CHAPTER - I

INTRODUCTION

Prologue

With about 45 million hectares (MH) of rice area, India is the second largest producer of rice in the world, after China. The rice production in India reached 91.61 million tones (MTs) during 2001-02. Of these, the three states West Bengal, Uttar Pradesh and Andhra Pradesh accounted for about 42.00 per cent. India also produces some of the best quality rices of the world. These include the long grained export quality Basmati and a host of locally adopted small and medium grained scented rice varieties, known for their excellent cooking and eating qualities. Most rice growing states in the country have few or many such varieties, like Basmati is found in Punjab, Haryana and Western Uttar Pradesh, the small and medium grained scented rice varieties like (i) Kalanamak, (ii) Shakarchini, and; (iii) Hansraj are found in U P, (i) Dubraj, (ii) Chinoor in Chattisgarh, Kalajoha in North-East, Ramdhuni Pagal in Orissa, Ambemohar in Maharashtra and so on. The long grained Basmati rice are generally exported and has assured markets, the small and medium grained non- basmati scented rices are consumed locally.

Due to the quest for high yielding varieties, beginning with mid sixties, a large number of the small and medium grained varieties slowly vanished from farmers' fields. For example only few years back, Uttar Pradesh farmers grew as many as 40 well known scented varieties. But, today, one finds not more than 3 or 4 being grown by farmers, that too on limited scale, and only in some specific areas *(Singh & Singh 2000).*

These are low yielding, susceptible to lodging and also to various pests and diseases. It can then be attributed to the special interest by a few selected farmers that some of them still exist. The farmers grow them mostly for their own consumption. The marketable surplus is hardly there and limited to a few pockets, like the sale of Dubraj in Chattisgarh region, or Kalanamak in Sidharth Nagar and Basti districts in

Uttar Pradesh. Dubraj was sold at the rate of Rs. 20-25/kg, while Kalanamak fetched Rs. 30-40/kg., so they were quite remunerative. However, in the absence of any improvement programme or non-availability of pure seeds, most varieties found on the farmers' fields are mixtures. It is difficult to get pure culture of any of these varieties, at the moment.

In Bihar, although aromatic rices are grown all over the state, they are mainly concentrated in Bhagalpur and Magadh divisions. Bhagalpur has been a traditional aromatic rice growing area, where the varieties, such as : (i) Katarni, (ii) Tulsi Manjari, (iii) Badshahbhog, (iv) Br-9, and; (v) Br – 10 are mostly common. These are photoperiod-sensitive, tall and hence, susceptible to lodging and several diseases and pests. Their yield vary from 2.0 to 2.5 t/ha (Katarni is the most prevalent variety of the region). However, over the period there has occurred a large variation, which has resulted into various types, such as (i) Bhauri katarni, (ii) Deshla katarni, and; (iii) Sabour katarni, (iv) Ghorayiya katarni. In Magadh region, which is the main rice growing tract of Bihar, farmers grow Karibank, Marueya, Mehijawain, Shyamjira, Tulsiphool, Sonachur and Shah Pasand. Over the time, the areas under these varieties have drastically reduced, although farmers still grow Karibank and Marueya, but on a small scale only. The tarai region of West Champaran was, at one time, known for its good quality aromatic rice varieties, that included (i) Lal champaran basmati, (ii) Bhuri champaran basmati, (iii) Kali champaran basmati, (iv) Baharni, (v) Badshahbhog, (vi) Chenaur, (vii) Dewtabhog, (viii) Kesar, (ix) Kamod, (x) Kanakjeera, (xi) Marcha, (xii) Ram Janwain, (xiii) Sonalari, and; (xiv) Tulsi Pasand. Most of these varieties have either already out of cultivation, or are at the verge of extinction *(Singh et al. 2000).*

Actually, two types of local Champaran Basmati are grown in East and West Champaran districts in small tracts for personal consumption by the local farmers' community. Some of the local varieties grown in Bihar are given in Table 1.1.

Table No. 1.1: Local Scented Rice Varieties and Landraces of Bihar

SN.	Location	Scented Rice Varieties/Landraces	Land Type	Important Characteristics
1.	Patna	Basmati-3, Karibank-2, Mohin Dhan, Sagarbhog and Hansraj	Medium and Low lands	Tall, late duration, small to medium fine grain, aromatic and photoperiod sensitive
2.	Bhojpur	Sonachur, Karibank, Basmati, Badshahbhog and Kanakjeera	-DO-	-DO-
3.	Rohtas	Sonachur, Shyamjeera, Basmati-3, Shahpasand and Thulsiphool	-DO-	-DO-
4.	Gaya	Basmati and Kanehonehur	-DO-	-DO-
5.	Aurangabad	Shyamjeera and Mehijawain	-DO-	-DO-
6.	Bhagalpur	Tulsimanjari, Katarnibhog, Badshahbhog and Br-9 & Br – 10	-DO-	-DO-
7.	Munger	Tulsimanjari, Shyamjeera, Karibank, Marueya and Lakhisar	-DO-	-DO-
8.	North Bihar	(i) Badshahbhog, (ii) Badshahpasand, (iii) Baharni, (iv) Basmati03, (v) Br-9, (vi) Br-10, (vii)Bhuri Champaran Basmati, (viii) Chenaur, (ix) Dewtabhog, (x) Hansraj, (xi) Kamod, (xii) Katarnibhog, (xiii) Kali Champaran Basmati, (xiv) Karibank, (xv) Karibank - 2 (xvi) Kanakjeera, (xvii) Kesaurbani, (xviii) Kesar, (xix) Lal Champaran Basmati, (xx) Lakhisar, (xxi) Marcha, (xxii) Marueya, (xxiii) Malbhog, (xxiv) Mehijawain, (xxv) MohinDhan, (xxvi) Ram Jawain, (xxvii) Sagarbhog, (xxviii) Sonalari, (ixxx) Sonachur, (xxx) Shyamjeera, (xxxi) Shahpasand, (xxxii) Tulsipasand, (xxxiii) Tulsimanjari, and; (xxxiv) Tulsiphool.	-DO-	-DO-

These local varieties have yield potential ranging from 15 to 30 qtls/ha, and are tall possessing short grains. Many of them are highly susceptible to various insect pests and diseases, like: (i) stem borer and (ii) bacterial blight. Since they have excellent cooking quality and aroma, they are still grown by farmers on small scale particularly in case of under mentioned three varieties, (i) Kamini (Katarni), (ii) Mircha, and; (iii) Malida. Each of these three has its own speciality: Katarni for cooked rice, Mircha for Cheura and Malida for its adaptability in low land deep water.

All land races of aromatic types grown in Bihar have fine, but short grains and consequently of low export values.

In view of the lower yield of traditional aromatic rice varieties in Bihar declining area under Katarni paddy over the years and most of the good quality aromatic rice varieties either being lost or facing the threat of extinction, the study has been undertaken with the objectives noted below:

Objectives of the Study

i. *To assess the potential area of Katarni paddy in the study area.*
ii. *To find out socio-economic characteristics of the farmers, who cultivate Katarni paddy.*
iii. *To study the economics of Katarni paddy in the study area.*
iv. *To identify the marketing channels of Katarni paddy in the study area*
v. *To identify the constraints in raising the area under Katarni paddy in the study area, and;*
vi. *To suggest suitable measures for the development of Katarni paddy in the study area.*

Methodology

The study entitled **Problems and Prospects of Katarni Paddy Production in Bihar** is mainly based on primary data collected from 30 katarni paddy growing cultivators each from Bhagalpur and Banka districts. 'Multi stage simple random sampling method' was followed to select respondents.

At the first stage of sampling, the two districts, namely: Bhagalpur and Banka were purposively chosen, as the specific variety of Katarni, to which this study is devoted, is grown only in particular areas of these two districts.

At the second stage of sampling, **one block from each district** was selected on the basis of area under Katarni paddy and potential. Jagdishpur and Amarpur blocks were selected from Bhagalpur and Banka Districts, respectively.

At the third stage of sampling, maintaining the harmonious basis of choosing potential villages, in regard to cultivation of Katarni paddy, two villages each from

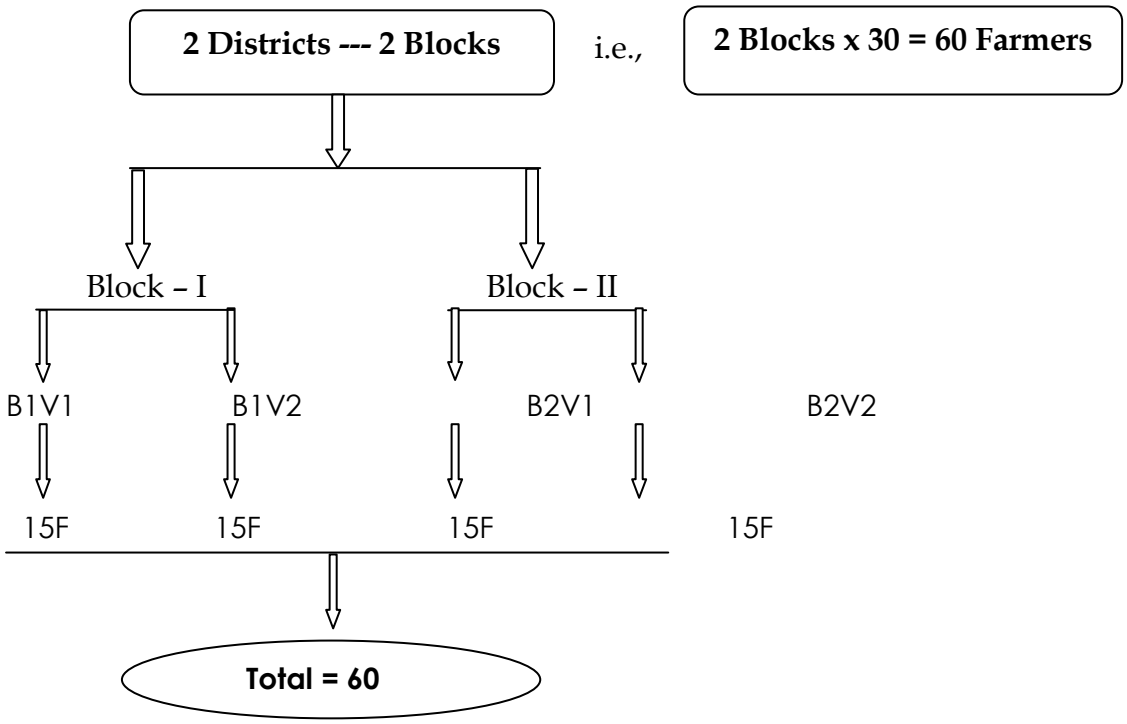
the two selected blocks of the concerned districts were identified. Thus, two villages, namely: Bhawanipur-Deshari and Jagdishpur cluster of villages under Jagdishpur block were selected. Similarly, (i) Tardih-Lakshmipur, and; (ii) Ramchandrapur-Bhadariya villages were selected from Amarpur block of Banka district.

At the fourth stage of sampling, enlistment of Katarni paddy growers in the selected villages was made. In Bhawanipur-Deshari and Jagdishpur cluster of villages under Jagdishpur block of Bhagalpur district, the number of marginal, small, medium and large farmers growing katarni paddy also, were 40, 50, 55 and 21 respectively. Number of katarni paddy growers, who belonged to marginal, small, medium and large farm size classes of 'Tardih Lakshmipur' and 'Ramchandrapur Bhadaria' villages in Amarpur Block of Banka district were 45, 40, 60 and 18 respectively.

At the fifth stage of sampling, indispensable classification of farmers from out of the enlisted growers was done based on farm size owned by them. All the enlisted growers were broadly kept in four categories: (i) Marginal --- owning land up to 1 hectare, (ii) Small --- 1.01 to 2 hectare, (iii) Medium --- 2.01 to 4 hectare, and; (iv) Large --- > 4 hectare.

At the sixth stage of sampling, 15 farmers from each of the selected villages (if required number of Katarni paddy growers was not found in a particular village, then cluster of adjoining villages was also considered) were selected for detail study. The selection of farmers was done on probability proportion method. Further, with the view to maintain discreet selection of respondents, due emphasis was given on social composition of the enlisted growers.

In this way, the selection of sample can be illustrated as below: 2 districts x 1 block each (=02) x 2 villages each (04) x 15 farmers = 60 Katarni paddy growers.



Selection of farmers in the two blocks of the two purposively selected districts (farm class-wise with number in particular categories) has been connoted through the following table:

Table No. 1.2: Farm Class wise Distribution of Respondents in Bhagalpur and Banka Districts.

Category of Farmers	Bhagalpur District	Banka District	Total
Marginal	07	08	15
Small	09	07	16
Medium	10	12	22
Large	04	03	07
Total	30	30	60

Statistical Tools

Simple tabular and percentage methods have been followed to analyze the data and interpretation of observed facts.

Reference Period

Reference year of the primary data collection is 2010-11. However, the secondary data are pertained to the latest one available in the Department of Agriculture, Government of Bihar, Bhagalpur & Banka districts.

CHAPTER - II

GENERAL DESCRIPTION OF THE STUDY AREA

2.1 Introduction (Bhagalpur)

Bhagalpur is one of the oldest districts of Bihar. The district is comparatively a developed district of Bihar. According to the development indicators, it ranks 9th among the districts of the State. The map of the district clearly shows its physical and administrative boundaries (Fig. No. 2.1)

2.2 District at a Glance

Future development patterns and strategy emerge primarily from the regional structure, which largely determine the nature of the impulses and the constraints of regional development. Familiarity with the regional structure is, therefore, a precondition for an understanding of growth promoting and growth retarding factors operating therein, and is needed in order to identify the location of growth centers and growth points in the district.

2.2.1 Location and Geographical Units

Bhagalpur district is situated between 25°07′ to 25°30′ N latitude and 86°37′ to 87°30′ E longitude in the basin at a height of 141 feet above sea level. The district is surrounded by Munger and Khagaria in West, Purnea and Katihar in north, Banka in south and Sahibganj (Jharkhand) in east. The district is divided centrally across from west to east by the river Ganga. On the northern part lie the Naugachia sub-division and the other two sub-divisions, Bhagalpur sadar and Kahalgaon lies on the southern bank. The district was spread over 2.54 lakh square hectares and divided into 16 blocks and 242 gram panchayats. The city of Bhagalpur is the headquarters of Bhagalpur division as also of the district and sadar sub-division. The district had 1519 revenue villages. Out of it, 923 villages (60.76%) are inhabitated and 596 (39.24%) un-inhabitated.

2.2.2 Demographic Profile

As per the Census 2001, the population of Bhagalpur district is 24.23 lakh, which accounts for 2.93 per cent of the state's total population. The percentage of rural

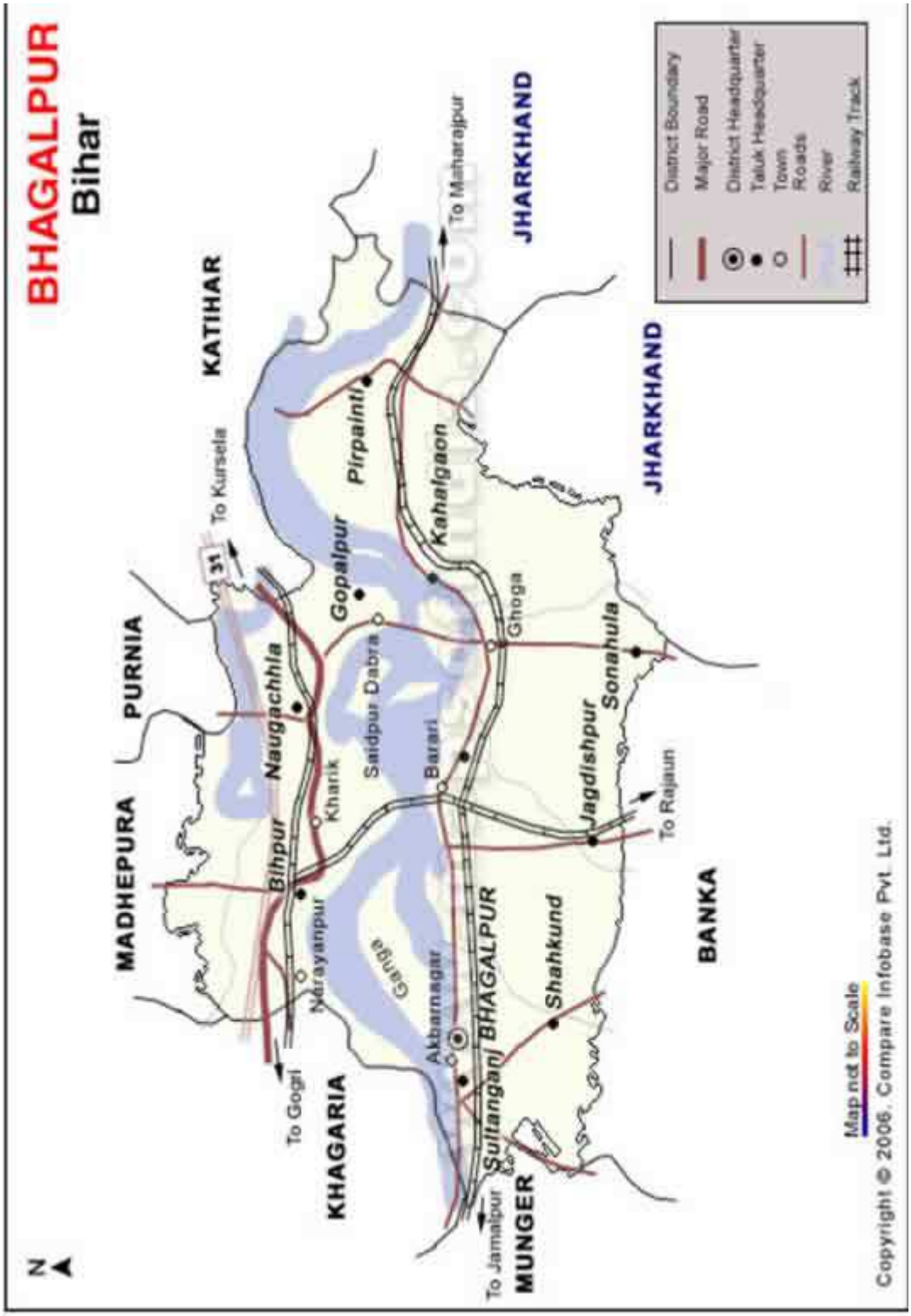


Fig. 2.1: Map of Bhagalpur District

population is 81.40. The proportion of population belonging to scheduled caste is 8.77 per cent and that of scheduled tribes is a meager 1.86 per cent. Sex ratio of the district is distressing (876 females/1000 males). The population density is 946/sq. kilometer. The percentage of rural population living below poverty line is 56.94. The literacy rates of males and females are 59.2 and 38.1 per cent respectively. It revealed that the gender gap in literacy is 21.1 per cent. The number of total workers in the district is 8.59 lakh, which accounts for 35.47 per cent of the total population.

However, as per the Census 2011, Series –II, the population of Bhagalpur district was 3,032,226 which accounted for 2.92 per cent of the state's total population. Sex ratio of the district was distressing (879 female/1000 male). The population density was found 1180/sq km. The literacy rates of male and female were 72.30 and 56.50 per cent respectively. It revealed that the gender gap in literacy was 15.80.

The data classification of workers reveals that 48.39 per cent were agricultural workers followed by 19.63 per cent cultivators. 7.43 per cent workers were engaged in household industries and 24.55 per cent constituted other workers. The work participation rate in the district was 35.37 per cent with only 21.34 per cent in case of female. Data on sector wise employment pattern revealed that 68.10 per cent workforce was employed in primary sector followed by 24.50 per cent in tertiary sector and only 7.40 per cent in secondary sector. Total number of households in the district is 412080, constituting 49.80 per cent of marginal size (<1ha), 20.50 per cent small size (1-2 ha) and 29.70 per cent medium and large size (>2 ha). As regards the housing conditions of the population, 34.6 per cent of the households were having RCC slab, 36.81 per cent tiles and thatched was 28.59 per cent.

