CONSOLIDATED REPORT STUDY NO. 177

# Spread of New Varieties of Hybrid Rice and their Impact on the Overall Production and Productivity

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*Debajit Roy*

**AGRO-ECONOMIC RESEARCH CENTRE**
**VISVA-BHARATI**
**SANTINIKETAN**
**2013**

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*Consolidated Report*

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# Preface

*The present consolidated report on "Spread of New Varieties of Hybrid Rice and their Impact on the Overall Production and Productivity" has been assigned by the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India to five AERCs as a common study. However, the coordination of the study and drafting of consolidated report has been done by this Centre.*

*Encouraged by the success of hybrid rice technology in enhancing the rice production and productivity in China, the Indian Council of Agricultural Research (ICAR) initiated a national program for development and large scale adoption of hybrid rice in the country in December 1989. The project was implemented through a National Network comprising research, seed production and extension networks. The hybrid rice research network consisted of 11 research centres and many voluntary centres spread across the country. The seed production network consisted of public sector seed production agencies such as National Seed Corporation, State Farms Corporation of India and the State Seed Development Corporations in addition to many private sector seed companies. The extension network consisted of state departments of Agriculture, extension wings of the SAUs, Krishi Vignan Kendras (Farm science centres) and the NGOs. Effective linkages were established within the different sub-components of the network. The entire project was co-ordinated and implemented by the Directorate of Rice Research (DRR), Hyderabad. The project initiated by the ICAR, was strengthened by the technical support from IRRI Philippines, FAO, the financial support from the UNDP, Mahyco Research Foundation (MRF), World Bank funded National Agricultural Technology Project (NATP) and IRRI/ADB Project on Hybrid Rice.*

*The present consolidated report has been drafted by Prof. Pranab Kanti Basu, Department of Economics & Politics, Visva-Bharati University, while Dr. Debajit Roy, AERC, Santiniketan assisted him in aggregation of data, preparation of tables & graphs and digitization of the report.*

*On behalf of the Centre, I extend my heartfelt thanks to the Ministry of Agriculture, Government of India, and all the participating centres, viz. AERC Allahabad, AERC Jabalpur, AERC Vizag & AERC Bhagalpur for their sincere cooperation and help.*

Sd/-
Saumya Chakrabarti
Hony. Director
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Santiniketan
November, 2013

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# CHAPTER-I

# Introduction

## 1.1 Background of the study

India has a large agrarian economy with majority of its rural population subsisting on farming. Over the decades since independence, Government of India has made concerted efforts to improve the lot of the farmers. By the mid sixties it was realized that for India to achieve self-sufficiency in food-grains, there was no alternative to technological change in agriculture. The spread of HYV technology resulting in the green revolution in India in the last decades and achievement of self-sufficiency in food-grains represent a success story for the Science and Technology sector. The most widely debated issue about the green revolution was the growing disparities in income between the different regions and the different classes of farmers. This was observed in the early phase of the green revolution i.e. until about the mid seventies. These trends however got reversed after the mid seventies which are typical of a diffusion process characterized by the spread of green revolution to new areas, and the increasing adoption of new technology by the small farmers. The achievements so far in respect of raising yields and reducing variability in the unfavourable agro-climatic regions are not comparable with those realized for the favourable environments. The limited spread of the green revolution can be explained partly by the nature of available technology itself and partly by the uneven development of infrastructure, physical as well as institutional which is pre-requisite for the adoption of improved practices.

Against such a background it is necessary to examine the needed changes in agricultural research strategy. Minimising regional imbalances in growth, imparting stability to agricultural output and bringing the benefits of agricultural research technology to the resource poor farmers are the three major concerns that motivate research. The research scientists considered hybrid rice technology as a readily available option to shift the yield frontier upward in the face of declining trend of the yield potential of the existing varieties. It was projected that hybrid rice technology would being about another rice revolution in the country. However, although a number of varieties of hybrid rice are released by the Government, the extent of adoption of hybrid rice varieties in the country is too meagre to make an impact on rice production. Against this backdrop, the present study is conceptualised and undertaken at the instance of the Directorate of Economics and Statistics, Ministry of

Agriculture, Government of India with a view to assessing the actual spread of hybrid rice varieties replacing the conventional HYVs to make an overall impact of rice production.

Rice is the most important cereal crop in India in terms of area occupied, production and consumption as a principal food and thus occupies a prominent place in Indian agriculture. India produces 99.18 million tonnes of rice (2008-09). It is cultivated over an area of 45.54 million hectares which account for 23.25 per cent of the gross cropped area and 37.08 per cent of the area sown to food-grains. Rice production contributes 42.30 per cent of the total food-grain production in the country. However, Plateuing trend in the yield of HYVs, depletion of natural resources like land and water and acute shortage of labour make the task of increasing rice production quite challenging. The current situation necessitates looking for some innovative technologies to boost rice production.

Encouraged by the success of hybrid rice technology in enhancing the rice production and productivity in China, the Indian Council of Agricultural Research (ICAR) initiated a national program for development and large scale adoption of hybrid rice in the country in December 1989. The project was implemented through a National Network comprising research, seed production and extension networks. The hybrid rice research network consisted of 11 research centres and many voluntary centres spread across the country. The seed production network consisted of public sector seed production agencies such as National Seed Corporation, State Farms Corporation of India and the State Seed Development Corporations in addition to many private sector seed companies. The extension network consisted of state departments of Agriculture, extension wings of the SAUs, Krishi Vignan Kendras (Farm science centres) and the NGOs. Effective linkages were established within the different sub-components of the network. The entire project was co-ordinated and implemented by the Directorate of Rice Research (DRR), Hyderabad. The project initiated by the ICAR, was strengthened by the technical support from IRRI Philippines, FAO, the financial support from the UNDP, Mahyco Research Foundation (MRF), World Bank funded National Agricultural Technology Project (NATP) and IRRI/ADB Project on Hybrid Rice.

Hybrid rice technology is likely to play a key role in increasing the rice production. During the year 2008, hybrid rice was planted in an area of 1.4 m.ha. and an additional rice production of 1.5 to 2.5 m.t. was added to our food basket through this technology. More than 80 per cent of the total hybrid rice area is in eastern Indian states like Uttar Pradesh, Jharkhand, Bihar, Chhattisgarh, with some little area in states like Madhya Pradesh, Assam, Punjab and Haryana. As rice is a key source of livelihood in eastern India, a considerable

increase in yield through this technology will have a major impact on household food and nutritional security, income generation, besides an economic impact in the region. In view of this, hybrid rice has been identified as one of the components under the National Food Security Mission (NFSM) launched by the Government of India (GOI) with the aim to enhance rice production by 10 million tonnes by 2011-12. Under the scheme it has been targeted to cover 3 million ha area under hybrid rice by the year 2011-12. The approach is to bridge the yield gap in respect of rice through dissemination of improved technology and farm management practices. Similarly, added emphasis is being given for adoption of hybrid rice under the special scheme (BGREI) of GOI to bring green revolution to eastern India.

