatively underdeveloped Lohardaga and Kandhamal districts of Jharkhand and Orissa respectively.

As regards fisheries, Burdwan district of West Bengal showed the highest proportion of farmers who engaged in fisheries (20%). The Bhadrak district of Orissa also showed a higher percentage of farmers engaged in fisheries (11.27%). The lowest proportions were seen in Jharkhand, Uttar Pradesh and Bihar. In most of the study region medium farmers engaged in fisheries. The proportion of small and marginal farmers that engaged in fisheries was very small in all the study regions and they mostly reported timely credit, accessibility to cold storages and poor road conditions, connectivity and transportation to be their major hindrances for diversifying into this sector. Most farming households fished from ponds rather than paddy fields.

Two main varieties of fish farming were observed in the sample villages; large and small. But farmers also practiced a combination of both. It was found that majority of

the farming households (100%) in the districts of Bihar, Jharkhand, Orissa and Uttar Pradesh practiced small fish farming. In West Bengal a large proportion of farmers across all farm size groups practiced a combination of both types of fish farming.

Overall it was seen that income from farm sources was more than non-farm sources in all the states of eastern India. The income from non-farm sources are the lesser in the under developed districts compared to the developed ones in all the selected states. It was also seen that in all the selected states, except Jharkhand, the net income from livestock sector was the highest followed by the agriculture (crop sector) and then the fisheries sector. In Jharkhand, the net income from agriculture was the highest followed by livestock and fisheries sector. Further, the net income from the livestock sector was greater than the crop sector in all the under developed districts, whereas it was lesser than the crop sector in all the developed districts except the Varanasi district in Uttar Pradesh, where income from the livestock sector was more than the crop sector.

Both income from agriculture and livestock showed a positive relationship with farm size. The income from fisheries sector was skewed towards medium farmers in the states of Bihar, Jharkhand and Uttar Pradesh, while in Orissa and West Bengal it showed a positive relationship with farm size. The income structure of marginal farmers only in the Kishanganj district of Bihar showed vertical diversification toward non-farm activities whereas overall it was seen that all size classes showed horizontal diversification within agriculture and allied activities. In all the states small and marginal farmers did not show much horizontal diversification within agriculture and allied activities compared to medium and large farmers.

Overall it is seen that despite the fact that small and marginal farmers were diversifying more within the crop sector into high value crops compared to other farm size categories, their output-input ratio and income-input ratio were lower than other farm size categories. Infact their working capital expenses were found to be relatively higher than other land size classes, indicating that these farmers incurred relatively higher cost of cultivation, but at the same time, they did not earn commensurate income despite high value crop diversification.

Small and marginal farmers diversified more within the crop sector relative to other farm categories firstly because, the yields from high value crops mainly vegetables

and sugarcane were higher than food grain crops. Secondly, the returns were more regular and earlier compared to food grains. Lastly, these farmers, with an abundance of family labour at their disposal tried to maximize their returns from their small holdings by allocating more acreages to high value crops whereas large farmers tended to hedge their bets by devoting more area towards food grains and also diversifying more within the allied sectors like livestock and fisheries. Despite the benefits of high value crop diversification for small and marginal farmers, their net incomes from crop farming were found to be lower than the other farm sizes indicating inefficient use of resources by them and also inadequate access to markets for their high value products.

At the district level certain factors were taken to explain agricultural diversification of value of output from crop production (excluding horticulture), horticulture, livestock, forestry and fisheries through multiple regressions for the triennium ending 2006-07. The value of output of crop production showed a positive relationship mostly with availability of credit in West Bengal, Bihar and Orissa. In Uttar Pradesh fertilizer consumption and in Jharkhand road density showed a positive relationship with the value of output of crop production. In horticulture, irrigation showed a positive relationship in the state of Bihar and Uttar Pradesh. Credit availability showed a positive relationship in Jharkhand and Orissa and cold storages showed a positive relationship in West Bengal. In the livestock sector veterinary service establishments showed a positive relationship all the states except Orissa where credit availability showed a positive relationship. In the forestry sector, forest protection committees positively affected the value of output in the states of Bihar, West Bengal and Orissa. In Uttar Pradesh average annual rainfall, while in Jharkhand road density showed a positive relationship. In the fisheries sector, availability of credit showed a positive relationship West Bengal and Orissa. Electrified villages, cold storages and village haats showed positive relationship in Bihar, Jharkhand and, Uttar Pradesh respectively.

Furthermore, for better understanding of agricultural diversification in the previous years at the district level certain factors were taken to explain agricultural diversification of area under horticultural crops, and livestock per 1000 hectares GCA for the trienniums ending 1972-73, 1982-83, 1992-93 and 2002-03. The regressions could not be formulated for the state of Jharkhand due to lack of districtwise data under most

heads. The results mainly showed that in all the trienniums irrigation was one of the major factors showing a positive relationship with horticulture while in the livestock sector road connectivity emerged as the most important factor. Timely availability of credit was also required for agricultural diversification.

Policy Implications

Despite the fact that small and marginal farmers are diversifying horizontally more within the crop sector compared to the allied sectors, they need to diversify much more towards high value crops and also within the allied sectors. At the same time their resource use efficiency within the crop sector need to improve. Further vertical diversification towards non-farm activities was also very less in the study region and therefore an integrated policy support system is required for promoting sustainable horizontal and vertical diversification of the rural economy in eastern India.

The major constraints reported by small and marginal farmers for crop diversification towards high value crops were lack of proper irrigation facilities, lack of knowledge and information, and non-availability of timely credit. Further, in the livestock sector, most small and marginal farmers reported lack of access to veterinary service centres to be a problem. Diversification into fisheries sector, was mostly constrained by lack of timely credit, inaccessibility to cold storages, poor road conditions and connectivity and transportation problems. Thus, in the crop, livestock and fisheries sector policies have to be made such that the specific problems faced by small and marginal farmers can be mitigated. Improving the small farmers access to irrigation, credit, technology and veterinary care services would hold the key in this respect.

Further, agriculture sector can hardly afford to sustain all its growing population and therefore vertical diversification especially of small and marginal farms is necessary. Small and marginal farmers have to be basically part-time farmers. But the investment and organizational requirements of such vertical diversification in the form of agro based industries, agri-business, agro-processing and services would have to be even greater.

From the factor analysis of value of output in agricultural diversification, it was seen that in the state of Bihar unbalanced use of fertilizers was posing a constraint to horticultural diversification. Hence a balanced use of fertilizers was required, which could be achieved by providing proper training in horticultural management and practices

to farmers. In the state of Jharkhand it was found that inappropriate water management and inadequate water supply was a major constraint towards horticultural diversification. Moreover, poor road conditions, bad road connectivity and transportation problems stood in the way of development of livestock and fisheries. In Orissa, Uttar Pradesh and West Bengal the diversification towards the forestry sector was mainly constrained by poor rural literacy rates. Therefore, literacy and awareness building for regeneration and sustainable management of forest resources would be essential. Also, poor infrastructure of road and electricity hold back the development of non-farm sector on adequate scale. Hence development of basic infrastructure, both hard and soft including road connectivity, electricity, literacy training and skills would be required to help promote non-farm diversification.

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