2.2.3 Topography and Agro-climatic Characteristics

Bhagalpur district is unique in its characteristic that it forms parts of two different Agro-climatic Zones. Though its major position is situated in Agro-climatic Zone – III A (South Alluvial Plane), but its area falling north of the river Ganges, precisely its Naugachia Sub-division comes under Agro-climatic Zone – II (North-East Alluvial Plane). The p^H ranges from 6.8 to 8. The climate of Bhagalpur district is

sub-humid and sub-tropical monsoon type with average annual rainfall around 1167.16 mm. The farming situations in the district were extremely diverse. The largest area consisted of old alluvial soils in south of river Ganges. These are typical rice producing soils having texture varying from silt loam in its upper peripheries to clay loam in low lying areas. Rice is the sole crop grown in these lands during kharif season followed by wheat, gram, and a number of para crops during rabi season. A sizeable area of the district was under 'Diara lands' which remains under flood water during rainy season. However, these lands are intensively cultivated in post-flood kharif season, rabi season, summer season and pre-kharif seasons. Maize, wheat, green gram are the most important crops of the area while banana is the cash crop covering a sizeable area in Naugachia sub-division falling north of the river Ganges. The soil here was highly permeable with sand layers. The alluvium brought during flood serves as a good source in replenishing soil fertility. In the southern flank of the river Ganges, there was some area referred to as 'Tal lands.' These are bowl shaped depressions where water accumulates during rainy season. When this accumulated water percolates or evaporates the land is available for cultivation some times in the month of October. These were heavy montmorrilonite type clays which develops wide and deep cracks during summer season, which also formed means for speedy percolation of accumulated water. Such lands were ideally suited for pulses and oilseeds during rabi season. A part of the area of Bhagalpur district was also in the foot hills of mountain ranges of Kharagpur, Mandar and Rajmahal. These lands were sloppy and highly permeable. Arhar, groundnut and maize were the major crops during kharif season and pulses and oilseeds having low water requirement were preferred during rabi season. Rice was also cultivated in plane low lying areas known as done lands.

The district had hot summer and moderate in winter season. The maximum temperature of the district was 44° to 45° Celsius in the month of May/June and minimum temperature fell up to 8° Celsius, in the month of December/January. The minimum and maximum percentage of the humidity was 38 and 95 respectively.

2.2.4 Land Utilization Pattern and Land Holdings

While changes in land utilization pattern were very slow and marginal throughout the state, however, there had been a marginal increase in the non-agricultural use of geographical area across the state. As regards the pattern of land utilization in the district of Bhagalpur, out of the total geographical area, net sown area was 1.53 lakh hectares i.e., 61.91 per cent. While forest coverage had remained at 0.10 per cent, permanent pasture land was 0.90 per cent. Current fallow land came to 20.87 per cent. Cultivable waste land (3.30%) and land under non-agricultural uses (18.33%).

The cropping intensity was 124.42 per cent only, which was slightly less than the state figure of 132.78 per cent.

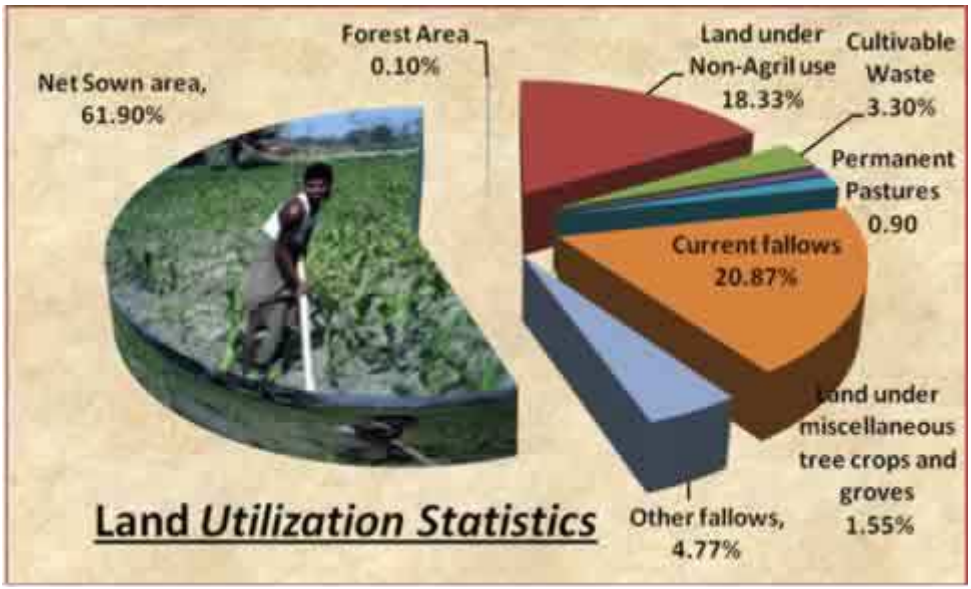


Fig. 2.2: Land Utilization Pattern

2.2.5 Land Capability Classification

Bhagalpur had an advantage of having a larger chunk of land (76.31%) of total geographical area in good shape. These lands, however, were of different grades.

The data revealed that out of the total cultivable land, class – I land was 13.44% followed by class – II, III and IV – (22.30%, 27.06% and 13.51%) respectively. It is to be pointed out here that the soils falling under the Indo-Gangetic plain were one of the most fertile ones in the World.

Fig. 2.3: Land Classification

2.2.6 Land Holding Pattern

History bears testimony to the fact that not all the cultivators were equal partners of the land available. For one or the other reason some became rich, other became small over the period of time, another category of farm holders also emerged into the scene to be classified again differently according to their possession of land. The District of Bhagalpur is also not uncommon in terms of land-man ratio prevalent across the state. The percentage of marginal farmers was 83.06 per cent with 42.45 per cent land as against the small farmers (11.06%), semi medium farmers (4.35), medium farmers (0.94) and large farmers (0.5) with 25.52, 19.93, 10.05 and 2.05 per cent respectively. The growing downward trend of land- man relationship did not augur well for the farmers in general who had to subsist on agrarian economy only in the district.

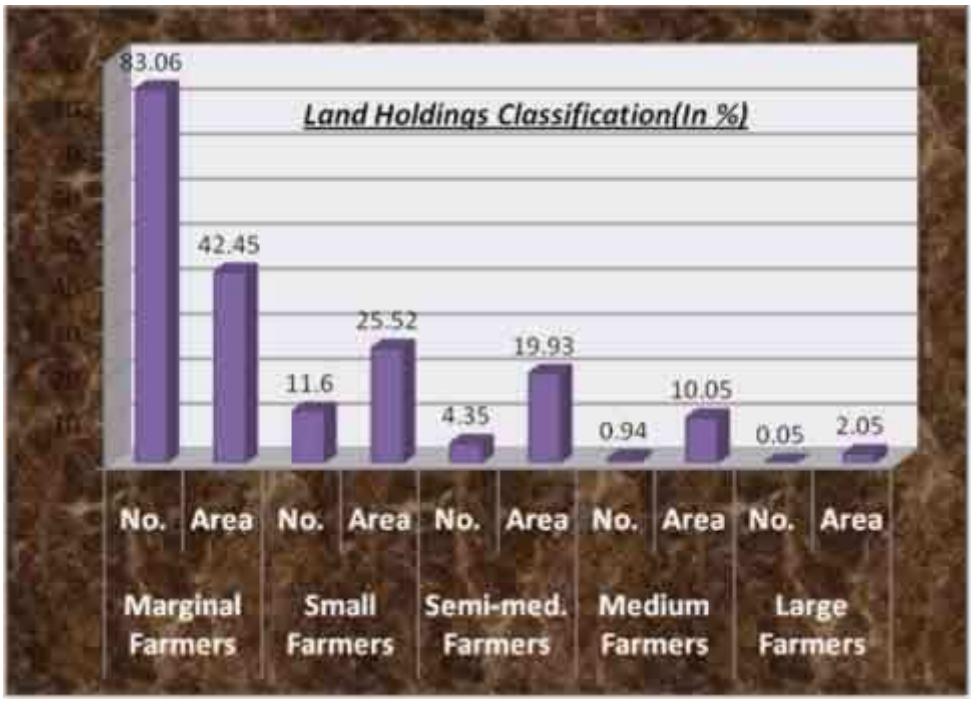


Fig. 2.4: Land Holdings

2.2.7 Irrigation and Groundwater Status

In fact, the district was richly endowed with water resources and a very healthy rainfall. A brief look on these aspects in Bhagalpur is placed below:

2.2.7.1 Weather

Weather included rainfall, minimum and maximum temperature and humidity. There was however, change in the weather season- wise. The change brought in all the features, whether be it rainfall, temperature or humidity.

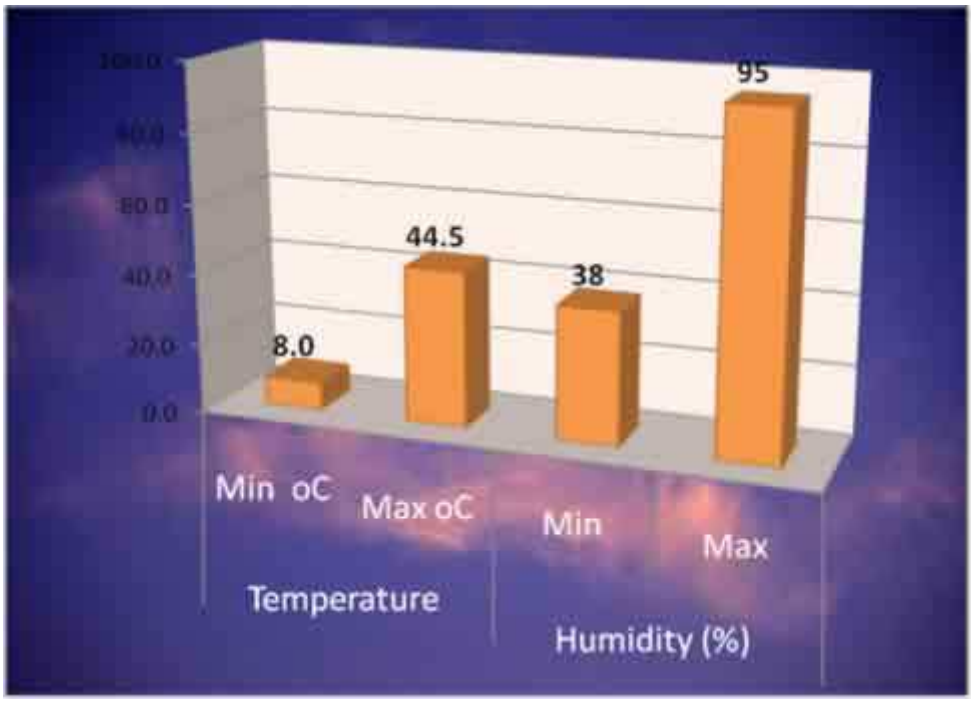


Fig. 2.5: Weather

In Bhagalpur, rainfall influenced mainly by the south-west monsoon starts in the second week of June and continues up to the end of September. It is revealed that there was maximum rainfall from June to September every year which, in aggregate came to 93.36 per cent of the total rainfall.

As far as maximum and minimum temperature and humidity is concerned, it was 44.05 °C, 8.0°C and maximum humidity 95.00 per cent while the minimum was 38.00 per cent, on the other hand, the average rainfall in the district was 1167.16 mm.

2.2.7.2 Irrigational Status

Irrigation happens to be one of the major inputs of agricultural development. Though, several measures have been taken to enhance the scope of irrigation ever since India became independent, however, things have not undergone metamorphosis change so far. Consequently, various sources of irrigation were taken recourse depending also on the status of the farmers. Notwithstanding these efforts, Bhagalpur lagged behind in terms of irrigational base and irrigational intensity compared to the state average.

Out of the net sown area, only 28.68 per cent of land was under irrigation and the rest either remained rainfed or face the worst. The data on source wise distribution of irrigated area revealed that Borewell (73.76%) was the major followed by tank (14.45%), open well (6.34%) river (5.37%) and the least being canal (0.12%).

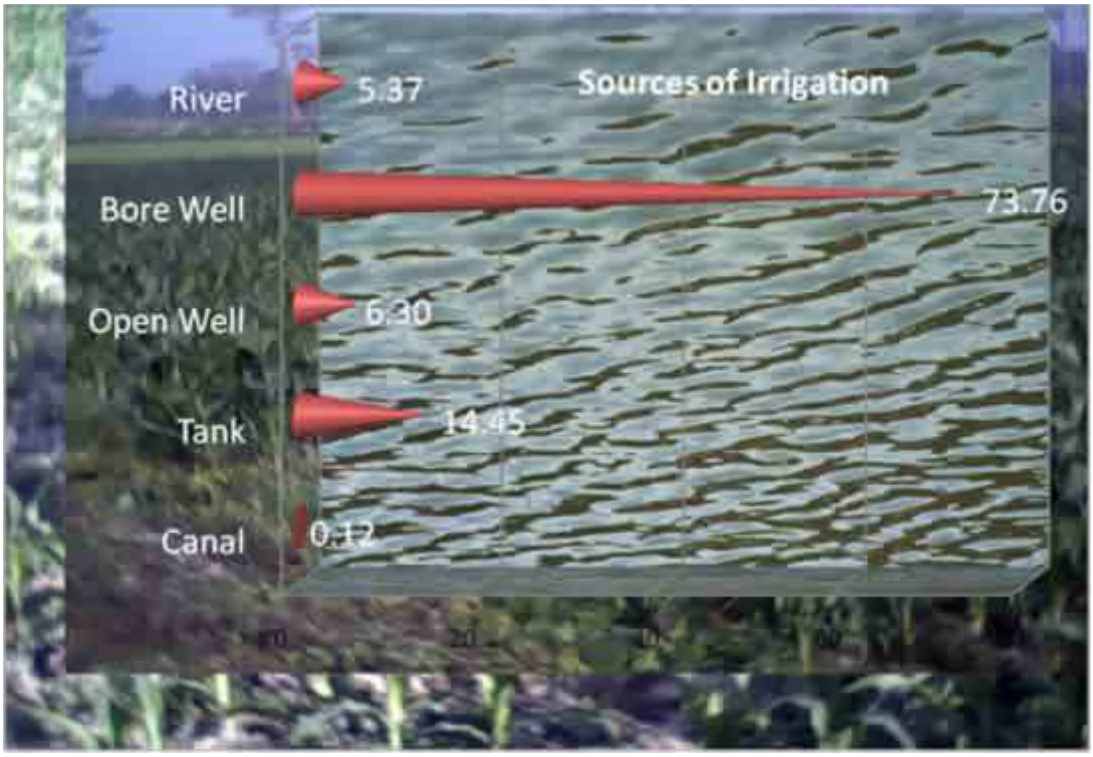


Fig. 2.6: Source of Irrigation

2.2.7.3 Groundwater

The contribution of groundwater resource to irrigated agriculture was half of the total irrigated area, which is the nature's benediction to agriculture. In regard to ground water status in the district, it is well known that the greatest use of water resources was for irrigation, which was the artificial application of water to crops. The irrigation base in the district was 28.68 per cent, which was far behind the state's picture (77.82%). The percentage of irrigation through groundwater structures was 80.06 to the gross cropped area. On an average, the depth of availability of ground water in the pre-monsoon of 2004 in the district was 5.85 meters. Though, it had gone down during 1980-2004 to the extent of 0.16 meter to 3.15 meters across the blocks in the district.

NB: (C-DAP, Bhagalpur District, 2008).

BANKA DISTRICT

2.1 Introduction

Banka district of Bihar came into existence in 1991. Earlier it was a part of the old Bhagalpur district and presently it continues to be a part of Bhagalpur Commissionery. The map of the district clearly shows its physical and administrative boundaries.

2.2 District at a Glance

It is generally agreed that future development patterns and strategy emerge primarily from the regional structure, which largely determine the nature of the impulses and the constraints of regional development. Familiarity with the regional structure is, therefore, a precondition for an understanding of growth promoting and growth retarding factors operating, and is needed in order to identify the locations of growth centres and growth points in the district. It is in this context significant to sketch a short profile of Banka district, which formed part of the villages, where respondents (katarni paddy growers) were surveyed.

2.2.1 Location and Geographical Units

Banka district is situated in centre of 24°30′ to 25°08′ N latitudes and 86°30′ to 87°12′ E longitudes in the basin at a height of 43 metres from the mean sea level. The district is surrounded by Dumka & Deoghar districts of Jharkhand in south, Bhagalpur in north, Godda (Jharkhand) in east and Jamui & Munger in West. The district is spread over 3.05 lakh hectares and divided into 11 blocks and 185 gram panchayats. It had 2114 revenue villages. Out of it, 1682 villages (79.56%) were inhabitated and 432 (20.44%) un-inhabitated.

2.2.2 Demographic Profile

As per the Census 2001, the population of Banka district is 16.08 lakh, which accounts for 1.94 per cent of the state's total population. The percentage of rural population is 96.49. The proportion of population belonging to scheduled caste is

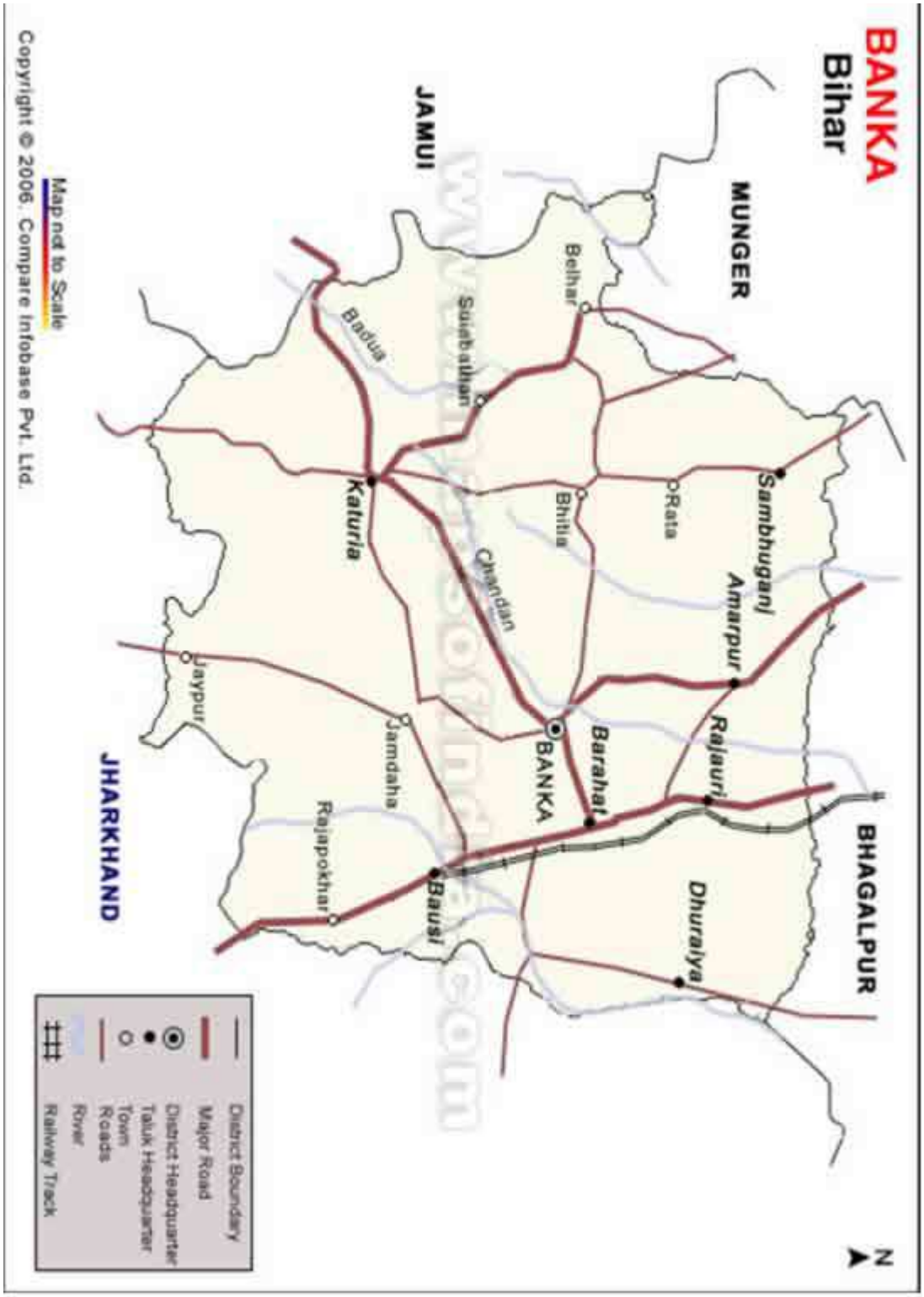


Fig. 2.7: Map of Banka District

12.44 per cent and that of scheduled tribes is a meagre 4.66 per cent of the total population in the district. Sex ratio of the district is distressing (908 females/1000 males). The population density is 533/sq. kilometer. The percentage of rural population living below poverty line is 48.69. The literacy rates of males and females are 55.3 and 28.7 per cent respectively. It revealed that the gender gap in literacy is 26.6 per cent.

However, the Census 2011, Series – II report reveals that the population of Banka district was 20,29,339, which accounted for 1.96 per cent of the state's total population. Sex ratio of the district was distressing (907 females/1000 male). The population density was 672/sq km. The literacy rates of male and female were 69.80 and 49.40 per cent respectively. It revealed that the gender gap in literacy was 20.40 per cent.

The number of total workers in the district was 6.39 lakh, which accounted for 39.74 per cent of the total population. The data on classification of workers reveals that 51.71 per cent were agricultural labourers followed by 33.74 per cent cultivators, 4.62 per cent workers engaged in household industries and 9.93 per cent constituted other workers. The work participation rate in the district was 39.70 per cent with only 28.16 per cent in case of female.