**Table 1.1: Hybrids currently available for cultivation across States**

| | Central releases | State releases |
|---|---|---|
| Public Sector | KRH 2, Pusa RH 10, DRRH 2, Rajlaxmi, Sahyadri 4, DRRH 3, CRHR 32 | Andhra Pradesh: APHR -1, APHR – 2, KRH – 1, DRRH – 1<br>Bihar & Jharkhand: PSD 3, Ajay, CoRH 3, Indira Sona, JRH 8<br>Madhya Pradesh: JRH-4, JRH-5, JRH-8, and DRRH-3<br>Uttar Pradesh: PSD-1, NSD-2, Ganga, Narendra Usar SD-3<br>West Bengal: PSD 3, Ajay, CoRH 3, Indira Sona, JRH 8 |
| Private Sector | PHB 71, PA 6129, PA 6201, PA 6444, JKRH 401, Suruchi, GK 5003, DRH 775, HRI-157, PAC 835, PAC 837, US 312, Indam 200-017, NK 5251, 27P11 | |

Source: Directorate of Rice Research, Rajendranagar, Hyderabad-30, and Directorate of Rice Development, Patna

As a result of concerted efforts for over two decades, a total of 46 hybrids have been released for commercial cultivation in the country. Among these, 29 have been released from the public sector while remaining 17 have been developed and released by the private sector. Though 46 hybrids have been released in the country so far, some of them have been outdated, and some are not in the production chain. Such hybrids related to production chain and available for commercial cultivation are listed in Table-1.1.

The farmers of the country are growing mostly the varieties bred by the research system such as ICAR, State Agril. Universities (SAUs) and other Research Institutions connected to agriculture. The varieties are normally bred taking into consideration, various

characters like yield potential, resistance to biotic and abiotic stress of the existing popular variety/varieties. The new varieties are bred by the Research Institutions and screened for their performance at different locations through initial evolution trial and advance varietal trial. A Technical Committee finally considers these varieties and release only those varieties which are found superior over the existing best varieties. While releasing these varieties the Technical Committee also specifies the ecology i.e. the State area within State, season in which the varieties are to be grown. The newly released varieties normally have edge over the existing varieties in yield, resistant to serious pest and diseases, resistant to the abiotic stresses i.e water related problems like drought etc. Although a number of varieties are being released by the Government to meet the demand of the farmers, the spread of these newer varieties in place of the conventional varieties that are grown by the farmers for a longer period has not been assessed properly. There is no comprehensive evaluation study to document farm-level insights into hybrid rice performance except very few studies citing the instance of yield superiority of hybrid rice but less profitable than the inbred varieties i.e conventional Hyvs (Janaiah, 2003, Chengappa et.al 2003).

## 1.2 Need for the Study

The spread of the newer varieties replacing the older varieties need to be closely monitored to take advantage of the superior characters of these newer varieties released by various Research Institutions. This will help to break the yield plateau in rice production of the recent past. Though the Government is taking a number of steps to popularize these varieties like Frontline Demonstration, minikit supply, organising training programmes (1-21days) for farmers, farm women, seed growers, seed production personnel of public and private seed agencies, extension functionaries of state departments of agriculture, officials of state agricultural universities and NGOs, there is no concrete evidence that the newer varieties of rice are spreading faster and replacing the older ones. Therefore, it is essential to conduct a study to assess the actual spreading of these newer varieties in terms of area. This will help the Government of India to draw a plan for augmenting the spread of the superior newer varieties.

## 1.3 Objectives of the Study

The specific objectives of the study are

1. to indicate the extent of adoption and the level of participation by the different categories of farmers in the cultivation of hybrid rice;
2. to assess the overall impact of hybrid rice cultivation on rice production and productivity;
3. to study the economics of cultivation of hybrid rice varieties vis-a-vis inbred varieties;
4. to identify factors determining the adoption of hybrid rice varieties;
5. to determine constraints and outline the prospects for increasing hybrid rice cultivation.
6. to suggest policy measures for expansion of hybrid rice cultivation.

## 1.4 Data Base, Sampling Design, Methodology and Coverage of the Study

The study is based on both secondary and primary data. Secondary data obtained from different state government publications relating to area, production and productivity of rice.

- West Bengal: Statistical Abstract, Government of West Bengal and Economic Review, Government of West Bengal.
- Uttar Pradesh: Farms and seeds sections of the Directorate of Agriculture of the state of Uttar Pradesh, Lucknow farms and seeds sections of the Directorate of Agriculture of the state of Uttar Pradesh, Lucknow.
- Bihar: Production and yield of rice crop were collected from the Directorate of Agriculture, Government of Bihar secondary data were also obtained from the publications of Government of Bihar and Government of India.
- Madhya Pradesh: various issues of Madhya Pradesh agriculture statistics, Land Record Office of Gwalior Madhya Pradesh and web sites like www.agricoop.nic.in, www.mpkrishi.org, www.dacnet.nic.in.
- Andhra Pradesh: Directorate of Economics and Statistics Publications was used.

Keeping in mind that the first hybrids was developed and released for commercial cultivation in India in 1994, the study period was divided into three sub-periods viz. 1984-85 to 1993-94, 1994-95 to 2003-04 and 2004-05 to 2009-10. The period-I viz. 1984-85 to 1993-94 refers to the pre-introduction period of hybrid rice while other two period's viz. period-II & III correspond to post-introduction periods.

Primary survey was confined to the National Food Security Mission (NFSM) districts in the states. The two districts having relatively higher concentration of hybrid seeds cultivation within the group of NFSM districts were chosen for the study. In each of the district, two representative blocks were taken and within each block two villages are selected. In each village, a complete list of cultivating households growing hybrid rice varieties and inbred varieties were prepared and stratified according to four standard land size groups such as marginal (less than 1 hectare), small (1 to 2 hectares), medium (2 to 4 hectares) and large (more than 4 hectares) farmers. In each district, 40 hybrid rice growers from the list of hybrid rice growing cultivators were drawn at random from different land size groups on the basis of their proportion in the universe. In addition to this sample, 10 inbred variety (traditional HYVs) rice growers but non-adopters of hybrid rice were selected randomly from the different land size groups amongst inbred rice growing cultivators following the same procedure. Thus altogether, 50 rice growing cultivators were chosen from each selected district. In all, 100 rice growing cultivators in each state equally spread over two selected districts constituted the size of the sample in the study. Primary survey was conducted over 2009-10 and 2010-11. Some state surveys covered different seasons over these years. However, this consolidated report does not present the seasonal patterns in the body because of non-comparability over states.

### 1.5 Analytical Approach

Farm level data is analyzed using a simple tabular analysis to study spread and impact of hybrid rice technology. Compound growth rates of area, production and productivity of the crops have been calculated from secondary data. In measuring the instability in crop production, the co-efficient of variation technique is used.

### 1.6 Organization of the Report

The Report is divided into eight chapters. Chapter-I is the introductory chapter which spells out the background, objectives, data base and methodology of the study. Chapter-II describes the status of rice in the states studied. Chapter-III analyzes the status of adoption of hybrid rice at the farm level. Chapter-IV examines the impact of hybrid rice cultivation on overall production of rice. Chapter-V studies the comparative economics of hybrid and inbred rice cultivation. Chapter-VI analyzes grain quality characteristics of hybrid rice vis-à-vis inbred

rice. Chapter-VII discusses the problems faced by hybrid rice growers and examines the prospect for increasing hybrid rice cultivation. Chapter-VIII provides concluding remarks and policy suggestions emerging from the study.

# CHAPTER-II

## Trends of Rice Production, Productivity and Area

### 2.1 Overall trends (1984 – 2010)

Discerning differences between patterns of growth of the various seasons was a purpose of this study, but as the seasonal patterns are not available for all the states it was decided to focus on the aggregate trends. Further, the analysis of performance of HYV across states was also hampered by the lack of data from all states. The detailed figures for annual production, acreage under paddy and productivity for all states from 1984-85 to 2009-10 are presented in the annexure. We are also unable to present a consolidated picture of performance of HYV during this period because of lack of information from some states. The available data relating to HYV are presented in annexure. We have also calculated the compound rates of growth from available data. This is also included in the annexure. The general finding, though based on only partial data, is that the rates of growth of yield and production of HYV paddy have tended to be negative, though there has been some growth in area under HYV paddy.