2.2.3 Topography and Agro-climatic Characteristics

Banka district is unique in its characteristic that it forms part of Agro-climatic Zone – III A (South Alluvial Plane). The p^H ranged from 6.8 to 8. The climate of Banka district was found sub-humid and sub-tropical monsoon type with average annual rainfall around 1123.29 mm. The farming situations in the district were extremely diverse. The soil of the district is medium to heavy in texture. It is grey to red in colour, moderately alkaline in reaction and cracks (5 to 8 cm wide and 16 to 120 cm deep) during summer. Soil becomes bounding during summer and remains inundated during rains. Banka can be divided into two regions; northern plains and southern hilly regions.

The district had hot summer and moderate in winter season. As per available normals, the maximum temperature of the district was 43° Celsius in the month of May/June and minimum temperature fell up to 8.8° Celsius in the month of December/January. The minimum and maximum percentages of the humidity were 28.8 and 77.6 respectively.

2.2.4 Land Utilization Pattern and Land Holdings

While changes in land utilization pattern were very slow and marginal throughout the state, however, there had been a marginal increase in the non-agricultural use of geographical area across the state. As regards the pattern of land utilization in the district of Banka, out of the total geographical area, net sown area was 1.52 lac hectares i.e., 49.86 per cent. While forest coverage had remained at 14.18 per cent, permanent pasture land was 0.56 per cent. Current fallow land came to 1.25 per cent, cultivable waste land (2.61%) and land under non-agricultural use (13.35%).

The cropping intensity was 106.00 per cent only, which was much lower than the state figure of 132.78 per cent.

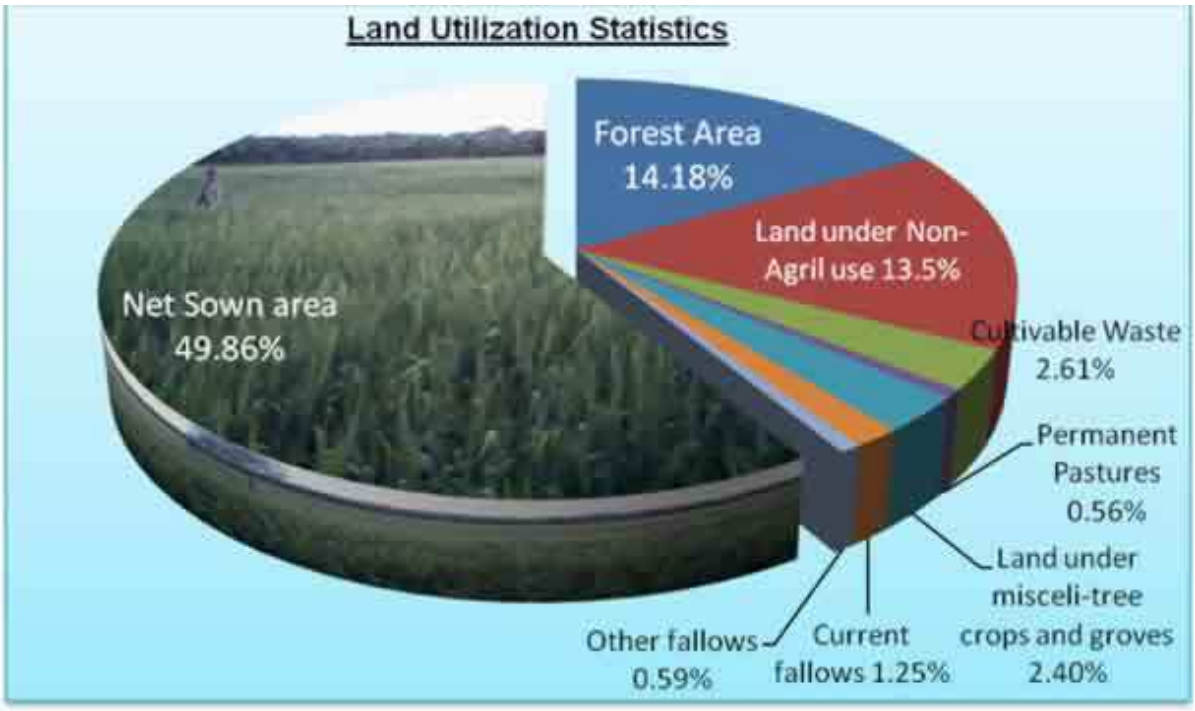


Fig. 2.8: Land Utilization

Land Capability Classification

Banka had an advantage of having 37.86 per cent of total geographical area and 75.93 per cent of net sown area in good shape. These lands, however, were of different grades.

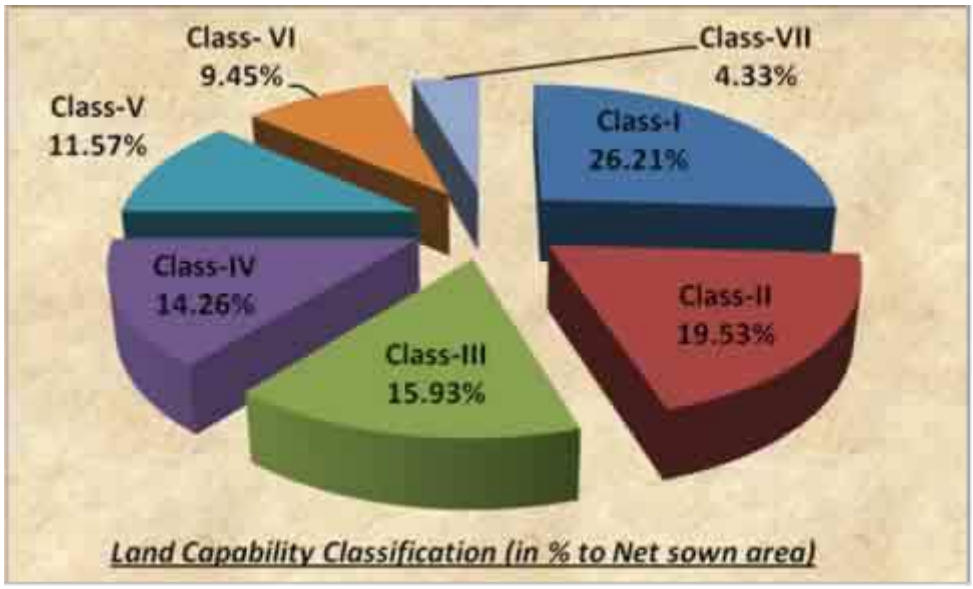


Fig. 2.9: Classification of Land

The data revealed that out of the total cultivable land, class – I land was (26.21%) followed by class – II, III and IV – (19.53%, 15.93% and 14.26%) of net sown area respectively. It is to be pointed out here that the soils falling under the middle Indo-Gangetic plain were one of the most fertile in the World.

Land Holding Pattern

History bears testimony to the fact that not all the cultivators were equal partners of the land available. For one or the other reason some became rich, other became small over the period of time another category of farm holders also emerged into the scene to be classified again differently according to their possession of land. The District of Banka is also not uncommon in terms of land-man ratio prevalent across the state. The percentage of marginal farmers was 80.18 per cent with 40.11 per cent land as against the small farmers (9.99%), medium farmers (6.52%) and large farmers (3.4%) with 19.91 per cent, 18.83 per cent and 21.15 per cent of land respectively. The growing downward trend of land man relationship did not augur well for the farmers in general, who had to subsist on agrarian economy only in the district.

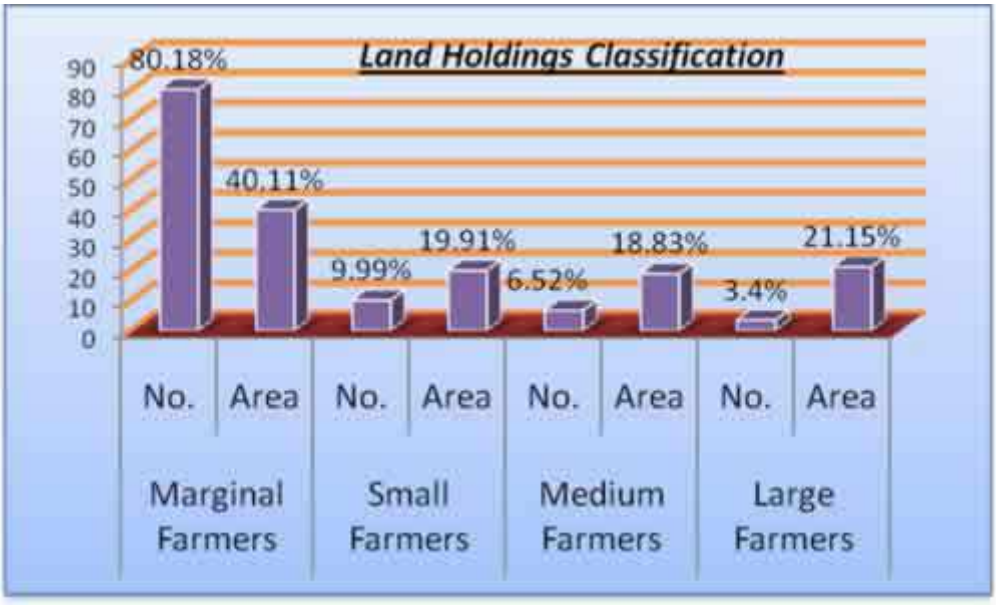


Fig. 2.10: Land Holdings

2.2.5 Irrigation and Groundwater Status

In fact, the state is richly endowed with water resources and a very healthy rainfall. However, neither the distribution of water resources nor the rainfalls were found to be uniform in the state, causing uneven irrigation potential/coverage across the state/district. A brief look on these aspects in Banka may be as below:

Weather

Weather includes rainfall, minimum and maximum temperature and humidity. Change in the weather season wise could be seen there. The change brought in all aspects of weather, be it rainfall, temperature or humidity.

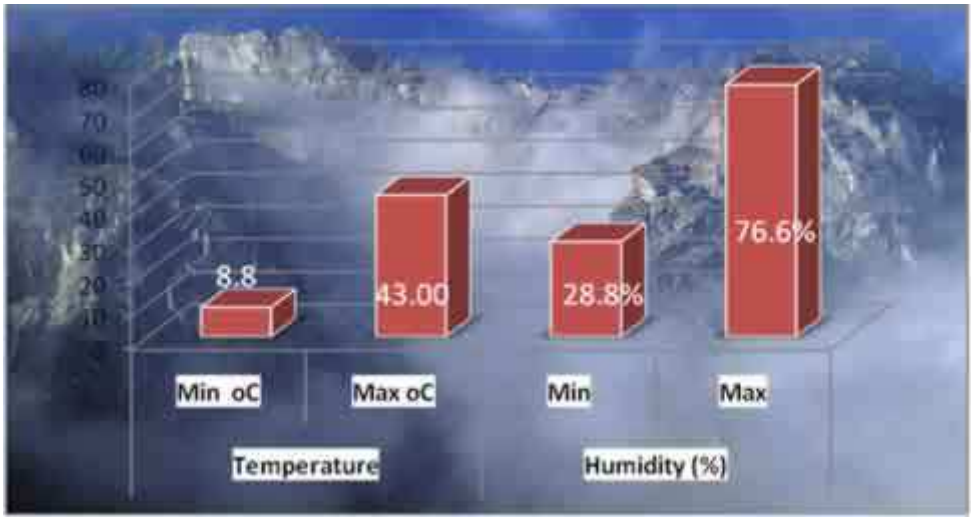


Fig. 2.11: Weather Conditions

In Banka, rainfall influenced mainly by the south-west monsoon starts in the second week of June and continues up to the end of September. It could be seen that there was maximum rainfall from June to September every year, which all together came to 90.81 per cent of the total rainfall.

As far as maximum and minimum temperatures and humidity is concerned, these were 43 °C, 8.8°C and maximum humidity 76.60 per cent; while the minimum being 28.80 per cent, on the other hand, the average rainfall in the district was 1123.29 mm.

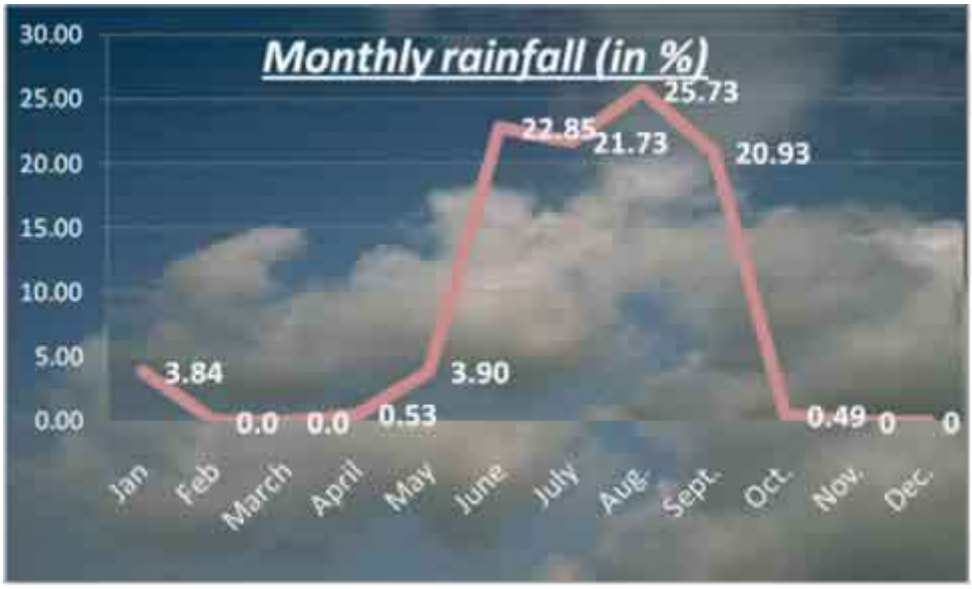


Fig. 2.12: Monthly Rainfall

Irrigational Status

Irrigation happens to be one of the major inputs of agricultural development. Though there have been several measures taken to enhance the scope of irrigation ever since India became independent, however, things had not undergone metamorphosis change so far. Consequently, various sources of irrigation were taken recourse to depending also on the status of the farmers. Notwithstanding these efforts, Banka lagged behind in terms of irrigational base and irrigational intensity compared to the state average. As per latest data, out of the net sown area, only 83.72 per cent of land had the scope of irrigation and the rest either remained rainfed or faced the worst. The data on source wise distribution of irrigated area

revealed that canal (70.57%) was the major source followed by bore well (18.74%), open well (5.67%), tank (2.34%) and others (2.68%).

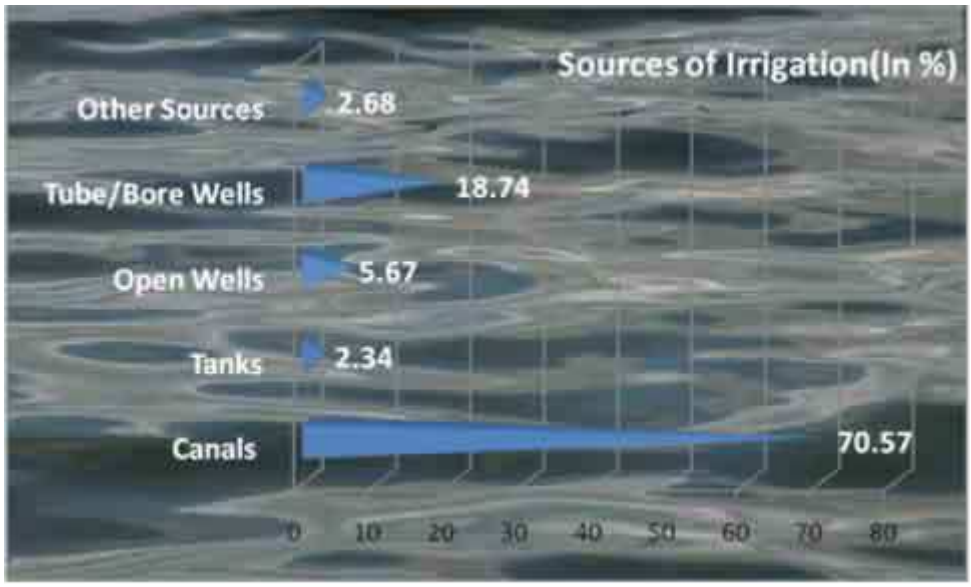


Fig. 2.13: Sources of Irrigation

Groundwater

The contribution of groundwater resource to irrigated agriculture was then almost one-fourth of the total irrigated area, which was the nature's benediction to agriculture. In regard to ground water status in the district, it was 96342 ha metre. Out of that, 76.50 per cent was available for irrigational use. Out of the utilizable quantity, only 22.33 per cent (16455 ha metre) was drafted and the balance available for use was 77.67 per cent (57248 ha metre). The irrigation base in the district was 83.72 per cent, which was far ahead the state's picture (77.82%). The percentage of irrigation through groundwater structures was 20.43 of the net sown area. On an average, the availability of ground water in the pre-monsoon of 2004 in the district was 4.24 metres. (Directorate of Soil Conservation, Govt. of Bihar).

NB: C-DAP, Banka District, 2008.

CHAPTER - III

SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

3.1 Extent, Distribution and Growing Environments of Aromatic Rices

Before comprehending the extent and distribution of aromatic rices in India, It will be desirable to contemplate some specific characteristics of aromatic (scented) rice.

As a matter of fact, aromatic or scented rices are characterized by mild to strong aroma. The aromatic rices of India may be categorized into two broad types. Basmati type, which are characterized by long, slender grains, having kernel length of 6.6 mm and more, length to breadth (L/B) ratio of 3 and above, and high kernel elongation (about 2) after cooking. The gains of Basmati cultivars are pointed at both ends with gradual tapering at the end opposite to the germination end and have uniform breadth between the tapering (Mahindru, 1995). The other non-basmati aromatic types also have one or more of the basmati characteristics, but not all of them usually. They have small (5.5 mm or less) and medium (5.5 to 6.6 mm) kernel length, although they may have similar L/B ratio or kernel elongation rate as high as of Basmati, or even more. But, overall kernel elongation after cooking is much higher in Basmati types than in non-basmati types. In terms of traits like: aroma, fluffiness, taste etc. some of the non basmati aromatic rices are superior to basmati types *(Singh et al, 2001). Singh, A N & Singh, V P "Extent Distribution and Growing Environments of Aromatic Rices in India," (R K Singh & U S Singh (Ed) Book: "A Treaties on the Scented Rices of India" Kalyani Publishers, B-1/1292, Rajinder Nagar, Ludhiana – 141 008 (2003), pp 211-229.*

Katarni varieties of rice being grown in certain, bit limited areas of Bhagalpur and Banka districts in Bihar do possess distinct and cursorily superior aroma and better taste than that of basmati rices.

3.1.1 Area under Aromatic Rices

In several rice-growing states of the country, aromatic rices are grown. The exact area under these rices is not available, more so for the non basmati type. For the basmati type, fairly accurate estimates are available due to its export market. Remote sensing satellite data have been used for accurate area estimate of basmati (Kalubarme et al., 1989) and some of the basmati exporters are also using these data for the pre-harvest acreage and production forecast of basmati rice in different states. Basmati rice cultivation is mainly confined to the states of Uttar Pradesh, Haryana, Punjab, Uttranchal and to limited areas in Himachal Pradesh, Jammu & Kashmir and Rajasthan. As an outcome of this export orientation, the area under basmati fluctuates depending on demand and the level of premium offered over the high yielding non basmati rices.

Sidding (1990) reported the basmati area in India to be about 0.7 to 0.8 million ha and production of 0.6 to 0.7 million tones of milled rice. Recently, Bhasin (2000) also reported about 0.7 million ha under basmati rice in the country with a production of nearly 0.6 million tones of milled rice. It means the productivity of basmati rice stood at 865.72 kg/ha or 8.66 Qtls/ha (of milled rice).

The state of Haryana had the largest area under basmati followed by Uttar Pradesh and Punjab. About 30-40 per cent of total rice area in Haryana, 3-4 per cent in UP and 5.00 per cent in Punjab are under basmati rice (Thapar et al, 1998). The area under basmati rice is reported to fluctuate in Haryana between 0.1 and 0.3 million ha during different years depending largely upon the rates offered to paddy during the preceding years and date of arrival as well as intensity of monsoon rains (Ahuja et al, 1995).

3.1.2 Distribution

With the help of the following tabular presentation, approximate extent (hectare – ha) of basmati and other aromatic rices in the state of Bihar can be understood. The electic tabular presentation includes: (i) aromatic rice type, (ii) approximate area ('000 ha), (iii) productivity (tone/ha), and; (iv) reference.

Table No. 3.1: Approximate Extent (ha) of Basmati and Other Aromatic Rices in Different Parts of Bihar

SN	State	Aromatic Rice type	Approx Area ('000 ha)	Productivity (T/ha)	Reference
1.	Bihar	Non-basmati	100	1.16 T/ha (1,160 kg/ha)	Thakur & Choudhary (2002)

Table No. 3.2: Climatic and Other Environmental Characteristics of Aromatic Rice Growing Areas of Eastern Bihar

Main Aromatic Rice Variety	Growing Districts & Approx Areas	Rainfall (mm) Annual/Rice Growing months	Max/Min Temperature (°C) in Flowering Months	Eco-Region Climate Physiography & Flowering time Water table Condition (Deep, Shallow)	Soil Characteristics (Texture, Fertility, Depth, Drainage)	Other Special Features (Irrigated/Refined), Growing period (GP) Length in Days
1	2	3	4	5	6	7
Bihar						
Katarni, Kamini (selection from katarni) tulsi manjari, Br-9 (selection), badshahbhog, Br-10 (selection)	Bhagalpur	Sabour Annual-1135 mm June-Oct- 1002 mm	Sabour Sept. 32.1/25.8 Oct. 31.2/21.9 Nov. 28.3/14.0	Eastern plains, hot sulphumid (moist); bunded fields, on flat lands in the river basins; chaur slops, shallows. Gently sloping alluvial plains of Ganga	Alluviam derived, deep, poorly to moderately drained, moderately to high fertile soils (haplustalfs and votochrepts)	Rainfed/Irrigated GP – 180-210
Mircha, Champaran basmati, sugandha	East & West Champaran	Motihari Annual – 1215 mm June-Oct—1095 mm	Motihari Sept – 32.0/25.2 Oct – 31.3/21.1 Nov- 28.0/13.8	Eastern plains, hot suphumid (moist); Bunded fields on flat lands in the river basins; chaur slops, shallow. Gently sloping foot hills (Tarai).	Alluvium derived, deep, poorly to moderately drained, moderately to highly fertile soils. (Ustarfherts and vstochrepts).	Rainfed/Irrigated GP-180-210
Malida	Darbhanga & Madhubani	Darbhanga Annual – 1257 mm June-Oct.- 1127 mm	Darbhanga Sept- 32.2/25.8 Oct -31.4/22.3 Nov 28.7/15.2	Eastern plains, hot subhumid (moist) Bunded fields, on flat lands in the river basins; chaur slops; shallow.	Alluvium derived; deep; poorly to moderately drained, moderately to highly fertile soils.	Rainfed, GP – 180-210
Hansraj	Patna	Patna Annual- 1110 mm June-Oct.- 1017 mm	Patna Sept.- 32.3/26.3 Oct. – 31.9/23.0 Nov. – 28.9/16.1	Northern plains; hot subhumid (dry); bunded fields on leveled lands in river basins; chaurs; deep.	Alluvium derived, deep, poorly to moderately drained, moderately to highly fertile soils.	Rainfed, GP-150-180

Having essayed extent of Basmati and other aromatic rices in India, Bihar and a glance on climatic and other environmental characteristics of 'aromatic rice growing areas of Eastern India's states an attempt has been made here to expatiate the socio-economic characteristics of the farmers who cultivate katarni paddy. It is worth mentioning here that the concentration of katarni paddy growers is mainly in Bhagalpur and Banka districts of Bihar.

3.2 Socio-Economic Characteristics of Sample Respondents

A glance on the table containing data related to socio-economic features of sample respondents reveals highest number of respondents (growing katarni paddy) to be in the age group of 36-60 years in both Bhagalpur (93.33%) and Banka districts (83.33%). The overall number in this age group was 53 (88.33%). In number terms, these were 28 and 25 in Bhagalpur and Banka districts respectively. Only 2 respondents were found in the age group of 60 years and above group in each of the districts.

As far as educational level of the surveyed respondents is concerned highest number 13 (43.33%) were found to have qualification up to graduation and above in Bhagalpur district, while in Banka district respondents qualified up to secondary level 14 (46.67%) dominated table No. 3.3).

Social group wise composition of the surveyed respondents reveals that the highest number of katarni paddy growing farmers belonged to OBC group 23 (76.67%) in Bhagalpur and 17 (56.67%) in Banka district. In Banka district, farm households of general category – 8 (26.67%) were higher than Bhagalpur (10%) only. Surveyed farmers belonging to Scheduled Caste (SC) group were also higher in Banka district 5 (16.66%) than that of Bhagalpur district 4 (13.33%). The reason behind the higher number of general caste katarni growers is that a good number of surveyed farmers, i.e., residents of nearby Lakshmipur village in Amarpur block of Banka district belonged to a particular Kayastha Community (known as Radhiya Kayastha migrated to Bihar several years back from the state of Bengal). It is to be noted here that out of the total 15 medium and large categories growers surveyed in Banka

district, 8 (53.34%) belonging to so called R K caste are mostly prosperous followed by good number of their respective family members engaged in high positioned jobs both in public and private sectors. So, they preferred to grow katarni paddy in larger proportion of their respective land areas, not for profit motive only, but with the objectives of self-consumption and maintaining social status. If some of them are not able to cultivate their fields themselves, then they preferred to cultivate it on share cropping basis (with the direction to the tenant farmers to grow katarni paddy in their pieces of land.

Data in table further expresses stronger presence of respondents belonging to hindu religion in Bhagalpur district (73.33%) and 100 per cent in Banka district. On overall level, there were 86.67 per cent growers belonging to hindu and 13.33 per cent to mohamden communities (table No. 3.3).

Data in table distinctly covers that all of the surveyed katarni paddy growers in both the selected districts were male (100% each).

In regard to main occupation and other activities of the surveyed farmers, table evinces agriculture to be the main source of livelihood for all the surveyed farmers of both the 30 (100%) districts i.e., Bhagalpur (30-100%) and Banka. Service (both in public and private sectors) also provided remarkable supplementary support to 13.33 per cent of surveyed farmers of Banka and 6.67 per cent of Bhagalpur district. Equal number of katarni paddy growers 2 (6.67%) were found to be working as agricultural labourers in both the districts. Business/trade was also adopted as supporting activity by 10 and 6.67 per cent of respondents of Bhagalpur and Banka districts respectively (table 3.3). On overall level, share of the sources of livelihood for the surveyed katarni paddy growers were: (i) Agriculture (as main occupation) 100 per cent, (ii) Business/Trade 8.34 per cent, (iii) Service (Public/Private Sector 10.00 per cent, and; (iv) as Agricultural Labourers 6.66 per cent).

3.3 Land Holding Account

The table No. 3.4 encompasses data related to (i) Owned land, (ii) Leased in land, (iii) Leased out land, and; (iv) Operational area of the sample respondents of both the selected districts (viz., Bhagalpur and Banka) containing irrigated and unirrigated land areas. A glance on the table helps us to expound that at an average the surveyed katarni paddy growers of Bhagalpur and Banka, districts both) fell under the broad category of medium land holding. It further furnishes that katarni paddy growing not being a much remunerative exercise, mostly the medium and big farmers preferred to undertake its cultivation.

Data in table 3.4 grounds that both in Bhagalpur and Banka districts unirrigated areas had greater shares in total land owned by the surveyed farmers (on aggregate level). Unirrigated land areas were estimated at 38.23 ha and 34.29 ha in Bhagalpur and Banka districts compared to 32.91 ha and 30.79 ha of irrigated ones in both the districts respectively. It is interesting to note that in Bhagalpur 4.54 ha and Banka 25.14 ha of leased in land areas were from irrigated conditions, i.e., higher than unirrigated ones 3.48 ha and 10.71 ha) respectively. The proportion of leased out land was higher under unirrigated condition in Bhagalpur district (1.88 ha against 0.89 ha of irrigated one) as compared to in contrast with 1.03 ha against 4.97 ha of Banka district. Having groped the reason, most probably responsible for larger gross areas on aggregate level in Banka district 100.93 ha than Bhagalpur 79.16 ha, the revealed factor may be attributed to much higher leased-in area of 35.85 ha actually leased out by the big and prosperous R K caste land owners of the district (table 3.4).

Table No. 3.3: Socio-Economic Features of the Sample Respondents

Particulars			Bhagalpur (N=30)		Banka (N=30)		Overall (N=60)	
I.	**Age**		No.	%	No.	%	No.	%
	a.	18-35	---	---	3	10.00	3	5.00
	b.	36-60	28	93.33	25	83.33	53	88.33
	c.	60 years & above	2	6.67	2	6.67	4	6.67
II.	**Educational Level**							
	a.	Primary	6	20.00	9	30.00	15	25.00
	b.	Secondary	11	36.67	14	46.67	25	41.67
	c.	Graduate & above	13	43.33	07	23.33	20	33.33
	d.	Any technical	---	---	---	---	---	---
III.	**Social Groups**							
	a.	Scheduled Caste (SC)	4	13.33	5	16.66	9	15.00
	b.	Scheduled Tribes (ST)	---	---	---	---	---	---
	c.	Other Backward Caste (OBC)	23	76.67	17	56.67	40	66.67
	d.	General	3	10.00	8	26.67	11	18.33
IV.	**Religion**							
	a.	Hindu	22	73.33	30	100.00	52	86.67
	b.	Muslim	8	26.67	---	---	08	13.33
V.	**Sex**							
	a.	Male	30	100.00	30	100.00	60	100.00
	b.	Female	---	---	---	---	---	---
VI.	**Main Occupation**							
	a.	Agriculture (other supplementary Activities /occupations)	30	100.00	30.00	100.00	60	100.00
	b.	Business/Trade	3	10.00	2	6.67	5	8.34
	c.	Service (Private/Government)	2	6.67	4	13.33	6	10.00
	d.	Agricultural Labours	2	6.67	2	6.67	4	6.66

Table No. 3.4: Land Holding Account of the Sample Respondents (In ha)

SN	Land Particulars	Bhagalpur			Banka		
		Irrigated	Unirrigated	Total	Irrigated	Unirrigated	Total
1.	Owned land	32.91	38.23	71.14	30.79	34.29	65.08
2.	Leased-in	4.54	3.48	8.02	25.14	10.71	35.85
3.	Leased-out	0.89	1.88	2.77	4.97	1.03	6.00
4.	Gross total area	37.45	41.71	79.16	55.93	45.00	100.93
5.	Net operational area	36.56	39.83	76.39	50.96	43.97	94.93

Net operational areas under irrigated and unirrigated conditions in Bhagalpur and Banka districts were found as 36.56 ha, 39.83 ha, 50.96 ha and 43.97 ha respectively (table 3.4).

3.4. Farm Class Wise Land Holdings

Farm class wise land holding detail of sample farmers belonging to Bhagalpur and Banka districts have been made its enclosure around: (i) owned land, (ii) leased-in land, (iii) leased-out land area, (iv) total area, and; (v) operational land area (comprising irrigated, unirrigated and total for each). It contains data/information

farm class wise (viz., marginal – 0.01 to 1 ha, small – 1.01 to 2 ha, medium – 2.01 to 4 ha and big/large – above 4 ha).

Data in table corroborate that average sizes of leased-in land were higher in cases of marginal farmers on overall level (0.53 ha) in Bhagalpur district, while small farmers (2.10 ha) in Banka district. It is interesting to note that no medium and/large farmer leased out their land in Bhagalpur district, while Banka district witnessed as per normal belief large (1.16 ha) and medium farmers (0.21 ha) to have leased out their cultivable land. One of the possible factors responsible for not leasing out land by medium and big surveyed farmers of Bhagalpur district could be that average sizes of land holdings by these farm households were not too large and, had the capacity and owned the resources to cultivate their highly fertile fields themselves. In addition to this, the farmers of Jagdishpur block under Bhagalpur district had the privileges of being in easy and nearby access to commissionary and district headquarters of Bhagalpur. Research team of the scientists of the Bihar Agricultural University (BAU) Sabour, Bhagalpur also used to pay frequent visits to the nearby villages of Bhagalpur district.

The farm class wise leased in area wise data reveal much higher proportion to have taken in by the sample growers of Banka district at aggregate total level 35.85 ha than that of Bhagalpur district 8.02 ha (table 3.5). Small and medium farmers of Banka district were clearly ahead in leasing in lands followed by marginal farmers in terms of aggregate total 14.65 ha, 14.48 ha and 6.72 ha respectively. In Bhagalpur district, marginal farmers were ahead 3.67 ha followed by small and medium 3.35 and 1 ha respectively.

While calibrating data related to average of the operational land areas at overall level, farm class wise, it is revealed that except, big farmers of Bhagalpur district 5.51 ha marginal, small and medium farmers of Banka district possessed larger areas. The average were 1.59 ha, 4.09 ha, 3.46 ha and 4.06 ha respectively in Banka, while the same for Bhagalpur district were 1.04 ha, 1.76 ha and 3.14 ha respectively. In regard to total land areas by farm size groups wise the scenario was found the same

i.e., larger land area with big farmers of Bhagalpur district as compared to Banka district 22.02 ha and 15.63 ha respectively. Total land areas grossly owned by marginal, small and medium farmers of Banka district 12.72 ha, 28.63 ha and 43.95 ha were clearly bigger than that of Bhagalpur district 8.27 ha, 17.54 ha and 31.33 ha respectively (table 3.5).

In nutshell, due to larger total and average land areas leased out by big farmers of Banka district (majority of them belonging to prosperous R K caste, 3.47 ha, 2.53 ha, 1.16 ha and 0.21 ha) respectively, the sample katarni paddy growers of this district were at more privileged stage having taken larger areas as leased in land.

Table No. 3.5: Farm Class wise Distribution of Land Holdings (In hectare)

Size Group	Owned Land				Leased- in Land				Leased-out Land				Gross Total Land				Operational Land			
	Irrigated	Unirrigated	Total	Average	Irrigated	Unirrigated	Total	Average	Irrigated	Unirrigated	Total	Average	Irrigated	Unirrigated	Total	Average	Irrigated	Unirrigated	Total	Average
Bhagalpur																				
Marginal	2.02	2.58	4.60	0.66	2.54	1.13	3.67	0.53	0.30	0.75	1.05	0.15	4.56	3.71	8.27	1.19	4.26	2.96	7.22	1.04
Small	6.28	7.91	14.19	1.58	1.25	2.10	3.35	0.38	0.59	1.13	1.72	0.20	7.53	10.01	17.54	1.95	6.94	8.88	15.82	1.76
Medium	13.99	16.34	30.33	3.04	0.75	0.25	1.00	0.10	---	---	---	---	14.74	16.59	31.33	3.14	14.74	16.59	31.33	3.14
Large	10.62	11.40	22.02	5.51	---	---	---	---	---	---	---	---	10.62	11.40	22.02	5.51	10.62	11.40	22.02	5.51
Total	32.91	38.23	71.14	2.38	4.54	3.48	8.02	0.31	0.89	1.88	2.77	0.18	37.45	41.71	79.16	2.64	36.56	39.83	76.39	2.55
Banka																				
Marginal	2.25	3.75	6.00	0.75	5.45	1.27	6.72	0.84	---	---	---	---	7.70	5.02	12.72	1.59	7.70	5.02	12.72	1.59
Small	7.72	6.26	13.98	2.00	10.71	3.94	14.65	2.10	---	---	---	---	18.43	10.20	28.63	4.09	18.43	10.20	28.63	4.09
Medium	12.58	16.89	29.47	2.46	8.98	5.50	14.48	1.21	2.00	0.53	2.53	0.21	21.56	22.39	43.95	3.67	19.56	21.86	41.42	3.46
Large	8.24	7.39	15.63	5.21	---	---	---	---	2.97	0.50	3.47	1.16	8.24	7.39	15.63	5.21	5.27	6.89	12.16	4.06
Total	30.79	34.29	65.08	2.17	25.14	10.71	35.85	1.33	4.97	1.03	6.00	0.40	55.93	45.00	100.93	3.37	50.96	43.97	94.93	3.17

3.5 Cropping Pattern

Analysis of cropping pattern contains data related to areas under various crops used by surveyed farmers of Bhagalpur and Banka districts in the year 2010-11.

Data in table No. 3.6 cause to develop that in Bhagalpur district larger areas under unirrigated conditions were used by the sample respondents for growing cereal mainly paddy 34.25 ha pulses, mustard 7 ha and orchards 3.50 hectares. In case of Banka district, areas under pulse crop masoor (lentil) 12.50 ha, khesadi 7 ha, mustard 8 ha, Tisi 4.92 ha and orchards 5.55 ha under unirrigated land areas were higher. Paddy in Banka district got greater share under irrigated condition 38.13 ha.

A concise look upon data in cropping pattern table crystallizes larger areas under katarni paddy devoted/used in irrigated conditions in Bhagapur and Banka districts both when compared to areas under unirrigated conditions 6.35 ha 10.20 ha and 2.08 ha and 9.15 ha respectively. Under cereal crop maize also got preference under irrigated conditions in both the districts 2.81 ha and 2.00 ha respectively.

Table No. 3.6: Cropping Pattern of the Sample Households (2010-11 in ha)

SN		Crops	Bhagalpur							Banka						
			Irrigated		Un-irrigated		Total (Irri + Unirri)			Irrigated		Un-irrigated		Total (Irri + Unirri)		
			Area	Production	Area	Production	Area	%age	Production	Area	Production	Area	Production	Area	%age	Production
1.		Paddy (General)	27.40	1100.00	34.25	1340.13	61.65	80.70	2440.13	38.13	1500.10	29.07	1109.02	67.20	70.79	2609.12
2.		Katarni paddy	06.35	121.89	02.08	39.31	08.43	11.04	161.20	10.20	192.00	09.15	167.11	19.35	20.38	359.11
3.		Maize (Kharif)	02.81	80.10	---	---	02.81	3.68	80.10	02.00	57.00	0.20	5.20	02.20	2.32	62.20
4.		Wheat	21.20	570.18	---	---	21.20	27.75	57.18	30.20	815.50	---	---	30.20	31.81	815.05
5.		Maize (Rabi)	02.50	68.05	---	---	02.50	3.27	68.05	01.40	39.20	---	---	01.40	1.48	39.20
6.		**Pulses**														
	i.	Gram	05.20	58.60	6.16	66.22	11.36	14.87	124.82	04.01	44.71	3.00	30.75	7.01	7.39	75.46
	ii.	Lentil (Masoor)	4.00	38.00	13.02	121.28	17.02	22.28	159.28	02.50	26.00	12.50	123.75	15.00	15.80	149.75
	iii.	Moong (Summ)	---	---	02.20	13.20	02.20	2.90	13.20	04.00	26.00	3.00	18.30	7.00	7.37	44.30
	iv.	Khesadi (Sum)	---	---	04.60	32.66	04.60	6.02	32.66	---	---	7.00	56.00	7.00	7.37	56.00
7.		**Oilseeds**														
	i.	Mustard	01.30	13.00	07.00	66.50	8.30	10.87	79.50	04.22	42.75	8.00	79.20	12.22	12.87	121.95
	ii.	Linseed (Tisi)	---	---	03.35	30.05	03.35	4.39	30.05	02.10	18.90	4.92	44.28	7.02	7.40	63.18
8.		**Vegetables**														
	i.	Potato (Rabi)	01.30	200.00	---	---	01.30	1.70	200.00	00.65	97.50	---	---	0.65	0.68	97.50
	ii.	Onion (Rabi)	0.56	104.16	---	---	0.56	0.73	104.16	01.00	140.00	---	---	1.00	1.05	140.00
	iii.	Brinjal	0.50	110.00	---	---	0.50	0.65	110.00	00.25	18.75	---	---	0.25	0.27	18.75
9		**Others**														
	i.	Orchards	---	---	3.50	238.03	03.50	4.58	238.03	0.63	New Plantation	5.55	549.29	6.18	6.51	549.29

NB: Percent has been calculated by taking area under orchards to be common and same for both the kharif and rabi seasons.

As per normal practice, one of the major cereal crop (wheat) was found to have been grown in only irrigated land by the surveyed farmers of both the districts (21.20 ha and 30.20 ha) namely, Bhagalpur and Banka respectively. Gram and Lentil (masoor) being the major pulse crops in the surveyed area are prominently grown in irrigated and unirrigated areas both in Bhagalpur and Banka districts. The area under these crops used by the sample farmers were found 5.20 ha, 6.16 ha, 4.00 ha, 13.02 ha in Bhagalpur district and 4.01 ha, 3.00 ha, 2.50 ha and 12.50 ha in Banka district respectively. Moong and Khesadi like pulses were also found to have grown in unirrigated land of Bhagalpur district. In Banka district, only Moong was found to have been grown in irrigated and unirrigated areas both (4 ha and 3 ha respectively table 3.6). Data in table further insinuates the principal oilseed crop Mustard to have been grown in significant areas by the surveyed respondents of both the districts, namely Bhagalpur and Banka (mainly in unirrigated area. The areas devoted to this crop were 7.00 ha and 8.00 ha respectively. Under irrigated condition, Mustard got 1.30 ha and 4.22 ha respectively in both the districts. Linseed (Tisi) was also grown by the surveyed farmers in unirrigated condition in Bhagalpur district and irrigated and unirrigated conditions both in Banka district 3.35 ha, 2.10 ha and 4.92 ha respectively.