**Figure 2.1**

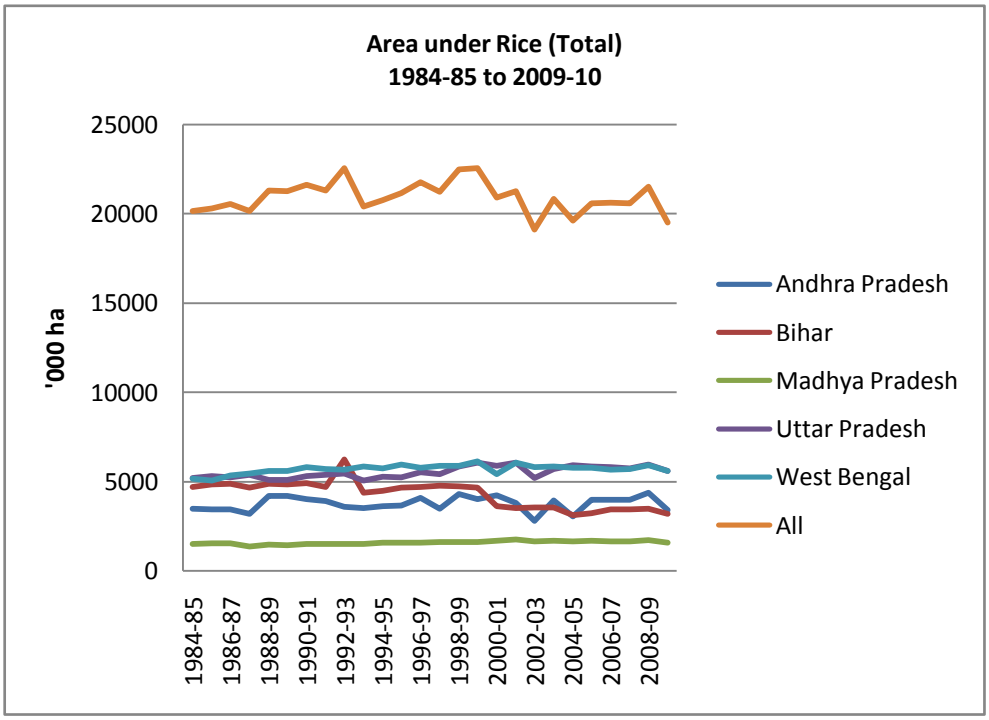


**Figure 2.2**

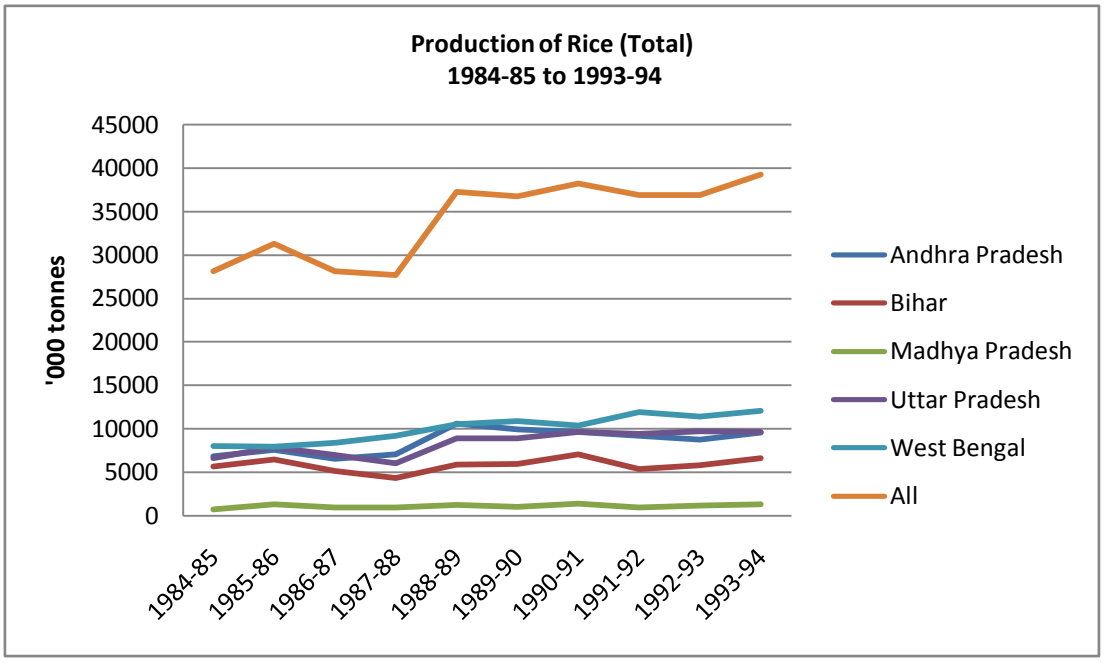



**Figure 2.3**

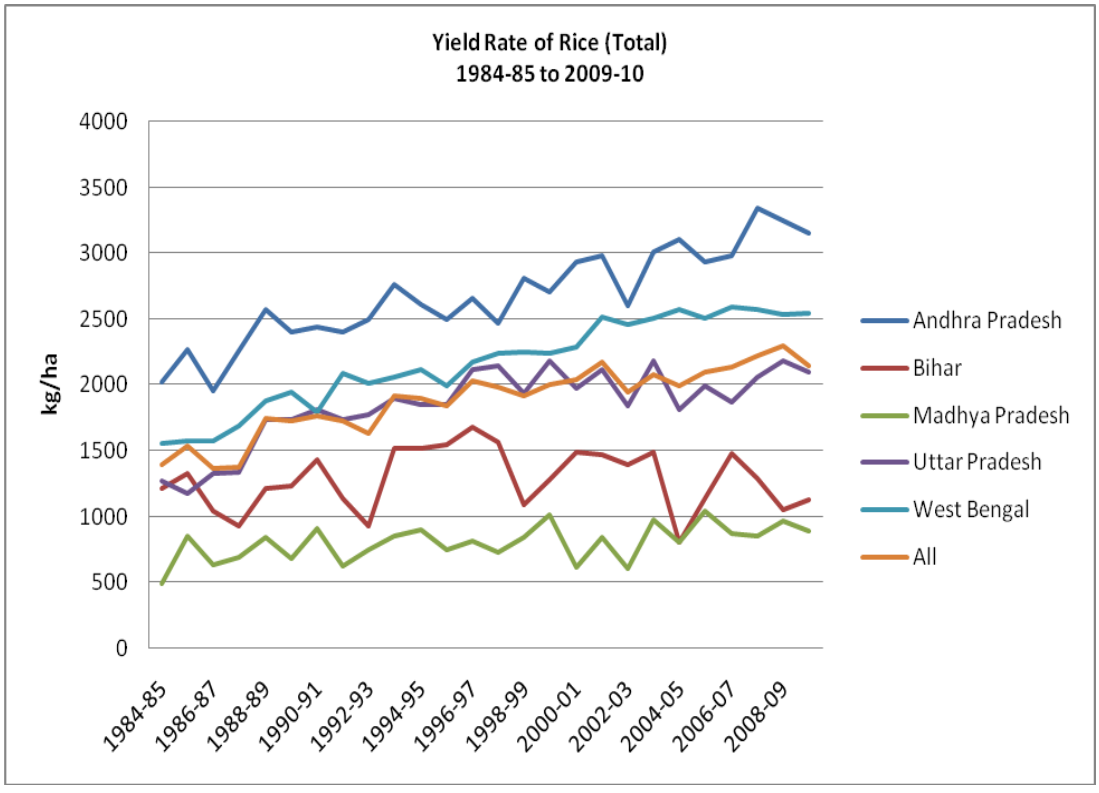


**Table 2.1: Compound Growth Rates of Area, Production and Productivity of Rice across States**

**Calculated using the Formula**: $\mathrm{CAGR}(t_0, t_n) = (V(t_n)/V(t_0))^{\frac{1}{t_n - t_0}} - 1$ (Per cent per annum)