As far cultivation of vegetables is concerned, data contained in the table reveals larger areas devoted towards onion (in irrigated condition) only in both the surveyed districts in comparison to brinjal and potato also in Banka district 0.56 ha, 1.00 ha, 0.50 ha, 0.25 ha and 0.65 ha respectively.

Orchards were found to have been grown in unirrigated conditions in Bhagalpur district whereas in Banka district, it got share in both irrigated and unirrigated land areas by the surveyed farmers 3.50 ha, 0.63 ha meant for new plantation and 5.55 ha respectively.

On aggregate level, general idea can be represented as Bhagalpur and Banka districts being suitably used for growing all principal cereal crops, pulses, oilseeds and vegetables.

3.6 Farm Size wise Operational and Katarni Paddy Areas

In this section of the chapter farm size wise total operational area and areas under katarni paddy used by surveyed farmers of Bhagalpur and Banka districts have been dealt. Data contained in table captivates towards largest areas under katarni paddy devoted by big large farmers of Bhagalpur and Banka districts both (4.22 ha and 10.00 ha, i.e., 50.06 per cent and 51.68 per cent of the respondents respectively. Having a glance on data it can also be framed that there is direct and positive relationship between farm size and areas devoted for growing katarni paddy, i.e., with the increase in the farm size, there were increases in land areas used for growing katarni paddy. Small farmers of Banka district were found to have devoted a bit larger area in percentage and physical terms both under katarni paddy cultivation 3.74 ha, 19.33 per cent than that of Bhagalpur district 1.22 ha, i.e., 14.47 per cent (table 3.7). Though medium surveyed farmers of Banka district devoted larger areas under katarni paddy cultivation in physical terms 4.51 ha, i.e., 23.31 per cent, however, in percentage terms, it was lower than that of Bhagalpur district 29.66 per cent, 2.50 ha.

Table No. 3.7: Farm Size wise Distribution of Operational Areas and Katarni Paddy Land Areas

(In ha)

SN	Size Group	Bhagalpur		Banka	
		Total Operational Area	Katarni Paddy Area	Total Operational Area	Katarni Paddy Area
1.	Marginal	7.22	0.49 (5.81)	12.72	1.10 (5.68)
2.	Small	15.82	1.22 (14.47)	28.63	3.74 (19.33)
3.	Medium	31.33	2.50 (29.66)	41.42	4.51 (23.31)
4.	Large	22.02	4.22 (50.06)	12.16	10.00 (51.68)
	Total	76.39	8.43	94.93	19.35 (100.00)

Further, the table evidently suggests that in percentage terms, except medium category surveyed farmers of Bhagalpur district 29.66 per cent, the marginal, small and large farmers of Banka district preferred to devote larger areas for growing katarni paddy than that of Bhagalpur district out of the total land owned. On overall level, total areas used for growing katarni paddy by surveyed farmers of all farm size groups in Bhagalpur and Banka districts were 8.43 ha and 19.35 ha respectively (table 3.7).

ECONOMICS OF KATARNI PADDY

This chapter seeks to circumspectly examine economics of Katarni paddy in the study area i.e., Bhagalpur and Banka districts of Bihar.

With the view to calculate cost of cultivation per hectare, data related to (i) fixed cost, (ii) variable cost, (iii) production, (iv) rate (price), (v) productivity (yield), and; (vi) returns, etc. were collected from surveyed farmers and analyzed. The data inscribed in table No. 4.1 lead us to ascertain that on overall level under variable cost maximum expenditure, i.e., in percentage terms, was incurred on hired labour Rs. 9,070 per hectare (24.68%), and the minimum being in case of depreciation on implements and farm buildings Rs. 650/- (1.77%). While the amount paid as wages to hired labourers was higher Banka district (Rs. 9,100/-), the transplantation cost was higher in Bhagalpur (Rs. 1,050/-). As the quantum of net returns were quite higher in Bhagalpur district (Rs. 12,986.72) in comparison to that of Banka district (Rs. 9,552.70), so Cost Benefit Ratio (CBR) of Bhagalpur district (1:1.36) was found to be genuinely higher than that of the later district (1:1.26).

Data in table 4.1 further displays that on overall level cost of production per quintal of Katarni paddy was estimated at Rs. 979.34. In Banka district, it was a bit higher (Rs. 2030.37) than that of Bhagalpur district Rs. 928.31), which might be due to the fact that irrigation cost in Banka district (Rs. 5000/- per hectare) was quite higher than that of Bhagalpur district. Jagdishpur block, under the villages of which the survey was conducted, is situated nearer to the main marketing centre and well developed and old commissionary headquarters of Bhagalpur hardly at 15-16 kms distance in comparison to villages under Banka district (23-24 kms each from Bhagalpur and Banka district headquarters both). Further, if the growers for Banka

district prefer to sell their produce in Jagdishpur market, the distances covered by them will be about 40 kms and 70 kms via Bhagalpur and Banka respectively. So, not only the price of Katarni paddy was higher in the former district (Rs. 2350/- per qtl) than that of the later one (2280.25/- per qtl), rather less transportation cost might have led to lower cost of production in Bhagalpur district. In aggregate terms, hired labour, irrigation, harvesting, ploughing and manure were found to be the items that shared major amounts of cost/investment.

On overall level, cost benefit ratio of katarni paddy is estimated at 1:1.31, which may be corroborative of the fact that, if an encouraging environment is provided to farmers by ensuring more remunerative market, the prospect of katarni paddy growing will be broader and brighter.

Table No. 4.1: Per hectare Cost of Cultivation of Katarni Paddy.

SN		Particulars	Bhagalpur	Banka	Overall (In %)
Average Area Under the Crop (In ha)			0.281	0.645	0.463
A		**Fixed Cost**			
	i.	Value of Land	3.71Lakh/ha	3.46	---
	ii.	Interest on Fixed Capital	6183.33	5766.66	---
	iii.	Land Revenue Paid	45.28	50.00	47.64 (0.13)
	iv.	Rental Value of Land	8251.50	7757.69	8004.59 (21.77)
B.		**Variable Cost**			
	i.	Ploughing	3100.00	3000.00	3050.00 (8.30)
	ii.	Transplantation	1050.00	950.00	1000.00 (2.72)
	iii.	Seeds (both farm produced & purchased)	1800.00	2000.00	1900.00 (5.17)
	iv.	Fertilizer	2187.50	2193.25	2190.38 (5.96)
	v.	Manure (owned & purchased)	2500.00	2550.00	2525.00 (6.87)
	vi.	Labour (hired & imputed family labour)	9040.00	9100.00	9070.00(24.68)
	vii.	Irrigation	4000.00	5000.00	4500.00 (12.24)
	viii.	Harvesting	3318.00	3000.00	3159.00 (8.59)
	ix.	Interest on working capital	630.00	692.52	661.26 (1.80)
	x.	Depreciation on implements and Farm Buildings	600.00	700.00	650.00 (1.77)
		Total	**28225.50**	**29185.77**	**28705.64**
		Total Cost (A (iii, iv) + B)	**36522.28**	**36993.46**	**36757.87 (100.00)**
C.		**Gross Return** (including price of straw @ Rs. 5000/- per ha)	49509.00	46546.16	48027.58
	i.	Rates (@ Rs./Qtl)	2350.00	2280.25	2315.13
	ii.	Yield rate (Qtl/ha)	18.94	18.22	18.58
D.		**Net Return (In Rs.)**	12986.72	9552.70	11269.71
E.		**Cost of Production (In Rs.)**			
	i.	Per quintal (Rs.)	1928.31	2030.37	1979.34
F.		**Cost Benefit Ratio**	1:1.36	1:1.26	1:1.31

NB: The Calculated Value of Rent is meant for 05 months period from sowing to harvesting of Katarni Paddy (already paid before).

Table No. 4.2: Input Cost of Total Farm of Katarni Paddy.

SN	Inputs	Qty/ha	Value (In Rs.)
1.	Ploughing	Twice	3050.00 (10.44)
2.	Transplantation	---	1000.00 (3.42)
3.	Seeds	60 Kg.	1900.00 (6.50)
4.	Fertilizers	87.50 kg	2190.38 (7.50)
5.	Manure	5 Bullock carts	2525.00 (8.64)
6.	Hired Labour	72 Labour mandays	9070.00 (31.04)
7.	Irrigation	50 hrs	4500.00 (15.40)
8.	Harvesting	10 % of products	3159.00 (10.81)
9.	Others	---	1827.50 (6.25)
10.	Total Value/ha	---	29221.88 (100.00)

4.2 Input Cost: Total Farm

In this section, an attempt has been made to calculate/estimate Input Cost of total farms of Katarni paddy taking into consideration both the surveyed districts (both in quintal/hectare and in value terms). Inputs costs include expenditures incurred in (i) ploughing, (ii) transplantation, (iii) seeds, (iv.) fertilizers, (v) manure, (vi) hired labour, (vii) irrigation, (viii) harvesting, and; (ix) others.

Data in table made it crystal clear that hired labour had remained the major items of expenditure (Rs. 9070/- per ha (31.40%) followed by irrigation (15.40%), harvesting (10.81%), ploughing (10.44%), manure (8.64%), fertilizers (7.50%), seeds (6.50%), others (6.25%) and transplantation (3.42%).

As far as head wise input cost in growing katarni paddy per hectare of land (in value terms) is concerned, irrigation accounted for Rs. 4500/-, harvesting Rs. 3159/- cost incurred in ploughing was estimated at Rs. 3050/-, manure and fertilizers (Rs. 2525/- and Rs. 2190.38/-) respectively, seeds Rs. 1900/-, others Rs. 1827.50 and transplantation Rs. 1000/- (table No. 4.2).

4.3 Areas across Districts and Farm Size Wise

A glance on data in table containing farm size wise areas under Katarni paddy in both the selected districts leads us to crunch for revealing that out of the total operational area owned by different size groups of respondents in Bhagalpur and Banka districts, in physical and percentage terms, large farmers were much ahead (4.22 ha i.e., 50.06% and 10 ha i.e., 51.68%) respectively.

Further, medium surveyed farmers of Bhagalpur and Banka districts were found to have devoted larger areas in (physical and percentage terms both) towards katarni paddy 2.50 ha (29.66%) and 4.51 ha (23.31%) respectively (table No. 4.3). It was followed by small and marginal farmers in both the districts. The data in table further indicates that in percentage terms, out of the total operational area larger proportion was devoted to katarni paddy by surveyed farmers of Banka district (20.38%). In Bhagalpur district, the same was only 11.04 per cent. Down to these, one of the possible factors responsible for this situation may be attributed to more than double of the total operated area devoted to katarni paddy by medium and large farmers of Banka district (14.51 ha) compared to Bhagalpur district (6.72 ha).

Table No. 4.3: Farm Size wise Katarni Paddy Area

Size Group	Bhagalpur			Banka		
	Total Operational Area	No. of Respondent	Katarni Area	Total Operational Area	No. of Respondent	Katarni Area
Marginal	7.22	07	0.49 (5.81)	12.72	08	1.10 (5.68)
Small	15.82	09	1.22 (14.47)	28.63	07	3.74 (19.33)
Medium	31.33	10	2.50 (29.66)	41.42	12	4.51 (23.31)
Large	22.02	04	4.2 (50.06)	12.16	03	10.00 (51.68)
Total	76.39	30	8.43 (11.04)	94.93	30	19.35 (20.38)

4.4 Farm Class wise Cost of Cultivation: Marginal

The table No. 4.4 contains data that sketches per hectare cost of katarni paddy meant for marginal farmers.

Data in table help in searching thoroughly that in case of marginal farms, on overall level, highest expenditure was incurred in hiring labour Rs. 8750 (26.22%) of the total i.e., fixed cost and variable costs. Gross return (including straw) was found lower in Bhagalpur district (Rs. 44050/-). Besides total cost of production (Rs. 26427.32) being higher, rate of sale of katarni paddy and yield rate were also found lower in Bhagalpur district. And hence, the cost benefit ratio was lower (1:1.30) because net return was also calculated lower at Rs. 10258.39 than that of Banka district Rs. 12089.90.

Rate of sale of katarni paddy and yield rate in Bhagalpur district were Rs. 25/- per quintal and 25 kg/ha lower than that of Banka district Rs. 2225/- and 18 qtls/ha

respectively. Per quintal cost of production of katarni paddy in Bhagalpur district was, no doubt, higher Rs. 1903.75 than that of Banka Rs. 1831.12. As gross return being Rs. 1000 more per ha in Banka district Rs. 45050/- than of Bhagalpur district, the C:B ratio is genuinely higher in the former district Banka (table 4.4).

Further, having a glance, it can be said with certainty that on overall level, after hired labour, highest cost was incurred in item of irrigation Rs. 4000/- i.e., (11.98%). It was followed by ploughing (7.64%), manure (7.49%), harvesting (7.20%), seeds (5.74%), fertilizers 5.36%), transplantation (2.92%) and interest on working capital (2.67%). In this regard, it is to be urgently mentioned that expenditure in irrigation can be reduced to a great extent by strictly not allowing further deepening of the bed of river Chandan that has been causing due to frequent excavation of sand from it.

4.4.1 Small Farmers

Table No. 4.4.1 contains data couching cost of cultivation of katarni paddy per hectare of land area incurred by small surveyed farmers in Bhagalpur and Banka districts both. Data in table help us in coming home to the fact that like marginal farmers, the surveyed growers belonging to small farm size, on overall level, incurred maximum expenditures in hired labour (24.78%), irrigation (12.74%), ploughing (8.78%), manure (7.36%) and harvesting (6.16%). Gross and net returns were higher in Banka district Rs. 47550/- and Rs. 11541.24 respectively. So, cost benefit ratio was marginally higher in Banka district (1:1.32) than that of Bhagalpur district (1:1.31). On overall level, it was estimated at 1:1.32.

Amounts of expenditure incurred in ploughing, transplantation, seeds and harvesting were bigger in Bhagalpur district Rs. 3200/-, Rs. 950/-, Rs. 1870.50 and Rs. 2250/- respectively. As far the expenditures in Banka district is concerned, costs incurred in growing per hectare of katarni paddy were higher in activities/items, viz., fertilizer, manure, labour (hired & imputed family labour), irrigation and depreciation on implements and farm buildings Rs. 2100/-, Rs. 2700/- Rs. 9000/-, Rs. 5000/-, and; Rs. 600/- respectively. Gross return including straw was Rs. 2050/- per hectare more in Banka district Rs. 47550/- than Bhagalpur district and, therefore, even after total cost (Cost A & Cost B) being Rs. 1389.03/- more in Banka district than that of Bhagalpur, the amount of net return in the former district was Rs. 660.97/- more than that of Bhagalpur district Rs. 10880.27 (table No 4.4.1). Respondents small farmers of Banka district were privileged in regard to rate of sale of the commodity Rs. 2300/- per quintal i.e, Rs. 50/- more than the other district and productivity 18.50 qtls/ha i.e., 50 kg/ha more than that of Bhagalpur district.

Table No.4.4: Per hectare Cost of Cultivation at total Farms of Katarni Paddy of Marginal Farmers

SN		Particulars	Bhagalpur	Banka	Overall (In %)
Average Area Under the Crop (In ha)			0.070	0.137	0.106
A		**Fixed Cost**			
	i.	Value of Land	---	---	---
	ii.	Interest on Fixed Capital	---	---	---
	iii.	Land Revenue Paid	22.62	15.20	18.91 (0.06)
	iv.	Rental Value of Land	7341.67	7175.00	7258.33 (21.75)
B.		**Variable Cost**			
	i.	Ploughing	2600.00	2500.00	2550.00 (7.64)
	ii.	Transplantation	950.00	1000.00	(975.00 (2.92)
	iii.	Seeds (both farm produced & purchased)	1980.00	1850.00	1915.00 (5.74)
	iv.	Fertilizer	1875.50	1700.00	1787.75 (5.36)
	v.	Manure (owned & purchased)	2500.00	2500.00	2500.00 (7.49)
	vi.	Labour (hired & imputed family labour)	8500.00	9000.00	8750.00 (26.22)
	vii.	Irrigation	4000.00	4000.00	4000.00 (11.98)
	viii.	Harvesting	2718.00	2090.00	2404.00 (7.20)
	ix.	Interest on Working Capital	903.82	879.90	891.86 (2.67)
	x.	Depreciation on Implements & Farm Buildings	400.00	250.00	325.00 (0.97)
		Total	**26427.32**	**25769.90**	**26098.61**
		Total Cost (A (iii, iv) + B)	**33791.61**	**32960.10**	**33375.85 (100.00)**
C.		**Gross Return** (including Straw Rs. 5000/ha)	44050.00	45050.00	44550.00
	i.	Rates (@ Rs./Qtl)	2200.00	2225.00	2212.50
	ii.	Yield rate (Qtl/ha)	17.75	18.00	17.88
D.		**Net Return (In Rs.)**	10258.39	12089.90	11174.15
E.		**Cost of Production (In Rs.)**			
	i.	Per quintal (Rs.)	1903.75	1831.12	1866.66
F.		**Cost Benefit Ratio**	1:1.30	1;1.36	1:1.33

NB: (including Straw Rs. 5000/ha)

Table No. 4.4.1: Per hectare Cost of Cultivation of Katarni Paddy of Small Farmers

SN		Particulars	Bhagalpur	Banka	Overall (In %)
Average Area Under the Crop (In ha)			1.607	0.534	1.138
A		**Fixed Cost**			
	i.	Value of Land	---	---	---
	ii.	Interest on Fixed Capital	---	---	---
	iii.	Land Revenue Paid	45.28	45.28	45.28 (0.13)
	iv.	Rental Value of Land	7416.66	7925.00	7670.83 (21.72)
B.		**Variable Cost**			
	i.	Ploughing	3200.00	3000.00	3100.00 (8.78)
	ii.	Transplantation	950.00	768.00	859.00 (2.43)
	iii.	Seeds (both farm produced & purchased)	1870.50	1800.50	1835.50 (5.20)
	iv.	Fertilizer	2075.00	2100.00	2087.50 (5.91)
	v.	Manure (owned & purchased)	2500.00	2700.00	2600.00 (7.36)
	vi.	Labour (hired & imputed family labour)	8500.00	9000.00	8750.00 (24.78)
	vii.	Irrigation	4000.00	5000.00	4500.00 (12.74)
	viii.	Harvesting	2250.00	2100.00	2175.00 (6.16)
	ix.	Interest on Working Capital	1312.29	969.98	1141.13 (3.23)
	x.	Depreciation on Implements & Farm Buildings	500.00	600.00	550.00 (1.56)
		Total	**27157.79**	**28038.48**	**27598.13**
		Total Cost (A (iii, iv) + B)	**34619.73**	**36008.76**	**35314.24 (100.00)**
C.		**Gross Return** (including Straw Rs. 5000/ha)	45500.00	47550.00	46525.00
	i.	Rates (@ Rs./Qtl)	2250.00	2300.00	2275.00
	ii.	Yield rate (Qtl/ha)	18.00	18.50	18.25
D.		**Net Return (In Rs.)**	10880.27	11541.24	11210.75
E.		**Cost of Production (In Rs.)**			
	i.	Per quintal (Rs.)	1923.31	1946.42	1934.86
F.		**Cost Benefit Ratio**	1:1.31	1:1.32	1:1.32

NB: (including Straw Rs. 5000/ha, calculated average)

4.4.2 Medium Farms

Table No. 4.4.2 contains data related to cost of cultivation of katarni paddy per hectare of land by the medium farmers. Different items of fixed cost, variable cost, yield rate, net return, cost of production and cost benefit ratio of Bhagalpur and Banka districts and overall scenario have been dealt in this section. Maintaining unchanged scenario, at the overall level, the surveyed farmers (belonging to medium farm size group) evinced highest expenditures to have made in items of labour (24.56%) followed by irrigation (11.04%) and ploughing (8.30%) like that of marginal and small farmers. Cost benefit ratio (CBR) in Bhagalpur district (1:1.35) was marginally higher than that of Banka district (1:1.30). Dwelling upon the reasons for it, some of the factors could be higher rate sale price Rs. 2350/- per qtl and yield rate 19.10 qtls/ha in the former district.

It can be substantiated that cost of production/quintal in Banka district Rs. 1955.93 was Rs. 30.07 more, yield rate 18.25 qtls/ha was 0.85 quintal lower and sale price Rs. 2275/- per quintal was Rs. 75 lower than that of Bhagalpur district, might have led to lower net returns Rs. 10822.96/ha and CBR (1:1.30). In Bhagalpur district, net return was estimated higher Rs. 13100.97/-, i.e., Rs.2278.01 only more than that of Banka district (table No. 4.4.2).