| Year/ Period | Andhra Pradesh | | | Bihar | | | Madhya Pradesh | | | Uttar Pradesh | | | West Bengal | | | All States | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | P | Y | A | P | Y | A | P | Y | A | P | Y | A | P | Y | A | P | Y |
| 1984-85 - 1993- 94 | 0.15 | 3.68 | 3.52 | -0.76 | 1.75 | 2.53 | 0.00 | 6.39 | 6.29 | -0.31 | 4.18 | 4.51 | 1.37 | 4.58 | 3.16 | 0.15 | 3.79 | 3.63 |
| 1994-95 - 2003- 04 | 0.99 | -0.39 | 1.61 | -2.56 | -2.80 | -0.24 | 0.88 | 3.11 | 0.93 | 0.89 | 2.74 | 1.83 | 0.16 | 2.03 | 1.87 | 0.03 | 1.00 | 0.97 |
| 2004-05 - 2009 - 10 | 2.20 | 2.45 | 0.25 | 0.46 | 7.47 | 6.98 | -0.97 | 1.06 | 2.19 | -1.11 | 1.81 | 2.94 | -0.54 | -0.74 | -0.21 | -0.13 | 1.43 | 1.56 |
| 1984-85 - 2009-10 | -0.07 | 1.82 | 1.79 | -1.52 | -1.80 | -0.28 | 0.18 | 2.41 | 2.42 | 0.29 | 2.31 | 2.01 | 0.32 | 2.31 | 1.99 | -0.13 | 1.61 | 1.75 |

A=Area, P=Production, Y= Yield
*Source: Respective AERC data*

**Table 2.2: Coefficient of variation (CV) in Area, Production and Productivity of Rice across States**

**Calculated using the Formula**: $c_v = \frac{\sigma}{\mu}$

| Year/ Period | Andhra Pradesh | | | Bihar | | | Madhya Pradesh | | | Uttar Pradesh | | | West Bengal | | | All* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | P | Y | A | P | Y | A | P | Y | A | P | Y | A | P | Y | A | P | Y |
| 1984-85 - 1993- 94 | 9.52 | 16.70 | 10.34 | 10.10 | 13.58 | 16.38 | 3.65 | 18.97 | 18.06 | 2.64 | 16.51 | 16.95 | 4.71 | 15.49 | 11.52 | 3.75 | 13.74 | 11.89 |
| 1994-95 - 2003- 04 | 11.46 | 16.42 | 7.22 | 13.44 | 18.06 | 11.42 | 3.76 | 23.49 | 17.04 | 5.92 | 11.46 | 7.03 | 3.27 | 8.39 | 7.43 | 4.58 | 6.78 | 4.83 |
| 2004-05 - 2009 - 10 | 12.21 | 14.00 | 4.91 | 4.70 | 26.64 | 19.67 | 2.61 | 10.95 | 9.57 | 2.25 | 6.97 | 6.91 | 1.84 | 1.71 | 1.21 | 3.66 | 8.00 | 4.87 |
| 1994-95 - 2009-10 | 10.57 | 20.03 | 13.53 | 17.87 | 22.38 | 17.87 | 5.74 | 21.81 | 17.25 | 5.83 | 19.11 | 15.57 | 4.33 | 18.13 | 15.74 | 4.20 | 14.55 | 13.85 |

A=Area, P=Production, Y= Yield
*Source: Respective AERC data*

Yield and productivity under paddy in all states together increased in all the periods. Area fluctuated and there was no upward trend. In fact the area under paddy at the end of the entire study period was lower than at the beginning. This indicates that the scope of increasing output through extension of area has been exhausted and it is imperative to concentrate on yield improvement, through Hybrid seeds, etc. It is also noticeable that yield and productivity performed substantially better during the pre-hybrid period (1984-85 to 1993-94). This probably indicates the fact, noted in various studies and also corroborated in the partial state figures given in the annexure, that HYV performance tapered off since the 90s. Hybrid cultivation did not spread sufficiently so as to compensate.

It can also be observed that the increase in production can be attributed more to gain in productivity than to increase in area under crop, which in fact declined, as we have already indicated. Both yield and production showed similar and substantial gains.

The performance of the all states has also varied substantially from year to year over the entire period. Remarkably, the variation has been most pronounced during the most productive period i.e. the pre-hybrid period (1984-85 to 1993-94). Year to year variations, particularly of yield, is generally attributable to fluctuations in weather. The fact that the period of strongest growth of yield was also the period during which variation was most pronounced suggests that yield gains may have been largely caused by weather conditions.

The performance of the states also differed significantly as can be seen from annexure tables & graphs (pages 62-67). While four of the five states studied have performed better than average, negative growth in productivity of Bihar alone has brought down the average.

# CHAPTER-III

## Status of Adoption of Hybrid Rice at the Farm Level

**Table3.1: Aggregate distribution of adopters/non-adopters according to farm size for All States**

| Size classes of operational holdings (ha) | Hybrid adopters | | Non-adopters | |
|---|---|---|---|---|
| | No of farms | Percent of farms | No of farms | Percent of farms |
| Below 1ha | 190 | 47.50 | 48 | 48.00 |
| 1 – 2 | 98 | 24.50 | 25 | 25.00 |
| 2 – 4 | 60 | 15.00 | 14 | 14.00 |
| 4 – 10 | 36 | 9.00 | 9 | 9.00 |
| 10 ha and above | 16 | 4.00 | 4 | 4.00 |
| Total | 400 | 100.00 | 100 | 100.00 |

Data source: primary
*simple averages of state figures.

The above table does not reveal any relation between farm size and inclination to adopt hybrid technology. The percentage distribution by size class among adopting and non-adopting farmers is predetermined by the sampling method.

**Table 3.2-a: Extent of adoption of hybrid rice technology by farm size in 2009-10 for All States***

(for hybrid adopters only)

| Farm size classes (ha) | Average farm size (ha) | Average rice area (ha) | Average rice area (ha) under | |
|---|---|---|---|---|
| | | | HYVs | Hybrid |
| Below 1ha | 0.75 | 0.69 | 0.41 | 0.28 |
| 1 – 2 | 1.69 | 1.43 | 0.92 | 0.51 |
| 2 – 4 | 3.11 | 2.57 | 1.93 | 0.64 |
| 4 – 10 | 5.55 | 3.79 | 2.37 | 1.42 |
| 10 ha & above | 12.16 | 6.86 | 2.59 | 4.26 |
| All sizes | 2.36 | 1.71 | 1.08 | 0.63 |

Data source: Primary data; * Simple average of state averages

**Table 3.2-b: Extent of adoption of hybrid rice technology by farm size in 2010-11 for All States***

(for hybrid adopters only)

| Farm size classes (ha) | Average farm size (ha) | Average rice area (ha) | Average rice area (ha) under | |
|---|---|---|---|---|
| | | | HYVs | Hybrid |
| Below 1ha | 0.75 | 0.71 | 0.27 | 0.44 |
| 1 – 2 | 1.69 | 1.44 | 0.80 | 0.62 |
| 2 – 4 | 3.07 | 2.54 | 1.74 | 0.80 |
| 4 – 10 | 5.48 | 3.93 | 2.38 | 1.55 |
| 10 ha & above | 12.16 | 7.24 | 2.93 | 4.31 |
| All sizes | 2.34 | 1.75 | 0.92 | 0.83 |

Data source: Primary data; * Simple average of state averages

**Figure 3.2-a**

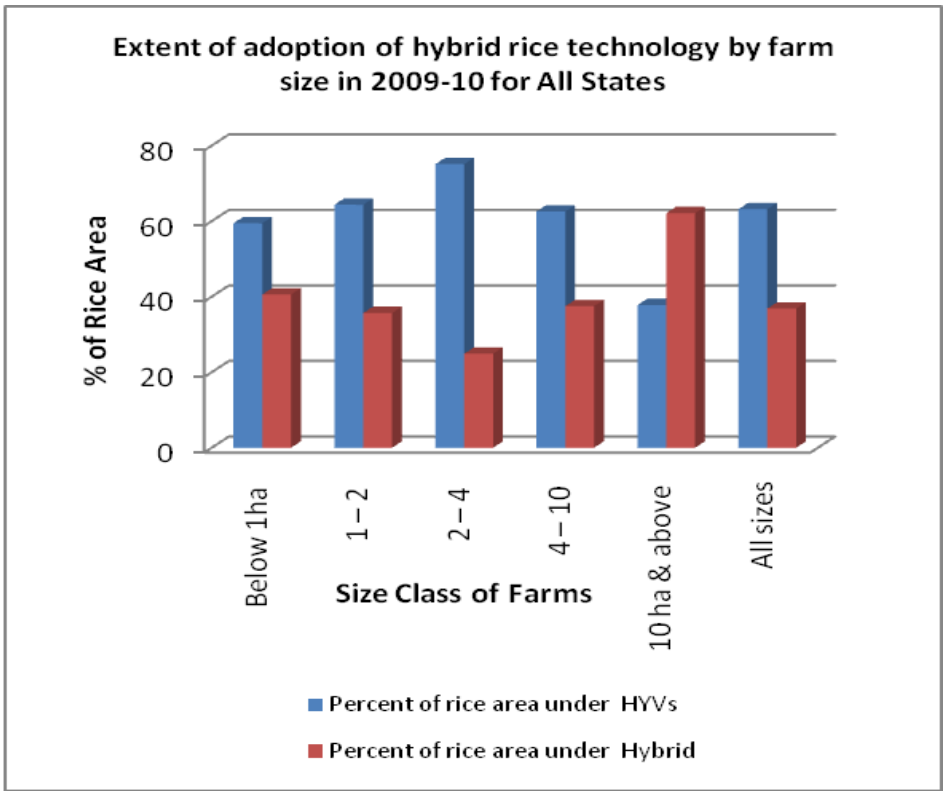
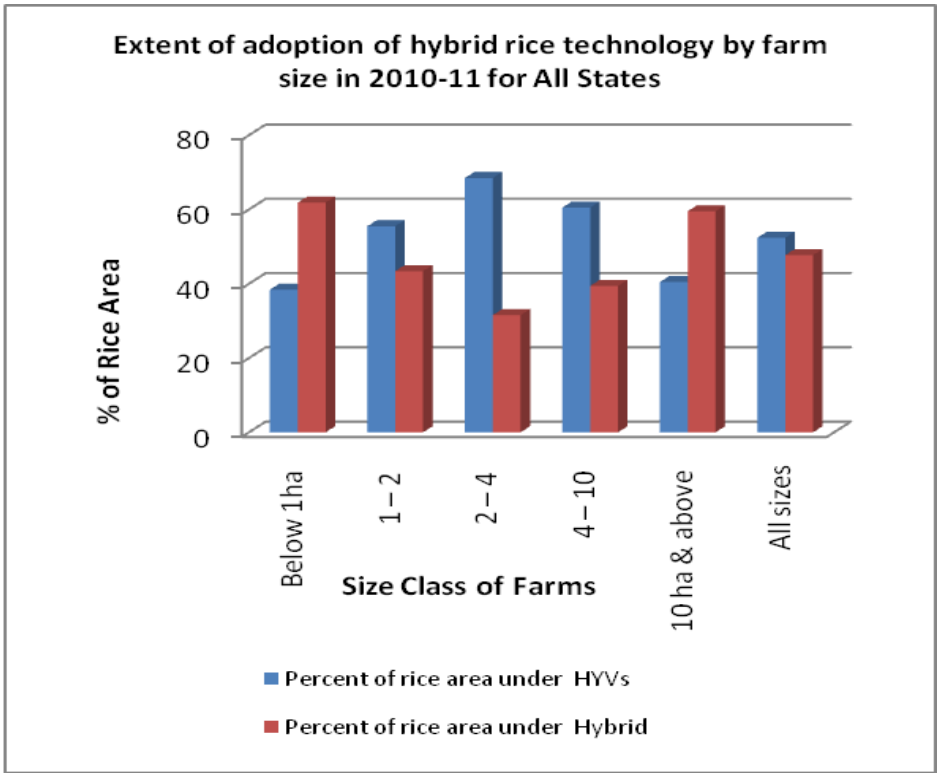



**Figure 3.2-b**



From the above diagrams it is clear that for both years the receptivity by size class to hybrid cultivation takes the form of a U, with the size class 2 to 4 ha being the least receptive. In striking contrast the receptivity to HYV takes the form of an inverted U, with the same size class being most receptive. Further apart from the largest farms, area under hybrid cultivation has increased between 2009-10 and 2010-2011. Correspondingly, there has been a decline in area under HYV. Though the time span is too short, the result is intuitively expected. With time information about and confidence in hybrid cultivation is likely to increase.

**Table 3.3-a: Household Size of sample farm households for All States ***

| Particulars | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|
| Male | 4.14 | 3.74 | 4.06 |
| % | 56.53 | 54.96 | 56.17 |
| Female | 3.20 | 3.06 | 3.17 |
| % | 43.64 | 45.04 | 43.83 |
| Total | 7.33 | 6.80 | 7.23 |
| % | 100.00 | 100.00 | 100.00 |

* Based on simple average of four states barring Madhya Pradesh.

There does not appear to be any significant difference in gender composition of adopting and non-adopting households (T 4). However it appears that family size of adopters is mentionably greater. It is difficult to conceive any logical reason for this, but this may b studied in greater detail to see whether the same result holds over larger samples and in different locations. Further, as the note to the table points out the aggregative result is a simple weighted average and the result could differ if the proper weighted average could be constructed.

**Table 3.3-b: No. of Workers of sample farm households for All States***

| Particulars | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|
| Male | 2.21 | 2.00 | 2.16 |
| % | 58.14 | 55.75 | 57.63 |
| Female | 1.59 | 1.59 | 1.59 |
| % | 41.92 | 44.25 | 42.37 |
| Total | 3.79 | 3.59 | 3.75 |
| % | 100.00 | 100.00 | 100.00 |

* Based on simple average of four states barring Madhya Pradesh.

There is no obvious difference in number of working people per household between hybrid adopters and non-adopters. Neither is the gender composition of working people very different.

**Table 3.3-c: Percentage age group of Head of sample farm households for All States***

| Age Groups | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|
| < 18 | 0.00 | 0.00 | 0.00 |
| 18 – 60 | 88.13 | 80.00 | 86.50 |
| > 60 | 11.88 | 20.00 | 13.50 |
| Total | 100.00 | 100.00 | 100.00 |

* Based on the data for four states barring Andhra Pradesh.

It appears that a significantly higher proportion of head of households adopting hybrid farming to younger households. This is intuitively expected as the younger decision makers are more likely to be innovative.