Table No. 4.4.2: Per hectare Cost of Cultivation at total Farm of Katarni Paddy of Medium Farmers

SN		Particulars	Bhagalpur	Banka	Overall (In %)
Average Area Under the Crop (In ha)			0.250	0.376	0.319
A		**Fixed Cost**			
	i.	Value of Land (Rs. In Lakh/ha)	3.70	3.42	3.56
	ii.	Interest on Fixed Capital	6166.66	5700.00	5933.33
	iii.	Land Revenue Paid	56.55	22.75	39.65 (0.10)
	iv.	Rental Value of Land	8314.16	7753.12	8033.64 (22.16)
B.		**Variable Cost**			
	i.	Ploughing	3000.00	3000.00	3000.00 (8.30)
	ii.	Transplantation	900.00	1000.00	950.00 (2.62)
	iii.	Seeds (both farm produced & purchased)	1850.00	1880.50	1865.25 (5.14)
	iv.	Fertilizer	2070.50	1950.20	2010.35 (5.54)
	v.	Manure (owned & purchased)	2500.00	2600.00	2550.00 (7.03)
	vi.	Labour (hired & imputed family labour)	9000.00	8800.00	8900.00 (24.56)
	vii.	Irrigation	4000.00	4000.00	4000.00 (11.04)
	viii.	Harvesting	3000.00	2500.00	2750.00 (7.60)
	ix.	Interest on Working Capital	1092.82	1089.22	1091.02 (3.01)
	x.	Depreciation on Implements & Farm Buildings	1000.00	1100.00	1050.00 (2.90)
		Total	**28413.32**	**27919.92**	**28166.62**
		Total Cost (A (iii, iv) + B)	**36784.03**	**35695.79**	**36239.91 (100.00)**
C.		**Gross Return** (including Straw Rs. 5000/ha)	49885.00	46518.75	48201.87
	i.	Rates (@ Rs./Qtl)	2350.00	2275.00	2312.50
	ii.	Yield rate (Qtl/ha)	19.10	18.25	18.67
D.		**Net Return (In Rs.)**	13100.97	10822.96	11961.96
E.		**Cost of Production (In Rs.)**			
	i.	Per quintal (Rs.)	1925.86	1955.93	1940.89
F.		**Cost Benefit Ratio**	1:1.35	1:1.30	1:1.33

NB: (including Straw Rs. 5000/ha)

Irrigation costs both in Bhagalpur and Banka districts were calculated same at Rs. 4000/- per hectare. The expenditure under the head depreciation on implements and farm buildings was found higher in Banka (Rs. 1100/-) only. Further, there is a good difference in total cost (Cost A + Cost B) of the two districts, i.e., it being Rs. 1088.24 more in Bhagalpur district. However, higher yield rate and sale price of katarni paddy could be the factors responsible for greater CBR in Bhagalpur district.

4.4.3 Large Farmers

Cost of cultivation per hectare in growing katarni paddy by large farmers has been examined and dealt in this section. Data in table No. 4.4.3 describes variable cost, fixed cost, total cost, gross return, sale price, yield rate, net return, cost of production and cost benefit ratio. A glance on table containing data on overall level, in percentage terms, elucidates similar scenario/trend of highest expenditures to have been made by large farmers in the heads of hired labour (25.00%) and irrigation (10.25%) as could be seen in case of marginal, small and medium farmers surveyed. It was followed by harvesting (8.78%), ploughing (8.56%), manure (6.41%), fertilizers (5.39%) and seeds (4.73%). Cost benefit ratio (CBR) in Bhagalpur and Banka districts was found almost same (1:1.30). The total cost was calculated a bit lower in Banka district (Rs. 38291.62) than that of Bhagalpur district (Rs. 39720.08). Despite the fact that total cost of production in Banka district was clearly lower than that of Bhagalpur district (Rs. 11358.38) i.e., Rs. 673.54 less than that of Bhagalpur district (Rs. 12031.92). It is to be urgently mentioned here that in case of both the districts, and on overall level, gross return included the amount of Rs. 5000/- only that was received as the sale price of straw grown during cultivating katarni paddy/hectare by the surveyed farmers of all the four size classes, i.e., marginal, small, medium and large. The lower net return in Banka district could emerge as a result of lower sale price Rs. 2350/qtl and lower yield also 19.00 qtls per hectare as against Rs. 2400 and 19.48 qtls per hectare in Bhagalpur district respectively.

Quality of straw of katarni paddy is no doubt, better than general paddy straw, longer in size, provides better taste as cattle feed, and serves the purpose of

comparatively long lasting roofing of kutcha houses in rural areas. So, it fetches a good price. It can also be interpreted that higher share of irrigation expenditure incurred by all farm size classes is one of the reasons for farmers having developed indifferent attitude towards growing katarni paddy in larger areas. So, if irrigation facility is strengthened and expanded in the region, farmers may be encouraged to get the jump on towards growing katarni paddy.

Table No. 4.4.3: Per hectare Cost of Cultivation at total Farm of Katarni Paddy of Large Farmers

SN		Particulars	Bhagalpur	Banka	Overall (In %)
Average Area Under the Crop (In ha)			1.055	3.333	2.031
A		**Fixed Cost**			
	i.	Value of Land (Rs. In Lakh/ha)	3.72	3.50	3.61
	ii.	Interest on Fixed Capital	6200.00	5833.33	6016.66
	iii.	Land Revenue Paid	33.93	45.62	39.78 (0.10)
	iv.	Rental Value of Land	8623.33	8275.00	8449.16 (21.66)
B.		**Variable Cost**			
	i.	Ploughing	3425.00	3250.00	3337.50 (8.56)
	ii.	Transplantation	1000.00	1000.00	1000.00 (2.56)
	iii.	Seeds (both farm produced & purchased)	1890.00	1800.00	1845.00 (4.73)
	iv.	Fertilizer	2200.90	2000.00	2100.45 (5.39)
	v.	Manure (owned & purchased)	2500.00	2500.00	2500.00 (6.41)
	vi.	Labour (hired & imputed family labour)	10000.00	9500.00	9750.00 (25.00)
	vii.	Irrigation	4000.00	4000.00	4000.00 (10.25)
	viii.	Harvesting	3500.00	3350.00	3425.00 (8.78)
	ix.	Interest on Working Capital	1546.92	1471.00	1508.96 (3.87)
	x.	Depreciation on Implements & Farm Buildings	1000.00	1100.00	1050.00 (2.69)
		Total	**31062.82**	**29971.00**	**30516.91**
		Total Cost (A (iii, iv) + B)	**39720.08**	**38291.62**	**39005.85 (100.00)**
C.		**Gross Return** (including Straw Rs. 5000/ha)	51752.00	49650.00	50701.00
	i.	Rates (@ Rs./Qtl)	2400.00	2350.00	2375.00
	ii.	Yield rate (Qtl/ha)	19.48	19.00	19.24
D.		**Net Return (In Rs.)**	12031.92	11358.38	11695.15
E.		**Cost of Production (In Rs.)**			
	i.	Per quintal (Rs.)	2039.01	2015.34	2027.17
F.		**Cost Benefit Ratio**	1:1.30	1:1.30	1:1.30

NB: (including Straw Rs. 5000/ha)

4.5 Disposal Pattern of Katarni Paddy

Disposal pattern of katarni paddy in both the districts, viz., Bhagalpur and Banka has been formed and written in this section. Data indicating total area of katarni paddy, total quantity produced, yield rate, home/domestic consumption, marketable surplus, marketed surplus and retained for further sale/consumption are contained in table No. 4.5. While trying for core to the overall data in the table, it can be leveled with that out of the total production of katarni paddy by the surveyed

farmers highest quantum in percentage terms in both the districts, viz., Bhagalpur and Banka districts were meant for marketable surplus (67.74% and 65.20%) followed by home consumption (32.26% and 34.80%) respectively. Further, out of the total marketable surplus lower quantum were found to have been retained for further sale/home consumption in both the districts (12.09% and 5.98%) respectively. In total, quantities of katarni paddy produced in Bhagalpur and Banka districts were estimated at 161.20 qtls and 359.11 qtls respectively. Out of it, despite much higher production in Banka district, the percentage of marketable surplus (65.20%) was a bit lower than that of the former district. One of the reasons for this could be that in Banka, most of the surveyed medium and large farmers belonging to general caste, i.e., Radhi Kayastha) were prosperous, service holders and fond of quality eating. So, they preferred to retain a good quantum for their own consumption and maintain reputation in society, rather than to sell larger quantities of their produce. Yield rate varied slightly across the districts. It was higher in Bhagalpur district (19.12 qtls/ha) than that of Banka (18.56 qtls/ha). It may be ultimately delineated that katarni paddy is grown mainly with the objective of trade/sale. If growers are assured of a desirably higher market price, larger areas are likely to be used for this most and uniquely fragrant price.

Table No. 4.5: Disposal Pattern of Katarni Paddy.

District	Total Area of Katarni Paddy	Total Quantity Produced (In qtls)	Yield Rate Qtl/ha	Home Domestic Consumption (In qtls)	Marketable Surplus (In qtls)	Marketed Surplus (In qtls)	Retained for Further Sale/ Consumption (In qtls)
Bhagalpur	8.43	161.20	19.12	52.00 (32.26)	109.20 (67.74)	96.00 (87.91	13.20 (12.09)
Banka	19.35	359.11	18.56	125.00 (34.80)	234.11 (65.20)	20.11 94.02)	14.00 (5.98)

NB: *Figures in brackets indicate the percentages of total quantity produced in respective districts and last two columns figures in bracket denote percentages of marketable surplus.*

4.6 Sale and Marketing Channel

This section of the chapter dwells upon quantity sold by the growers/farmers through different marketing channels. Five channels have been dealt here:

Channel – I: Encircles --- Producer --- Consumer

Channel - II: Comprises ---Producer --- Itinerant trader --- Consumer

Channel: III: Producer --- Wholesaler --- Retailer --- Consumer

Channel: IV: Includes Producer --- Retailer --- Consumer, and;

Channel: V: Consisted others (if any).

A glance on the table clearly reveals Channel – III to be the most prominent one for selling maximum quantities of katarni paddy by the surveyed growers of Bhagalpur and Banka districts (59.38% and 54.34%) respectively. The channel of sale through which lowest quantities were sold, was channel – I both the districts (7.29% and 4.77%) respectively.

In Bhagalpur district, Channel – IV (Producer-Retailer-Consumer i.e., PRC) was the second commonly used outlet for selling the marketed surplus (20.83%), while in Banka, it was Channel – II (Producer-Itinerant trader-Consumer i.e., PIC) that accounted for 22.72 per cent. Channel IV in Banka district (Producer-Retailer-Consumer i.e., PRC 18.17%) also revealed popular source of disposing off the marketed surplus, while in Bhagalpur, it was Channel – II (12.50%) table No. 4.6.

4.6.1 Marketing Margin

A brief discussion of marketing margins and costs are important, for they reveal many facets of marketing and the price structure, as well as, the efficiency of the system. The magnitude of the marketing margins relative to the first level price (means the price received by the primary growers of katarni paddy), indicates the efficiency or otherwise of the marketing system. It refers to the efficiency of the intermediaries between the producer and the consumer in respect of the services rendered and the remuneration received by them. While comparing the efficiency of the marketing system by means of marketing margins over space or time, the difference in the value added to the product through various services/ functions has been taken into account.

In Bhagalpur district (as the table No. 4.6) reveals, the marketing margins at channel – II (PITC), channel – III (PWRC) and channel – IV (PRC) could be calculated at Rs.

150/- Rs. 300/- and Rs. 100/- only respectively. It means that from **Producer and Consumer points of view, Producers–Retailers-Consumer' Channel** is the most advantageous, desirable and effective channel.

In Banka district, almost similar scenario of marketing margins could be seen, except the amount of margin in case of Channel – IV being Rs. 50/- lower than that of Bhagalpur district. It was Rs. 2,150/- per quintal in PRC Channel.

Table No. 4.6: Quantity Sold by Different Marketing Channels (In qtls)

District	Quantity/Price	Zero Level Producer-Consumers (PC)	One Level Producers-Itinerant-Traders Consumers-(PIC)	Third Level Producers-Whole-sellers--Retailer-Consumer (PWRC)	Fourth Level Producers-Retailer Consumer-(PRC)
Bhagalpur	Qty (In qtls)	7.00 (7.29)	12.00 (12.50)	57.00 (59.38)	20.00 (20.83)
	Selling Price (In Rs./qtls)	2100.00	2250.00	2400.00	2200.00
Banka	Qty (In qtls)	10.50 (4.77)	50.00 (22.72)	119.61 (54.34)	40.00 (18.17)
	Selling Price (In Rs./qtls)	2100.00	2250.00	2400.00	2150.00

NB: *Figures in brackets indicate percentages of the Marketed Surplus of the Districts concerned, i.e., out of the total quantities sold --- estimated at 96 qtls for Bhagalpur and 220.11 qtls for Banka.*

It can thus be concluded that if the number of intermediate traders are reduced, then the growers may earn higher sale price, which is urgently desired with the view to encourage the farmers to undertake cultivation of katarni paddy in more areas.

As regards sale price, it varied from Rs. 100 to 300 across the marketing channels in Bhagalpur district. In Banka district too, the selling prices were the same for Channel-I, II and III. Only in case of Channel – IV, it was Rs. 50.00 lower Rs. 2150.00 per quintal than that of Bhagalpur district (Rs. 2200/-) table No. 4.6. It is clearly, evident that from sellers/growers angle, channel-III (PWRC) is the most profitable and encouraging one, as the growers got highest rate (Rs. 2400/- per quintal. This rate of Rs 2400/- per qtls was found to have been paid for katarni paddy to the growers in Jagdishpur, Katiyama Haat, Rajawar Mode (Khiddi Haat- Nawada Bazar, Maharna Haat, (Near Mandar Hill) etc. by the wholesale traders of Bhagalpur. It may also be suggested/opined that if the whole sellers/big businessmen could be

directed or advised by the Government/the concerned department to pay a more remunerative price to the growers for their marketable surplus, then the fate of extinction (in the form of declining area under these most rare varieties of highly fragrant katarni paddy grown only in this region of Bihar) can be made brighter.

4.7 Marketing Cost

In this section, attempt has been made to grope marketing cost of katarni paddy in the surveyed districts (table No. 4.7) contains data related to costs incurred in (i) transportation, (ii) loading and unloading, (iii) weighing charge, (iv) market fee/tax, etc. and; (v) others (specified if any). Gathered data distinctly reveal that distance of farmers' fields and houses from the main, market/sale point has caused higher transportation and loading and unloading charges. These were Rs. 12/- each per quintal in case of Banka district. Compared to Rs. 10/- and Rs. 11.50 respectively in Bhagalpur district. Marketing fee/tax etc. were the same in both the districts.

Table No. 4.7: Marketing Cost

SN	Particulars	Bhagalpur Cost (In Rs./qtls	Banka Cost (In Rs./qtls
1.	Transportation	10.00	12.00
2.	Loading & Unloading	11.50	12.00
3.	Weighing Charge	5.00	5.00
4.	Marketing Fee/Tax, etc.	21.50	21.50
5.	Others (Specify)	---	---
	Total	48.00	50.50

Total costs of marketing of katarni paddy were calculated at Rs. 48/- and Rs. 50.50 only per quintal in Bhagalpur and Banka districts respectively.

As far as producer's share in consumer's rupees is concerned, in Bhagalpur district, it was Rs 2,302/- per quintal. In Banka district, this producer's share was estimated at Rs. 2,229.75/- only per quintal. Having deducted the total marketing cost of Rs. 48/- per quintal in Bhagalpur district and Rs. 50.50 meant for Banka district, from sale price of katarni paddy calculated @ Rs. 2,350/- and @ Rs. 2,280.25 per quintal in Bhagalpur and Banka districts respectively-producer's share in consumer's rupee have been arrived at.

It can thus be enunciated that if not only remunerative but encouraging markets are made available for katarni paddy growers in their vicinity, then transportation cost, loading and unloading charges will be reduced to a great extent. It can boost up the farmers to undertake larger areas for cultivation of katarni paddy.

CHAPTER - V

CONSTRAINTS IN RAISING KATARNI PADDY AND PROSPECTS

5.1 Chapter Sketch

In this chapter, attempt has been made to identify constraints and problems by engraving farmers' difficulties in raising katarni paddy. Scientists' perception and other experts' views have also been dug for related to different problems, some engrossing and encouraging prospects of katarni paddy, not only from production points of view in Bhagalpur and Banka districts, but from marketing point of view also (at national and international levels both). Some significant, 'specific knowledge provider' and envious information/inputs also form part of this chapter. Those feedback (containing problems or threat to katarni paddy and prospects too) are based on most valuable discussions with Prof. (Dr.) R N Sharma, Director, Agricultural Research Institute, (ICAR), Lohiyanagar, Patna who had developed two varieties of katarni paddy: (i) Rajendra Suwashini, and; (ii) Rajendra kastoori. Other scientists whose views have been covered included Dr. Ajay Kumar, Chief Scientist-Cum-University Professor, RAU, at Paddy Research Centre, Mithapur Farm, Department of Agriculture, Government of Bihar, and; Dr. M C Diwakar, Director, Directorate of Rice Development, DAC, MoA, GoI, Patna.

Attempt has also been made in this chapter to figure out the views and specific inputs given by the above noted scientists. Extracted form of the knowledge extended by them has been presented under the sub-heading "Problems and Prospects (taken together)."

5.2 Shift of Cultivation

This section elaborately discusses farmers' response given by them about reasons for shift of areas from katarni paddy to other crops. The data in table No. 5.1 contains data in percentage terms out of the total surveyed farmers in both the districts,

Bhagalpur and Banka. Some of the remarkable factors told by the respondents as cross elements that led them to shift areas under katarni paddy to other crops were: (i) farmers do not get remunerative, (ii) long duration crop; (iii) lack of irrigation, (iv) unchecked excavation of sand from river Chandan that made irrigation costly, and; (v) non-availability of katarni paddy seed by any government agency.

While farmers not getting more than remunerative prices was highlighted as the most prominent causes of shifting areas under katarni paddy to other crops in both the districts (100%) non-availability of katarni paddy seed by any government agency was the least intense factor for such trend in Bhagalpur and Banka districts (76.67% & 80%) respectively. Data in table No. 5.1 further express higher percentage of respondents quoting unchecked excavation of sand from river Chandan that made irrigation to become a costly component (100% & 86.67%) respectively as one of the significant reasons for shifting of area. It was followed by the factor katarni being a long duration crop (90% & 86.67%) and lack of irrigation before harvesting (80% each in the two districts).

It can thus be educed that if suitable and stringent measures are taken for stopping uncontrolled excavation of sand from river Chandan and original/certified seeds of katarni paddy are made available to farmers by any government agency then a remarkable increase in areas under katarni paddy in both the districts can be certainly brought.

Table No. 5.1: Reasons for Shifting Cultivation of Katarni Paddy to Other Crops (%)

SN	Reasons	Bhagalpur	Banka
i.	Farmers do not get remunerative price	100.00	100.00
ii.	Long duration crop	90.00	86.67
iii.	Lack of irrigation	80.00	80.00
iv.	Unchecked excavation of sand from river that made irrigation costly	100.00	86.67
v.	Non-availability of katarni paddy seed by any government agency	76.67	80.00

Fig. 2.14: Indisposed bed of River Chandan due to excess excavation of sand.

Deepened bed of river Chandan as a result of excess excavation of sand from the river
Fig. 2.15

Research Team of the AER Centre, Bhagalpur interacting with farmers regarding irrigation problem
Fig. 2.17

Block Agriculture Officer measuring the length of Kararni paddy plant with Research Officer.
Fig. 2.18

5.3 Prospects, Scientists' Perception

The fortification of the distinguished and specific identity of katarni paddy is likely to take place in near future. Katarni will now get global recognition. Farmers of Jagdishpur block engaged in growing katarni paddy by using traditional methods of cultivation will now get advantages of foreign technology. International Rice

Research Institute (IRRI a Pioneer, well established and world level organization) has not only marked to put its best forward to provide global recognition to this crop but it has also determined to economically strengthen the farmers of Jagdishpur area. In this connection, Dr. Emli Henry, Physiologist of IRRI, Philippines, had paid a visit to Jagdishpur with Dr. Aravinda Kumar and other Scientists of the Bihar Agricultural University, Sabour, Bhagalpur. The team took stock of the katarni paddy planted in the fields. It is to be noted here that during this visit of IRRI's Scientist, Dean, Agriculture, Dr. D Roy, Director, Research, Dr. Ravi Gopal Singh and other experts were also present.

As per the information given by the farmers to the scientists of Philippines the productivity of katarni paddy in areas under Jagdishpur block was 800 kgs/acre. It means per hectare productivity came to around 2000 kg, i.e., 20 qtls/ha. The low yield of katarni paddy was astonishing for the scientists. One of the main reasons as quoted or driven home to by the farmers for lower productivity was the filling up of sand in thousands of acres of land was most suitable for katarni paddy earlier brought in by devastating flood in the year 2001 and in 1995 too.

Intervention

However, it may be taken as a matter of encouragement that now cultivation will be done by using foreign techniques. Blueprint was being prepared for this. In BAU, Sabour, Bhagalpur also, research is being conducted to save the fragrance of katarni paddy. As stated by the scientists from Philippines, productivity will be doubled by using foreign techniques/technology. This will not only help farmers in being more prosperous, but, Katarni's fragrance will smell in foreign countries also.

As a matter of fact, traditional variety of katarni paddy is a long duration crop. It takes 160-165 days in achieving the stage of maturity or harvesting under natural conditions. With increasing population pressure, how such a long duration crop can be preferred at the cost of most probably winter crop. In traditional variety, as length of plants is more, so higher production is generally not possible. So, dwarf variety had to be developed. It is a medium size variety. The gross and net returns

under this dwarf variety can be expanded by an increase in yield followed by comparatively less duration.

As per a rough estimate, about 20,000 qtls of katarni rice is required. To meet this high demand, modification in the variety of katarni paddy (into dwarf variety is desired. As per Vardan's Report by using SRI method of cultivation with the dwarf variety, 79 qtls/ha of yield can be obtained.

Kastoori variety is very small in size. In the year 2010, its rate was Rs. 22/- per kg. Besides, cost of production is more or less same as in case of other varieties.

However, in the present form, kastoori can not continue for longer. It was, therefore, 130 days variety was developed. Generally, traditional katarni paddy is of the length of 1 metre to 1.5 metres. To get better yield of katarni paddy in shorter duration, dwarfing and reduction of maturity time are inevitable. It is interesting to note here that in breeding one variety 10 to 15 years time is required.

5.4 Scanned Problems and Prospects: Scientists' Views

The desirability of the farmers to get higher net returns in shorter time leads to the farmers being desisted from growing traditional variety of katarni paddy. Actually sonam and sobha are being grown by farmers in the name of as replacement of katarni paddy. So, the reliability of katarni paddy is being eroded among the purchasers, i.e., consumers.

Despite encouraging potential of growing best quality (ies) of natural katarni paddy in Bihar particularly in certain pockets of Bhagalpur and Banka districts, it is a matter of flunk that we lack desired buoyancy to get our distinct katarni paddy, patented or registered as our own product. In fact, farmers have become selfish. Now-a-days, sonam and sobha are being produced by claiming it to be katarni. So, the reliability of katarni paddy is being eroded among purchasers and the consumers.

Badshahbhog, a fine rice variety, is the product of Bihar, but it the state couldn't get it patented in its name. In addition to this, there are three types of Champaran Basmati. We are reluctant, rather not much interested in properly propagating our products at national and international levels.

With the view to bring area expansion under katarni paddy bio-technological modification has to be made. It is praiseworthy that three stages of the same could have been made travelled by now:

i. *120 days' duration variety has been developed that gives yield rate of 50 qtls/ha.*
ii. *Dwarfing of katarni paddy's plants' has been shortened in height from 90 cms to 1 metre.*
iii. *Earlier traditional variety got height of 5 feet or more, which used to become easy prey of storm or even air blow at slightly higher speed.*

Lack of irrigation facility is revealed through poor growth of katarni paddy plants in Amarpur Block, Banka district.

Fig. 2.19

Katarni paddy (rear side) and HYV paddy (front side) seen in neighbouring fields Amarpur Block, Banka District.

Fig. 2.20

It is to be noted here that the above noted three modifications have been brought in the traditional katarni paddy by Dr. R N Sharma. However, it couldn't be practiced by the farmers in their fields. Thus, it remained confined to innovation and development of the new variety. It means that groping of the new dwarf variety of short duration, could not be popularized, and tried by the farmers of Bhagalpur and Banka districts. It may be termed as one of the remarkable constraints in way of enhancing its productivity and thus, gross or net returns too.

Picture shows potential of katarni paddy, Jagdishpur block, Bhagalpur district

Fig. 2.21

Picture showing longer maturity period of katarni paddy, Jagdishpur Block, Bhagalpur district.

Fig. 2.22

CHAPTER - VI

POTENTIAL OF KATARNI PADDY: EXPERTS' ENVISAGED VIEWS

In Banka and Bhagalpur districts of Bihar, there are areas like: Punsiya, Rajoun, Jagdishpur, Amarpur to Sultanganj road, Lakshimpur, Rupsa, Chak-Narayanpur, Rajapur, etc. identified as potential katarni paddy growing areas.

As per the feedback/inputs given by Dr. Ajay Kumar, Chief Scientist-Cum-University Professor, RAU, PUSA, Samastipur, katarni paddy is a specific area based variety of rice. It has high potential with vast untapped opportunities of marketability. In true sense, basmati can not be produced in Bihar despite willingness of the farmers. Agricultural commodities do possess their area specific characteristics. Marketing of any good or service involves already existing feature of competition. Having classified under hard aroma group *(katarni rice) is mainly termed as khir & khichadi rice.* On the other hand, basmati rice is soft aroma rice, and it is known as polao rice.

Actually katarni is ceremonial rice, so there is no option to it particularly on special occasions. Bhagalpur and Banka districts are the main areas for growing katarni paddy. It is worth mentioning that fine scented rice is the strength of Bihar. Patna rice was also the main source of economy in Bihar. *Super katarni & Kanpur katarni,* not original and genetically bred, are likely to destroy original katarni paddy of Bhagalpur. It can be embodied that no entity other than the nature is the biggest scientist. It is only the katarni paddy of Bhagalpur and adjoining areas of Banka districts which have its unique and specific characteristics. It is desirable to flutter about the significance of katarni paddy, particularly in regard to its: (i) economic, (ii) environmental, and; (iii) cultural suitability. Local germ product is being destroyed

with the development of 'super katarni.' It is a threat for the survival of that variety of traditional katarni paddy which is grown in perfectly natural conditions, i.e., without the use of much chemical fertilizers and unwanted scientific interference.

It can be a matter to crave that none of the public or private agencies in Bihar did take any endeavour to produce/develop or did make any effort to promote production of katarni paddy seed. Names of such public/private agencies or departments may be noted as below:

i. Bihar Rajya Beez Nigam (BRBN), (ii) Tarai Development Corporation (TDC), (iii) State Food Corporation (SFC), (iv) Food Corporation of India (FCI), (v) Rajendra Agricultural University (RAU), (vi) National Seed Corporation (NSC), and; (vii) Private Companies. Instead, these agencies use to provide or promote production of Hybrid Varieties (HYVs) of all other types of paddy. These didn't take pain of producing preserving traditional seed of katarni paddy.

Extinction of Patna Rice

It will not be out of order to mention here that due to reluctant and indifferent attitude of all concerned, Patna rice, which was once upon a time, the pride of Bihar has practically reached to extinction. However, it can be, probably, filliping for the specific variety of paddy growing farmers in Bihar and India that Patna rice is now being sold in countries like: USA, & UK. It is interesting to note that some of the labourers who belonged to Bihar traditionally experienced in growing Patna rice settled down in some parts of the UK & USA.

Some of the fore stalled inputs given by Dr. M C Diwakar, Director, Department of Agriculture & Co-operation, Ministry of Agriculture, Government of India, Directorate of Rice Development, Pataliputra Colony, Patna – 800 013 throwing light on the significance, causes of erosion in the specific qualities of katarni paddy, threat to its cultivation and opportunities may be of great help in understanding the problems and prospects of the crop.

Some varieties of fine scented rice, namely: (i) kala namak, (ii) adam chini, (iii) Mirzapur (UP) do belong to Varanashi and Gorakhpur regions, while mircha variety belonged to Motihari district of Bihar state. There is 2 to 3 per cent chance of cross pollution. At the same time, the threat of deterioration in quality is also involved in it. It was also embodied that due to exchange of seeds from in some cases, 'non-real katarni seeds, the originality of the product is being vanished. Besides the above threat, germs are also being deteriorated. Another one of the challenges before the prospects of katarni paddy production in Bihar is its less demand. Further, no scientific research could have taken up to ascertain as to which are the particular micronutrients, that are responsible for generating aroma in katarni paddy. Actually, there are several nutrients present in the soil. It is to be urgently noted here that the productivity of HYV paddy is nearly 3.77 times more than that of katarni paddy. If cultivation of katarni paddy is to be preserved and maintained, then some socio-economic studies to popularize its unique and distinguished significance will have to be undertaken. By adoption SRI method the yield of katarni paddy also can be enhanced to 25 to 30 per cent.

CHAPTER - VII

SUMMARY & CONCLUSIONS

In Bihar, although aromatic rices are grown all over the state, they are mainly concentrated in Bhagalpur and Magadh divisions. Bhagalpur has been a traditional aromatic rice growing area, where the varieties, such as : (i) Katarni, (ii) Tulsi Manjari, (iii) Badshahbhog, (iv) Br-9, and; (v) Br – 10 are mostly common. These are photoperiod-sensitive, tall and hence, susceptible to lodging and several diseases and pests. Their yield vary from 2.0 to 2.5 t/ha (Katarni is the most prevalent variety of the region). However, over the period there has occurred a large variation, which has resulted into various types, such as (i) Bhauri katarni, (ii) Deshla katarni, and; (iii) Sabour katarni, (iv) Ghorayiya katarni. In Magadh region, which is the main rice growing tract of Bihar, farmers grow Karibank, Marueya, Mehijawain, Shyamjira, Tulsiphool, Sonachur and Shah Pasand. Over the time, the areas under these varieties have drastically reduced, although farmers still grow Karibank and Marueya, but on a small scale only. The tarai region of West Champaran was, at one time, known for its good quality aromatic rice varieties, that included (i) Lal champaran basmati, (ii) Bhuri champaran basmati, (iii) Kali champaran basmati, (iv) Baharni, (v) Badshahbhog, (vi) Chenaur, (vii) Dewtabhog, (viii) Kesar, (ix) Kamod, (x) Kanakjeera, (xi) Marcha, (xii) Ram Janwain, (xiii) Sonalari, and; (xiv) Tulsi Pasand. Most of these varieties have either already lost, or are at the verge of extinction *(Singh et al. 2000).*

Local varieties have yield potential ranging from 15 to 30 qtls/ha, and are tall possessing short grains. Many of them are highly susceptible to various insect pests and diseases, like: (i) stem borer and (ii) bacterial blight. Since they have excellent cooking quality and aroma, they are still grown by farmers on small scale particularly in case of under mentioned three varieties, (i) Kamini (Katarni), (ii)

Mircha, and; (iii) Malida. Each of these three has its own speciality: Katarni for cooked rice, Mircha for Cheura and Malida for its adaptability in low land deep water.

All land races of aromatic types grown in Bihar have fine, but short grains and consequently of low export values.

In view of the lower yield of traditional aromatic rice varieties in Bihar declining area under Katarni paddy over the years and most of the good quality aromatic rice varieties either being lost or facing the threat of extinction the study has been undertaken with the objectives noted below:

i. *To assess the potential area of Katarni paddy in the study area.*
ii. *To find out socio-economic characteristics of the farmers, who cultivate Katarni paddy.*
iii. *To study the economics of Katarni paddy in the study area.*
iv. *To identify the marketing channels of Katarni paddy in the study area*
v. *To identify the constraints in raising the area under Katarni paddy in the study area, and;*
vi. *To suggest suitable measures for the development of Katarni paddy in the study area.*

The study entitled **Problems and Prospects of Katarni Paddy Production in Bihar** is mainly based on primary data collected from 30 katarni paddy growing cultivators each from Bhagalpur and Banka districts. 'Multi stage random sampling method' was followed to select respondents.

At the first stage of sampling, the two districts, namely: Bhagalpur and Banka were purposively chosen, as the specific variety of Katarni, to which this study is devoted can be grown only in particular areas of these two districts.

At the second stage of sampling, **one block, in from each district** was selected on the basis of larger the area under Katarni paddy and potential. On this basis, Jagdishpur block and Amarpur block were selected from Bhagalpur and Banka Districts respectively.

At the third stage of sampling, maintaining the harmonious basis of choosing potential villages, in regard to cultivation of Katarni paddy, two villages each from

the two selected blocks of the concerned districts were identified. Thus, two villages, namely: Bhawanipur-Deshari and Jagdishpur cluster of villages under Jagdishpur block were selected. Similarly, (i) Tardih-Lakshmipur, and; (ii) Ramchandrapur-Bhadariya villages were selected from Amarpur block of Banka district.

At the fourth stage of sampling, enlistment of Katarni paddy growers in the selected villages was made. In Bhawanipur-Deshari and Jagdishpur cluster of villages under Jagdishpur block of Bhagalpur district, the number of marginal, small, medium and large farmers growing katarni paddy also, were 40, 50, 55 and 21 respectively. Number of katarni paddy growers, who belonged to marginal, small, medium and large farm size classes of 'Tardih Lakshmipur' and 'Ramchandrapur Bhadaria' villages in Amarpur Block of Banka district were 45, 40, 60 and 18 respectively.

At the fifth stage of sampling, indispensable classification of farmers from out of the enlisted growers was done based on farm size owned by them. All the enlisted growers were broadly kept in four categories: (i) Marginal --- owning land up to 1 hectare, (ii) Small --- 1.01 to 2 hectare, (iii) Medium --- 2.01 to 4 hectare, and; (iv) Large --- > 4 hectare.

At the sixth stage of sampling, 15 farmers from each of the selected villages (if required number of Katarni paddy growers was not found in a particular village, then cluster of adjoining villages was also considered) were selected for detail study. The selection of farmers was done on probability proportion method. Further, with the view to maintain discreet selection of respondents, due emphasis was given on social composition of the enlisted growers.

In this way, the selection of sample can be illustrated as below: 2 districts x 1 block each (=02) x 2 villages each (04) x 15 farmers = 60 Katarni paddy growers.

Simple tabular and percentage methods have been followed to analyze the data and interpretation of observed facts. Reference year of the primary data collection is 2010-11. However, the secondary data are pertained to the latest one available in the Department of Agriculture, Government of Bihar, Bhagalpur & Banka districts.

I

Bhagalpur district is situated between 25°07′ to 25°30′ N latitude and 86°37′ to 87°30′ E longitude in the basin at a height of 141 feet above sea level. The district is surrounded by Munger and Khagaria in West, Purnea and Katihar in north, Banka in south and Sahibganj (Jharkhand) in east. The district is divided centrally across from west to east by the river Ganga. On the northern part lie the Naugachia sub-division and the other two sub-divisions, Bhagalpur sadar and Kahalgaon lies on the southern bank. The district was spread over 2.54 lakh square hectares and divided into 16 blocks and 242 gram panchayats. The city of Bhagalpur is the headquarters of Bhagalpur division as also of the district and sadar sub-division. The district had 1519 revenue villages. Out of it, 923 villages (60.76%) are inhabitated and 596 (39.24%) un-inhabitated.

However, as per the Census 2011, Series –II, the population of Bhagalpur district was 3,032,226 which accounted for 2.92 per cent of the state's total population. Sex ratio of the district was distressing (879 female/1000 male). The population density was found 1180/sq km. The literacy rates of male and female were 72.30 and 56.50 per cent respectively. It revealed that the gender gap in literacy was 15.80.

The data classification of workers reveals that 48.39 per cent were agricultural workers followed by 19.63 per cent cultivators. 7.43 per cent workers were engaged in household industries and 24.55 per cent constituted other workers. The work participation rate in the district was 35.37 per cent with only 21.34 per cent in case of female. Data on sector wise employment pattern revealed that 68.10 per cent workforce was employed in primary sector followed by 24.50 per cent in tertiary sector and only 7.40 per cent in secondary sector.

While changes in land utilization pattern were very slow and marginal throughout the state, however, there had been a marginal increase in the non-agricultural use of geographical area across the state. As regards the pattern of land utilization in the district of Bhagalpur, out of the total geographical area, net sown area was 1.53 lakh

hectares i.e., 61.91 per cent. While forest coverage had remained at 0.10 per cent, permanent pasture land was 0.90 per cent. Current fallow land came to 20.87 per cent. Cultivable waste land (3.30%) and land under non-agricultural uses (18.33%).

The cropping intensity was 124.42 per cent only, which was slightly less than the state figure of 132.78 per cent.

Irrigation happens to be one of the major inputs of agricultural development. Though, several measures have been taken to enhance the scope of irrigation ever since India became independent, however, things have not undergone metamorphosis change so far. Consequently, various sources of irrigation were taken recourse depending also on the status of the farmers. Notwithstanding these efforts, Bhagalpur lagged behind in terms of irrigational base and irrigational intensity compared to the state average.

II

Banka district is situated in centre of 24°30′ to 25°08′ N latitudes and 86°30′ to 87°12′ E longitudes in the basin at a height of 43 metres from the mean sea level. The district is surrounded by Dumka & Deoghar districts of Jharkhand in south, Bhagalpur in north, Godda (Jharkhand) in east and Jamui & Munger in West. The district is spread over 3.05 lakh hectares and divided into 11 blocks and 185 gram panchayats. It had 2114 revenue villages. Out of it, 1682 villages (79.56%) were inhabitated and 432 (20.44%) un-inhabitated.

However, the Census 2011, Series – II report reveals that the population of Banka district was 20,29,339, which accounted for 1.96 per cent of the state's total population. Sex ratio of the district was distressing (907 females/1000 male). The population density was 672/sq km. The literacy rates of male and female were 69.80 and 49.40 per cent respectively. It revealed that the gender gap in literacy was 20.40 per cent.

The number of total workers in the district was 6.39 lakh, which accounted for 39.74 per cent of the total population. The data on classification of workers reveals that

51.71 per cent were agricultural labourers followed by 33.74 per cent cultivators, 4.62 per cent workers engaged in household industries and 9.93 per cent constituted other workers. The work participation rate in the district was 39.70 per cent with only 28.16 per cent in case of female.

The district had hot summer and moderate in winter season. As per available normals, the maximum temperature of the district was 43° Celsius in the month of May/June and minimum temperature fell up to 8.8° Celsius in the month of December/January. The minimum and maximum percentages of the humidity were 28.8 and 77.6 respectively.

While changes in land utilization pattern were very slow and marginal throughout the state, however, there had been a marginal increase in the non-agricultural use of geographical area across the state. As regards the pattern of land utilization in the district of Banka, out of the total geographical area, net sown area was 1.52 lac hectares i.e., 49.86 per cent. While forest coverage had remained at 14.18 per cent, permanent pasture land was 0.56 per cent. Current fallow land came to 1.25 per cent, cultivable waste land (2.61%) and land under non-agricultural use (13.35%).

The cropping intensity was 106.00 per cent only, which was much lower than the state figure of 132.78 per cent.

Irrigation happens to be one of the major inputs of agricultural development. Though there have been several measures taken to enhance the scope of irrigation ever since India became independent, however, things had not undergone metamorphosis change so far. Consequently, various sources of irrigation were taken recourse to depending also on the status of the farmers. Notwithstanding these efforts, Banka lagged behind in terms of irrigational base and irrigational intensity compared to the state average. As per latest data, out of the net sown area, only 83.72 per cent of land had the scope of irrigation and the rest either remained rainfed or faced the worst. The data on source wise distribution of irrigated area

revealed that canal (70.57%) was the major source followed by bore well, open well (5.67%), tank (2.34%) and others (2.68%).

A glance on the table containing data related to socio-economic features of sample respondents reveals highest number of respondents (growing katarni paddy) to be in the age group of 36-60 years in both Bhagalpur (93.33%) and Banka districts (83.33%).

Social group wise composition of the surveyed respondents reveals that the highest number of katarni paddy growing farmers belonged to OBC group 23 (76.67%) in Bhagalpur and 17 (56.67%) in Banka district.

Data in table further expresses stronger presence of respondents belonging to hindu religion in Bhagalpur district (73.33%) and 100 per cent in Banka district.

Data in table distinctly covers that all of the surveyed katarni paddy growers in both the selected districts were male (100% each).

In regard to main occupation and other activities of the surveyed farmers, table evinces agriculture to be the main source of livelihood for all the surveyed farmers of both the districts i.e., Bhagalpur and Banka 30-30 (100%) each.

On overall level, share of the sources of livelihood for the surveyed katarni paddy growers were: (i) Agriculture (as main occupation) 100 per cent, (ii) Business/Trade 8.34 per cent, (iii) Service (Public/Private Sector 10.00 per cent, and; (iv) as Agricultural Labourers 6.66 per cent).

A glance on the table helps us to expound that at an average the surveyed katarni paddy growers of Bhagalpur and Banka, districts both) fell under the broad category of medium land holding. It further furnishes that katarni paddy growing not being a much remunerative exercise, mostly the medium and big farmers preferred to undertake its cultivation.

It is interesting to note that in Bhagalpur 4.54 ha and Banka 25.14 ha of leased in land areas were from irrigated conditions, i.e., higher than unirrigated ones 3.48 ha and 10.71 ha) respectively.