**Table 3.3-d: Educational Status of Head of sample farm households for All States***

| Educational Levels | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|
| % Illiterate | 14.00 | 20.00 | 15.20 |
| % Up to Primary | 29.25 | 23.00 | 28.00 |
| % Up to secondary | 40.50 | 44.00 | 41.20 |
| % Up to Graduate | 11.50 | 8.00 | 10.80 |
| % Above Graduate | 4.75 | 5.00 | 4.80 |

* Based on simple average of four state figures

Analysis of primary data relating to the educational status of adopter and non-adopters lead to results that are intuitively anticipated. One would expect the more educated to go in for newer technology. We find a significantly greater proportion of non-adopters to be illiterate, and also a greater proportion of adopters to have completed primary schooling. But we find that the proportion of secondary educated is greater among non-adopters. This would suggest that the ability to read literature on hybrid cultivation is sufficient and that higher formal education is unnecessary. However the proportion of graduates and above is greater among adopters. Perhaps, a greater exposure to education informs one of the long term futility of HYV cultivation vis-a-vis hybrid cultivation.

**Table 3.3-e: Caste Composition of sample farm households for All States***

| Castes (percentage) | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|
| SC | 14.25 | 10.00 | 13.40 |
| ST | 17.75 | 11.00 | 16.40 |
| OBC | 32.75 | 38.00 | 33.80 |
| General | 35.25 | 41.00 | 36.40 |

* Based on simple average of four states figures

It appears from that a significantly larger proportion of SC, ST farmers go in for hybrid cultivation. It could be that they are less tradition bound than general castes, or it could be that their poorer economic condition induces them to take greater risks in the hope of sustainable livelihood. This needs investigation of economic status of SC ST component of

population. The same is not true for OBCs. It may be that this category is to imprecise and, therefore, undifferentiable from the general castes.

**Table 3.3-f: Main Occupation of the Head of sample farm households for All States***

| Nature of Employment (percentage) | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|
| Self-employed Farming | 77.50 | 68.75 | 75.75 |
| Self-employed Non-farming | 4.06 | 12.50 | 5.75 |
| Salaried Person | 4.38 | 3.75 | 4.25 |
| Agriculture Labour | 3.13 | 5.00 | 3.50 |
| Non-agricultural Labour | 2.50 | 3.75 | 2.75 |
| Pensioner | 1.88 | 1.25 | 1.75 |
| Household Work | 4.69 | 5.00 | 4.75 |
| Student | 0.00 | 0.00 | 0.00 |
| Others | 1.88 | 0.00 | 1.50 |

* Based on four states barring Andhra Pradesh.

Two categories stand out as good hybrid adopters: self-employed farming and labour. It is likely that these two categories have the greatest information and interest in agriculture, of course excluding the non-agricultural labour.

**Table 3.3-g: Average size of Holding of sample farm households for All States***

| | Nature of Landholding | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|---|
| **All States *** | Ownership holdings (ha) | 2.64 | 2.24 | 2.52 |
| | Operational holdings (ha) | 2.73 | 2.32 | 2.61 |

* Represent simple average of average landholding across states

The table above suggests that the hybrid adopters have greater landholding. This is not very illuminating unless supplemented with the findings from T 2 and T 3, which we have discussed.

**Table 3.3-h: Season wise average size of irrigated land (ha) of sample farm households for All States***

| Characteristics | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|
| Kharif | 2.37 | 1.87 | 2.23 |
| % | 53.43 | 52.94 | 53.46 |
| Rabi | 1.96 | 1.58 | 1.84 |
| % | 44.27 | 44.62 | 44.24 |
| Summer | 0.10 | 0.09 | 0.10 |
| % | 2.30 | 2.43 | 2.35 |
| Total (All Seasons) | 4.43 | 3.53 | 4.16 |
| % | 100.00 | 100.00 | 100.00 |

* Based on simple average of four states figures

The table above does not indicate any significant difference between proportion of areas irrigated by adopters and non adopters in all the seasons. Hence irrigations facility does

not appear to be a significant explanation of adoption of hybrid. This is intuitively understandable because hybrid cultivation, unlike HYV cultivation is not dependent on controlled water supply to that extent.

**Table 3.4: Cropping pattern for the years 2009-10 & 2010-11 for Hybrid Adopters & Non-adopters for All States***

| Seasons/Crops | Hybrid Adopters | | | | Hybrid Non-Adopters | | | |
|---|---|---|---|---|---|---|---|---|
| | 2009-10 | | 2010-11 | | 2009-10 | | 2010-11 | |
| | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent |
| **Kharif** | **784.83** | **52.76** | **793.42** | **53.05** | **168.07** | **53.83** | **168.81** | **53.56** |
| Hybrid Rice | 175.89 | 11.82 | 207.79 | 13.89 | 0.00 | 0.00 | 0.00 | 0.00 |
| Inbred Rice | 214.45 | 14.42 | 198.97 | 13.30 | 79.55 | 25.48 | 81.35 | 25.81 |
| Rice (undefined) | 187.10 | 12.58 | 191.20 | 12.78 | 40.46 | 12.96 | 39.62 | 12.57 |
| Jute | 2.53 | 0.17 | 1.53 | 0.10 | 0.20 | 0.06 | 0.20 | 0.06 |
| Betel leaf (Pan) | 3.13 | 0.21 | 3.13 | 0.21 | 0.37 | 0.12 | 0.37 | 0.12 |
| Groundnut | 9.11 | 0.61 | 9.11 | 0.61 | 0.00 | 0.00 | 0.00 | 0.00 |
| Turmeric | 7.49 | 0.50 | 7.49 | 0.50 | 6.17 | 1.98 | 6.17 | 1.96 |
| Soya been | 103.03 | 6.93 | 101.43 | 6.78 | 20.20 | 6.47 | 23.40 | 7.42 |
| Maize | 20.15 | 1.35 | 19.52 | 1.31 | 4.02 | 1.29 | 3.89 | 1.23 |
| Sugarcane | 12.33 | 0.83 | 11.68 | 0.78 | 1.65 | 0.53 | 1.60 | 0.51 |
| Others (undefined) | 28.02 | 1.88 | 26.37 | 1.76 | 7.85 | 2.51 | 7.81 | 2.48 |
| Urd & Moong | 15.20 | 1.02 | 11.20 | 0.75 | 4.40 | 1.41 | 2.60 | 0.82 |
| Arhar | 6.40 | 0.43 | 4.00 | 0.27 | 3.20 | 1.02 | 1.80 | 0.57 |
| **Rabi** | **665.51** | **44.74** | **665.38** | **44.49** | **135.91** | **43.53** | **138.09** | **43.81** |
| Hybrid Paddy | 35.81 | 2.41 | 36.62 | 2.45 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hyv Paddy | 10.12 | 0.68 | 5.67 | 0.38 | 12.95 | 4.15 | 12.95 | 4.11 |
| Wheat | 409.63 | 27.54 | 408.58 | 27.32 | 79.61 | 25.50 | 82.05 | 26.03 |
| Maize | 15.73 | 1.06 | 15.68 | 1.05 | 2.29 | 0.73 | 2.56 | 0.81 |
| Mustard | 1.67 | 0.11 | 1.47 | 0.10 | 0.40 | 0.13 | 0.33 | 0.10 |
| Potato | 0.47 | 0.03 | 0.50 | 0.03 | 0.10 | 0.03 | 0.10 | 0.03 |
| Maskalai | 1.63 | 0.11 | 1.40 | 0.09 | 0.30 | 0.10 | 0.30 | 0.10 |
| black gram | 8.70 | 0.58 | 8.30 | 0.55 | 0.81 | 0.26 | 0.81 | 0.26 |
| Seasmum | 9.51 | 0.64 | 8.90 | 0.60 | 0.40 | 0.13 | 0.40 | 0.13 |
| Groundnut | 21.85 | 1.47 | 21.65 | 1.45 | 3.24 | 1.04 | 3.24 | 1.03 |
| G.GRAM | 1.82 | 0.12 | 78.26 | 5.23 | 19.43 | 6.22 | 20.10 | 6.38 |
| Turmeric | 4.05 | 0.27 | 4.05 | 0.27 | 0.51 | 0.16 | 0.51 | 0.16 |
| Pulse (undefined) | 8.25 | 0.55 | 4.30 | 0.29 | 1.09 | 0.35 | 1.11 | 0.35 |
| Others (undefined) | 7.27 | 0.49 | 8.59 | 0.57 | 1.93 | 0.62 | 1.53 | 0.49 |
| Gram (undefined) | 67.82 | 4.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sugarcane & others | 26.78 | 1.80 | 23.81 | 1.59 | 3.65 | 1.17 | 3.70 | 1.17 |
| Masoor | 27.20 | 1.83 | 26.40 | 1.77 | 7.40 | 2.37 | 6.40 | 2.03 |
| Pea | 7.20 | 0.48 | 11.20 | 0.75 | 1.80 | 0.58 | 2.00 | 0.63 |
| **Summer** | **37.26** | **2.50** | **36.94** | **2.47** | **8.26** | **2.65** | **8.27** | **2.62** |
| Hybrid Rice | 10.13 | 0.68 | 12.87 | 0.86 | 0.00 | 0.00 | 0.00 | 0.00 |
| Inbred Rice | 26.20 | 1.76 | 20.87 | 1.40 | 8.13 | 2.60 | 7.20 | 2.28 |
| Maize | 0.93 | 0.06 | 3.20 | 0.21 | 0.13 | 0.04 | 1.07 | 0.34 |
| **GCA** | **1487.60** | **100.00** | **1495.74** | **100.00** | **312.24** | **100.00** | **315.17** | **100.00** |

Data source: Primary data

* Average data converted into total by multiplying by 80 (no. of adopter households) for Madhya Pradesh

Data presented in the table above does not reveal any causal factor contrary to expectation at the time of designing the study. Partly, this could be because a lot of state level data does not specify whether the crop is hybrid or HYV.

**Table 3.5-a: Farmers accessing source of information on hybrid rice technology for All States***

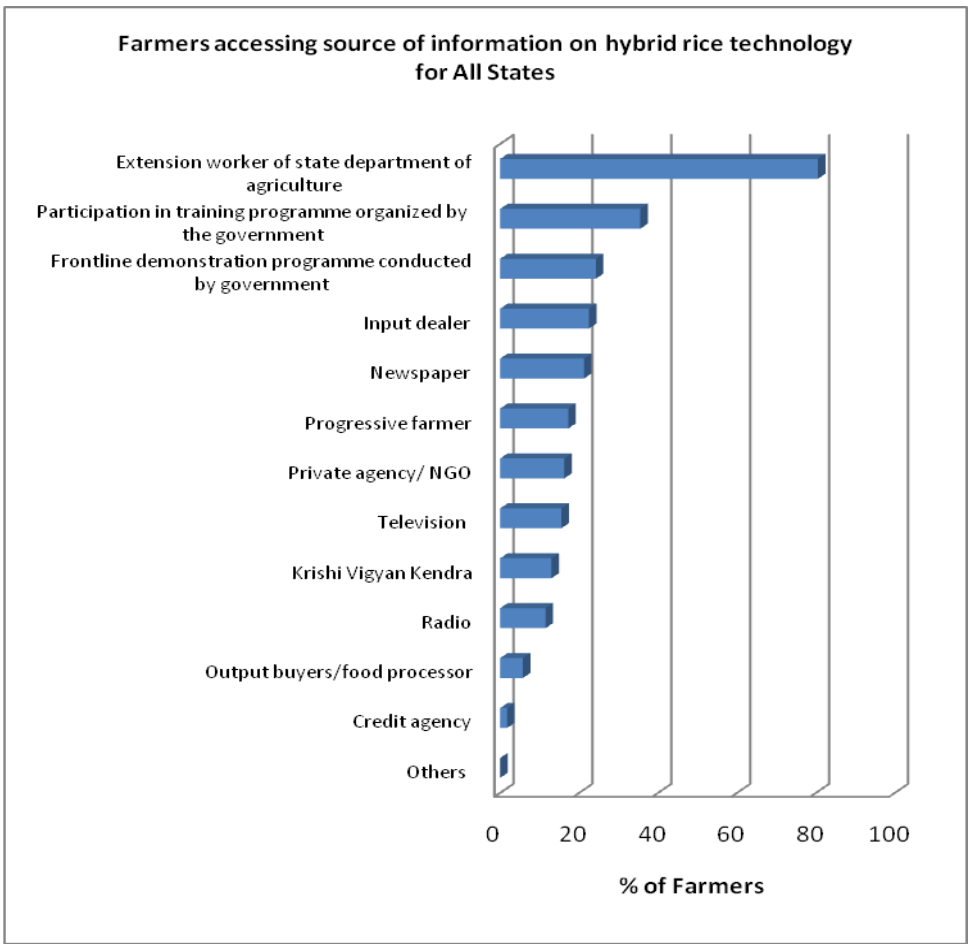
(For Hybrid adopters only)

| Source | Number of farmers reporting |
|---|---|
| Frontline demonstration programme conducted by government | 97 |
| Participation in training programme organized by the government | 142 |
| Krishi Vigyan Kendra | 52 |
| Extension worker of state department of agriculture | 322 |
| Television | 62 |
| Radio | 46 |
| Newspaper | 85 |
| Input dealer | 90 |
| Progressive farmer | 69 |
| Private agency/ NGO | 65 |
| Output buyers/food processor | 23 |
| Credit agency | 7 |
| Others | 0 |

Data source: Primary data

* Simple average of state figures

**Figure 3.5-a**



Agriculturists have accessed information relating to hybrid seeds from multiple sources. 'Extension workers' are by far the most effective disseminating knowledge about the new technology. Participation in government training programme is next in order of effectivity, followed by frontline demonstrations. Input dealers and newspapers come next. Farmers who have already adopted (progressive farmers) or private agencies or NGOs together with agricultural science centres are the other important sources of information. It can be seen that the state plays predominant role in dissemination of information of new agricultural technology.

**Table 3.5-b: Farmers reporting quality of information received for All States***

**(**For hybrid adopters only)

| **Source** | **Hybrid adopters reporting quality of information received** | | |
|---|---|---|---|
| | **Good** | **Satisfactory** | **Poor** |
| Participation in training programme conducted by the government | 78 [ 19.50] | 59 [14.75] | 17 [4.25] |
| Participation in demonstration programme organized by the government | 22 [5.50] | 46 [11.50] | 22 [5.50] |
| Extension worker of state department of agriculture | 105 [26.25] | 185 [46.25] | 35 [8.75] |
| Krishi vigyan Kendra | 17 [4.25] | 40 [10.00] | 8 [2.00] |

** simple average across state figures.*

**Table 3.5-c: Adoption of recommended package according to source of information for All States***

(Percent of farmers reporting)

| **Source of information** | **Hybrid Adopters** | | **Non-Adopters** |
|---|---|---|---|
| | **Hybrid Rice** | **HYV Rice** | **HYV Rice** |
| Participation in training programme conducted by the government | 35.82 | 19.25 | 20.25 |
| Participation in demonstration programme organized by the government | 20.50 | 14.00 | 16.00 |
| Extension worker of state department of agriculture | 67.29 | 31.50 | 22.75 |
| Krishi Vigyan Kendra | 19.40 | 10.50 | 8.50 |
| Progressive Farmer | 10.59 | 0.00 | 0.00 |

* Simple average of state figures

It seems that training programmes have to be toned up, as the extension workers are more effective in persuading farmers to adopt appropriate input mix while participation in training programmes yields much poorer results. Participation in demonstration programmes is even less effective.