Having groped the reason, most probably responsible for larger gross areas on aggregate level in Banka district 100.93 ha than Bhagalpur 79.16 ha, the revealed factor may be attributed to much higher leased-in area of 35.85 ha actually leased out by the big and prosperous R K caste land owners of the district.

Data in table corroborate that average sizes of leased-in land were higher in cases of marginal farmers on overall level (0.53 ha) in Bhagalpur district, while small farmers (2.10 ha) in Banka district. It is interesting to note that no medium and/large farmer leased out their land in Bhagalpur district, while Banka district witnessed as per normal belief large (1.16 ha) and medium farmers (0.21 ha) to have leased out their cultivable land.

Small and medium farmers of Banka district were clearly ahead in leasing in lands followed by marginal farmers in terms of aggregate total 14.65 ha, 14.48 ha and 6.72 ha respectively. In Bhagalpur district, marginal farmers were ahead 3.67 ha followed by small and medium 3.35 and 1 ha respectively.

In nutshell, due to larger total and average land areas leased out by big farmers of Banka district (majority of them belonging to prosperous R K caste, 3.47 ha, 2.53 ha, 1.16 ha and 0.21 ha) respectively, the sample katarni paddy growers of this district were at more privileged stage having taken larger areas as leased in land.

In Bhagalpur district larger areas under unirrigated conditions were used by the sample respondents for growing cereal mainly paddy 34.25 ha pulses, mustard 7 ha and orchards 3.50 hectares. In case of Banka district, areas under pulse crop masoor (lentil) 12.50 ha, khesadi 7 ha, mustard 8 ha, Tisi 4.92 ha and orchards 5.55 ha under unirrigated land areas were higher. Paddy in Banka district got greater share under irrigated condition 38.13 ha.

A concise look upon data in cropping pattern table crystallizes larger areas under katarni paddy devoted/used in irrigated conditions in Bhagapur and Banka districts both when compared to areas under unirrigated conditions 6.35 ha 10.20 ha and 2.08 ha and 9.15 ha respectively.

As far cultivation of vegetables is concerned, data contained in the table reveals larger areas devoted towards onion (in irrigated condition) only in both the surveyed districts in comparison to brinjal and potato also in Banka district 0.56 ha, 1.00 ha, 0.50 ha, 0.25 ha and 0.65 ha respectively.

Data contained in table captivates towards largest areas under katarni paddy devoted by big large farmers of Bhagalpur and Banka districts both (4.22 ha and 10.00 ha, i.e., 50.06 per cent and 51.68 per cent of the total operational areas of the concerned districts) respectively. Having a glance on data it can also be framed that there is direct and positive relationship between farm size and areas devoted for growing katarni paddy, i.e., with the increase in the farm size, there were increases in land areas used for growing katarni paddy.

On overall level, under variable cost, maximum expenditure, i.e., in percentage terms, was incurred on hired labour Rs. 9,070 per hectare (24.68%), and the minimum being in case of transplantation Rs. 1,000/- (2.72%). While the amount paid as wages to labourers was higher in Banka district (Rs. 9,100/-), the transplantation cost was higher in Bhagalpur (Rs. 1,050/-). As the quantum of net returns were quite higher in Bhagalpur district (Rs. 12,986.72) in comparison to that of Banka district (Rs. 9,552.70), so Cost Benefit Ratio (CBR) of Bhagalpur district (1:1.36) was found to be genuinely higher than that of the later district (1:1.26).

Data in table made it crystal clear that hired labour had remained the major items of expenditure (Rs. 9070/- per ha (24.68%) followed by irrigation (12.24%), harvesting (8.59%), ploughing (8.30%), manure (6.87%), fertilizers (5.96%), seeds (5.17%), transplantation (2.72%) and interest on working capital (1.80%).

A glance on data in table containing farm size wise areas under Katarni paddy in both the selected districts leads us to crunch for revealing that out of the total operational area owned by different size groups of respondents in Bhagalpur and Banka districts, in physical and percentage terms, large farmers were much ahead (4.22 ha i.e., 50.06% and 10 ha i.e., 51.68%) respectively.

Data in table help in searching thoroughly that in case of marginal farms, on overall level, highest expenditure was incurred in hiring labour Rs. 8750 (26.22%) of the total i.e., fixed cost and variable costs. Gross return (including straw) was found lower in Bhagalpur district (Rs. 44050/-). Besides total cost of production (Rs. 26427.32) being higher, the rate of sale of katarni paddy and yield rate were found lower in Bhagalpur district. Hence, cost benefit ratio was lower (1:1.30) because net return was also calculated quite lower at Rs. 10258.39 than that of Banka district Rs. 12089.90.

Data in table help us in coming home to the fact that like marginal farmers, the surveyed growers belonging to small farm size on overall level, incurred maximum expenditures in labour (24.78%), irrigation (12.74%), ploughing (8.78%), manure (7.36%) and harvesting (6.16%). Gross and net returns were higher in Banka district Rs. 47550/- and Rs. 11541.24 respectively. So, cost benefit ratio was marginally higher in Banka district (1:1.32) than that of Bhagalpur district (1:1.31). On overall level, it was estimated at 1:1.32.

Maintaining unchanged scenario, at the overall level, the surveyed farmers (belonging to medium farm size group) evinced highest expenditures to have made in items of labour (24.56%) followed by irrigation (11.04%) and ploughing (8.30%) like that of marginal and small farmers. Cost benefit ratio (CBR) in Bhagalpur district (1:1.35) was higher than that of Banka district (1:1.30). Dwelling upon the reasons for it, some of the factors could be higher rate (sale price) of Rs. 2350/- per qtl and yield rate 19.10 qtls/ha in the former district.

A glance on table containing data on overall level, in percentage terms, elucidates similar scenario/trend of highest expenditures to have been made by large farmers in the heads of hired labour (25.00%) and irrigation (10.25%) as could be seen in case of marginal, small and medium farmers surveyed. It was followed by harvesting (8.78%), ploughing (8.56%), manure (6.41%), fertilizers (5.39%) and seeds (4.73%). Cost benefit ratio (CBR) in Bhagalpur and Banka districts could be found almost same (1:1.30).

It can also be interpreted that higher share of irrigation expenditure incurred by all farm size classes is one of the reasons for farmers having developed indifferent attitude towards growing katarni paddy in larger areas. So, if irrigation facility is strengthened and expanded in the region, farmers may be encouraged to get the jump on towards growing katarni paddy.

While trying for core to the overall data in the table, it can be leveled with that out of the total production of katarni paddy by the surveyed farmers, highest quantum in percentage terms in both the districts, viz., Bhagalpur and Banka districts were meant for marketable surplus (67.74% and 65.20%) followed by home consumption (32.26% and 34.80%) respectively. Further, out of the total marketable surplus lower quantum were found to have been retained for further sale/home consumption in both the districts (12.09% and 5.98%) respectively.

Five channels have been dealt here:

Channel – I: Encircles --- Producer --- Consumer
Channel - II: Comprises ---Producer --- Itinerant trader --- Consumer
Channel- III: Producer --- Wholesaler --- Retailer --- Consumer
Channel - IV: Includes Producer --- Retailer --- Consumer, and;
Channel -V: Consisted others (if any).

A glance on the table clearly reveals Channel – III to be the most prominent one for selling maximum quantities of katarni paddy by the surveyed growers of Bhagalpur and Banka districts (59.38% and 54.34%) respectively. The channel of sale through which lowest quantities were sold, was channel – I for both the districts (7.29% and 4.77%) respectively.

In Bhagalpur district as it is revealed, the marketing margins at channel – II (PITC), channel – III (PWRC) and channel – IV (PRC) could be calculated at Rs. 150/- Rs. 300/- and Rs. 100/- only respectively. It means that from **Producer and Consumer points of view, Producers–Retailers-Consumer' Channel** is the most advantageous, desirable and effective channel.

In Banka district, almost similar scenario of marketing margins could be seen, except the amount of margin in case of Channel – IV being Rs. 50/- lower than that of Bhagalpur district. It was Rs. 2,150/- per quintal in PRC Channel.

It can thus be concluded that if the number of intermediate traders are reduced, then the growers may earn higher sale price, which is urgently desired with the view to encourage the farmers to undertake cultivation of katarni paddy in more areas.

It is clearly, evident that from sellers/growers angle, channel-III (PWRC) is the most profitable and encouraging one, as the growers got highest rate (Rs. 2400/- per quintal.

It may also be suggested/opined that if the whole sellers/big businessmen could be directed or advised by the Government/the concerned department to pay a more remunerative price to the growers for their marketable surplus, then the fate of extinction (in the form of declining area under these most rare varieties of highly fragrant katarni paddy grown only in this region of Bihar) can be made brighter.

Gathered data distinctly reveal that distance of farmers' fields and houses from the main, market/sale point has caused higher transportation and loading and unloading charges. These were Rs. 12/- each per quintal in case of Banka district. Compared to Rs. 10/- and Rs. 11.50 respectively in Bhagalpur district. Marketing fee/tax etc. were the same in both the districts.

While farmers not getting more than remunerative prices was highlighted as the most prominent causes of shifting areas under katarni paddy to other crops in both the districts (100%) non-availability of katarni paddy seed by any government

agency was the least intense factor for such trend in Bhagalpur and Banka districts (75% and 80%) respectively.

It can thus be educed that if suitable and stringent measures are taken for stopping uncontrolled excavation of sand from river Chandan and original/certified seeds of katarni paddy are made available to farmers by any government agency then a remarkable increase in areas under katarni paddy in both the districts can be certainly brought.

However, it may be taken as a matter of encouragement that now cultivation will be done by using foreign techniques. Blueprint was being prepared for this. In BAU, Sabour, Bhagalpur also, research is being conducted to save the fragrance of katarni paddy. As stated by the scientists from Philippines, productivity will be doubled by using foreign techniques/technology. This will not only help farmers in being more prosperous, but, Katarni's fragrance will smell in foreign countries also.

As per a rough estimate, about 20,000 qtls of katarni rice is required. To meet this high demand, modification in the variety of katarni paddy (into dwarf variety is desired. As per Vardan's Report by using SRI method of cultivation with the dwarf variety, 79 qtls/ha of yield can be obtained.

katarni paddy is a specific area based variety of rice. It has high potential with vast untapped opportunities of marketability. In true sense, basmati can not be produced in Bihar despite willingness of the farmers. Agricultural commodities do possess their area specific characteristics. Marketing of any good or service involves already existing feature of competition. Having classified under hard aroma group *(katarni rice) is mainly termed as khir & khichadi rice.* On the other hand, basmati rice is soft aroma rice, and it is known as polao rice.

Actually katarni is ceremonial rice, so there is no option to it particularly on special occasions. Bhagalpur and Banka districts are the main areas for growing katarni paddy. It is worth mentioning that fine scented rice is the strength of Bihar. Patna rice was also the main source of economy in Bihar.

It can be a matter to crave that none of the public or private agencies in Bihar did take any endeavour to produce/develop or did make any effort to promote production of katarni paddy seed. Names of such public/private agencies or departments may be noted as below:

(i).)Bihar Rajya Beez Nigam (BRBN), (ii) Tarai Development Corporation (TDC), (iii) State Food Corporation (SFC), (iv) Food Corporation of India (FCI), (v) Rajendra Agricultural University (RAU), (vi) National Seed Corporation (NSC), and; (vii) Private Companies. Instead, these agencies use to provide or promote production of Hybrid Varieties (HYVs) of all other types of paddy. These didn't take pain of producing preserving traditional seed of katarni paddy.

Some varieties of fine scented rice, namely: (i) kala namak, (ii) adam chini, (iii) Mirzapur (UP) do belong to Varanashi and Gorakhpur regions, while mircha variety belonged to Motihari district of Bihar state. There is 2 to 3 per cent chance of cross pollution. At the same time, the threat of deterioration in quality is also involved in it. It was also embodied that due to exchange of seeds from in some cases, 'non-real katarni seeds, the originality of the product is being vanished. Besides the above threat, germs are also being deteriorated. Another one of the challenges before the prospects of katarni paddy production in Bihar is its less demand.

If cultivation of katarni paddy is to be preserved and maintained, then some socio-economic studies to popularize its unique and distinguished significance will have to be undertaken. By adoption SRI method the yield of katarni paddy also can be enhanced to 25 to 30 per cent.

Diagnostic Measures/Action Points

i. Katarni paddy should be improved agronomically. *(Attn: IARI, PUSA, MoA, GoI, and Dept. of Agri., Govt. of Bihar).*

ii. Causation endeavours may be made by the Agricultural Scientists' and the farmers to maintain the natural and unique fragrance of Katarni Paddy and not to increase its yield only. *(Attn: Dept. of Agril. Extn., Govt. of Bihar & Bihar Agril. Univ., Sabour, Bhagalpur).*

iii. Agronomically developed Seeds need to be innovated. *(Attn: Dept. of Agri., Govt. of Bihar, Patna & BAU, Sabour, Bhagalpur).*

iv. All the public and private agencies (directly or indirectly involved in the production/manufacturing of seeds, should emphasize and ginger its activities towards preserving traditional katarni paddy seeds. These agencies need to include preparing and preservation traditional katarni paddy seeds in their programme. *(Attn: Bihar Rajya Beez Nigam, NSC, & BAU, Sabour, Bhagalpur).*

v. Emphasis has to be given on preserving aroma of katarni paddy. For this, "National Bureau of Plants and Genetic Resources, New Delhi" needs to be invited to look into the problem/matter in Bhagalpur and Banka districts of Bihar. *(Attn: BAU, Sabour, Bhagalpur, NBPGR, & IARI, New Delhi).*

vi. Scientific research needs to be conducted to ascertain as to which particular micronutrients are responsible for maintaining aroma in katarni paddy. *(Attn: Dept. of Soil Sciences, Dept. of Agronomy, BAU, Sabour, Bhagalpur).*

vii. By mutation (Gama radiation), genetical improvement, yield increase and quality improvement can be obtained. *(Attn: Dept. of Plant Breeding & Genetics, BAU, Sabour, Bhagalpur).*

viii. With the view to enhance yield of katarni paddy, organic farming should be propagated and encouraged. *(Attn: Agriculture Department, Govt. of Bihar & BAU, Sabour, Bhagalpur).*

ix. With the objective to deter the problem of adulterated seed, nucleus seed has to be maintained. After every 3-4 years, practice of using new seeds needs to be promoted. If the breeder doesn't have nucleus seed, arrangements may be made to bring it from National Bureau of Plant Genetic Research, (NBPGR), New Delhi, so that its originality and quality could be maintained. *(Attn: NBPGR). (Attn: District & Block level officers of the Agril. Dept., Govt. of Bihar).*

x. Genetic purity (True to Type) of katarni paddy should be maintained. *(Attn: Deptt. of Genetic Engineering, BAU, Sabour, Bhagalpur).*

xi. Drive to popularize katarni paddy should be launched with the objective to check the decline of area under it. *(Attn: Dte. of Extn., Dept. of Agri., Govt. of Bihar, Patna).*

xii. Threat of eroding natural taste/fragrance of katarni paddy as a result of excessive use of chemical fertilizers needs to be countered by creating awareness among the farmers to cultivate it by using bio-fertilizers or natural manure only. *(Attn: Extn. Agency, Agri. Dept., Govt. of Bihar).*

xiii. Check dams in river Chandan in quite a few numbers should be constructed to uplift and retain water level at a height that could facilitate easy cheaper and assured irrigation. *(Attn: Dept. of Water Resources, Govt. of Bihar).*

xiv. Unchecked excavation of sand from different points of Chandan River in large quantum everyday has caused deepening of river bed. It has been causing outflow of water from such a depth, from where irrigation is too costly and can not be done at required intervals. Sand less bed of river Chandan has lost water retention capacity making farmers indifferent towards cultivation of katarni paddy on a large scale. *(Attn: Bihar State Mineral Development Corporation, Govt. of Bihar & District Mining Officers, Bhagalpur & Banka).*

xv. As Basmati the aromatic rice grown in Northern India has seen phenomenal growth in regard to its processing industries in the past five years (2006-07 to 2010-11), due to the result of more than doubled demand, similarly environment for increase in production of katarni paddy could be created by promoting and carrying out branding exercise. *(Attn: MoA, GoI, Min. of Food & Consumers' Affairs, GoI, Dept. of Agri. GoB, All India Rice Exporters' Association, President & CMD, KRBL (Owner of India Gate Basmati Brand).*

References:

1. Thakur, R Choudhary, V K & Singh, J P, "*The Aromatic Rices of Bihar,*" R K Singh & U S Singh (ed.) Book "*A Treaties on the Scented Rices of India,*" Kalyani Publishers, Ludhiana – 141 008 (2003, first edition), pp. 251-260.
2. Singh, R K & Singh, U S, "*Scented Rices of India: An Introduction,*" Ibid, p 1-4.
3. Rani, N Shobha & Singh, R K, "*Efforts on Aromatic Rice Improvement in India,*" Ibid, P 23-25, 31.
4. Singh, A N & Singh, V P, "*Extent, Distribution and Growing Environments of Aromatic Rices in India,*" Ibid, pp 211-229.
5. Singh, R K, Mani, S C, Singh, Neelam, Singh, G, Singh, H N, Rohilla, Rashmi & Singh U S, "*The Aromatic Rices of Uttar Pradesh and Uttaranchal,*" Ibid, pp - 403-420.
6. Mallik, S & Roy, T K, "*The Scope of Cultivation of Aromatic Rice in West Bengal,*" Ibid, pp 433-446.
7. "*Prabhat Khabar,*" Hindi Daily, Bhagalpur edition," October 18, 2011, p 6.
8. "*Dainik Jagaran,*" Hindi Daily, March 3, 2012, p. 3.
9. Kumar, Roop "*Dainik Jagaran*" Hindi Daily, November 29, 2011, p 8.
10. Mishra, Lalit Kishore "*Prabhat Khabar,*" Hindi Daily, February 27, 2012, p. 1, 17
11. "*Prabhat Khabar,*" Hindi Daily, May 10, 2011, p. 3
12. Thakur, Pran Mohan, Ex-Commissioner, Bhagalpur, "*Hindustan,*" Hindi Daily, May 13, 2010.
13. "*Hindustan,*" Hindi Daily, August 6, 2011.
14. Kumar, Prateek "*Hindustan*" Hindi Daily, August 07, 2012.
15. "*Dainik Jagaran,*" Hindi Daily, May 18, 2011, p. 1, 9.
16. Tiwari, Amarendra Kumar, "*Dainik Jagaran,*" Hindi Daily, Sept. 15, 2011, p. 2.

Comments on the Draft Report

1.	Title of the Research Study	:	**Problems and Prospects of Katarni Paddy Production in Bihar**
2.	Date of receipt of the Draft Report	:	September 26, 2012
3.	Date of dispatch of the Comments	:	November 20, 2012
4.	Comments on the Objectives	:	The study addresses about all the Objectives mentioned in it.
5.	Comments on Methodology	:	Multistage simple random sampling method was adopted for selection of respondents. Mistakes pointed out on page No. 4.

6. Comments on Analysis, Organization, Presentation etc:

i. Report is analytically good and presents the result in logical manner.

ii. Per hectare cost of cultivation of katarni paddy was not worked out as per the methodology adopted under Comprehensive Scheme for estimating cost of cultivation/production hence require reconstruction of the tables 4.1, 4.4, 4.4.1, 4.4.2, 4.4.3, as per the above methodology *(methodology enclosed)*. Particularly rental value of land which should be calculated as 1/6th of Gross Income.

iii. While analyzing the marketing channels of katarni paddy, very important aspects viz., marketing margin and producers' share in consumer rupee were missed to be analyzed.

iv. At several places some mistakes were found which have been marked on the pages 1, 2, 4, 5, 7, 9, 12, 13, 14, 21, 22, 23, 37, 38, 40, 42, 43, 46, 50, 51, 56, 60.

7. Overview on Acceptability of report : The report can be accepted after making necessary corrections suggested as above.

Sd/-
H O Sharma
Director
AER Centre for MP & CG
JNKVV
Jabalpur – 482 004 (MP)

1. No action needed.
2. Date of dispatch of the Draft report : 23/09/2012
3. Date of receipt of the Comments : 30/11/2012
4. No action needed.
5. Mistake corrected as suggested on page No. 4.
6. i. No action needed.

   ii. Rectification made accordingly in Table Nos. 4.1, 4.4, 4.4.1, 4.4.2, 4.4.3.

   iii. Aspects of Marketing Margin and Producer's share in Consumer rupee incorporated at appropriate places in Section 4.6 and 4.7 of Chapter – IV.

   iv. All other minor word and sentence related mistakes on different pages have been corrected.
7. General Overview : Necessary corrections made.

Dr. Rajiv Kumar Sinha
Project Leader
AER Centre
T M Bhagalpur University
Bhagalpur – 812 007

Dr. (Mrs) Rosline Kusum Marandi
Co-Project Leader
AER Centre
T M Bhagalpur University
Bhagalpur – 812 007

****
******
***