**Table- 3.5-d: Sources of seed for Hybrid rice (percentage) for All States***

**(**For hybrid adopters only)

| | **Sources of seeds** | **2009-2010** | **2010-2011** |
|---|---|---|---|
| **All States** | Public on full subsidy | 25.75 | 28.50 |
| | Public on partial subsidy | 34.25 | 33.00 |
| | Private | 40.00 | 38.50 |
| | Total | 100.00 | 100.00 |

* Simple average of state figures

Though government sources predominate, private sources are quite significant. This suggests that private-public participation model is essential for the success of the hybrid paddy cultivation project. There appears to be a decline in the role of the private sector over the survey period but this is on account of increase in subsidised seed supply. In the long run this is not sustainable.

# CHAPTER IV

## Impact of Hybrid Rice Cultivation on Overall Production of Rice

**4.1-a: Mean yield levels of hybrids and HYV 2009-2010 for All States***

| Farm size classes (ha) | Mean yield (Kg/ha) | | Percent difference [(3-4)/(4)]×100 |
|---|---|---|---|
| | Hybrid (3) | HYVs (4) | |
| Below 1ha | 6011 | 4226 | 29.70 |
| 1 – 2 | 6186 | 4371 | 29.35 |
| 2 – 4 | 6509 | 4471 | 31.32 |
| 4 – 10 | 6320 | 4070 | 35.61 |
| 10 ha and above | 4983 | 2819 | 43.41 |
| All sizes | 6241 | 4349 | 30.31 |

Data source: Primary data

* Simple average of state figures

**Table 4.1-b: Mean yield levels of hybrids and HYV 2010-2011for All States**

| Farm size classes (ha) | Mean yield (Kg/ha) | | Percent difference |
|---|---|---|---|
| | Hybrid | HYVs | |
| Below 1ha | 6173 | 4259 | 31.00 |
| 1 – 2 | 6212 | 4413 | 28.96 |
| 2 – 4 | 6462 | 4401 | 31.90 |
| 4 – 10 | 6443 | 4207 | 34.70 |
| 10 ha and above | 5053 | 3034 | 39.95 |
| All sizes | 6331 | 4379 | 30.83 |

It appears that hybrid technology is more productive by approximately a third compared to HYV across farm sizes. It is noticeably more productive in the largest farm size. The causes for this needs to be explored. There is no definite trend over time, though of course the time span is too short to pass judgement.

# CHAPTER-V

# Comparative Economics of Hybrid and Inbred Rice Cultivation

The adoption of a new technology in a market economy is basically an economic decision of the farmers. The present chapter thus aims to study the comparative economics of hybrid and inbred rice cultivation. More precisely the chapter examines the profitability of hybrid rice cultivation compared with inbred or conventional HYVs. Needless to say, the profitability of any technology is the ultimate factor that determines the long run sustainability of its adoption by farmers.

The product value and farm-operating surplus are the ultimate factors that would determine reallocation of rice land from the existing inbred to the new hybrid varieties. Three basic factors determine the relative profitability of a new variety/hybrid over the conventional one – yield gain, additional input cost and higher/lower market price. Average yield gain, input costs and market price of grain were taken into account to compute economic returns in hybrid and inbred rice cultivation. Cost refers to all actual expenses, in cash and kind, incurred in production by the operator. Cost items included seed (both farm produced and purchased), manure (owned and purchased), chemical fertilizer, insecticides/pesticides, irrigation cost (both owned and hired), machinery charges, hired human labour charges, bullock labour (owned and hired).

## 5.1 Input Use Pattern for Cultivation of Hybrid and HYV Rice

Table-5.1 summarizes the average amount of inputs used for the cultivation of hybrid and inbred rice. Input use pattern is furnished separately for hybrid and HYVs. HYV cultivation requires 4 times as much seeds as hybrid farming. This is because hybrids required only one or two seedlings per hill for transplanting. In case of non-adopter more or less similar seed rate is used. Organic manure use for hybrids was slightly higher, though there were significant variations between states – West Bengal hybrid farming requirement being nearly 5 times higher than that for HYVs. The use of chemical fertilizer is a bit higher for hybrid farming than that for HYVs. The same holds for data relating to non-adopters. The number of pesticides sprays is relatively lower for hybrid varieties than HYVs showing hybrids

relatively less sensitive to pest attack. But irrigation is almost the same for the hybrid and the inbred varieties. Labour use is significantly higher for the hybrid than for HYVs.

**Table 5.1: Input Use Pattern of Cultivation of Hybrid and Inbred Rice (2010-11) for All States***

| Inputs | Hybrid Adopters | | Non-adopters |
|---|---|---|---|
| | Hybrid | HYVs | HYVs |
| Seed (kg/ha) | 13.95 | 56.09 | 58.24 |
| Manure (tonne/ha) | 3.18 | 2.56 | 2.69 |
| Chemical fertiliser (kg/ha) | 278.90 | 252.36 | 260.54 |
| Pesticide (no. of sprays) | 1.59 | 1.77 | 1.91 |
| Irrigation (no. of application)** | 3.23 | 2.88 | 2.89 |
| Human labour (days/ha) | 109.04 | 104.90 | 106.83 |
| Bullock labour (days/ha) | 3.18 | 2.52 | 2.84 |

Data source: Primary data
*Simple average of state figures
Calculation based on four states barring Andhra Pradesh

Bullock use in terms of days per hectare is significantly higher for hybrids than HYVs for the hybrid adopters those who cultivated HYVs along with hybrids. For non-adopters, bullock use for HYVs is marginally lower than that for hybrids.

## 5.2 Operation-wise Labour Absorption in Hybrid and HYV Rice

**Table 5.2-a: Operation-wise Human Labour Use in Hybrid and HYV Rice: 2010-11 for All States**

(for hybrid adopters only)

| Type of operation | Hybrid rice | | | HYV Rice | | |
|---|---|---|---|---|---|---|
| | Family labour (days/ha) | Hired labour (days/ha) | Total labour (days/ha) | Family labour (days/ha) | Hired labour (days/ha) | Total labour (days/ha) |
| Ploughing | 8.51 | 1.96 | 11.87 | 2.74 | 2.01 | 4.75 |
| Uprooting of seedlings | 4.91 | 4.08 | 8.98 | 4.21 | 5.82 | 10.06 |
| Transplantation of seedlings | | | | | | |
| a) Single seedlings per hill | 11.29 | 23.84 | 35.10 | 0.00 | 0.00 | 0.00 |
| b) Multiple seedlings per hill | 0.00 | 0.00 | 0.00 | 7.58 | 25.60 | 33.14 |
| Manu ring | 1.69 | 0.98 | 2.67 | 1.37 | 0.77 | 2.14 |
| Application of chemical fertilizer | 2.28 | 1.58 | 3.86 | 2.72 | 1.70 | 4.43 |
| Spraying plant protection chemicals | 2.16 | 1.92 | 4.11 | 2.14 | 0.94 | 3.09 |
| Irrigation | 6.66 | 2.89 | 9.55 | 5.84 | 1.88 | 7.72 |
| Harvesting | 11.10 | 15.62 | 26.73 | 8.81 | 17.17 | 25.95 |
| Post-harvesting | 9.59 | 10.55 | 20.14 | 7.56 | 10.93 | 18.48 |
| All operations | 52.74 | 63.79 | 115.83 | 43.14 | 66.91 | 109.87 |

Data source: Primary data
* Simple average of state figures

**Figure 5.2-a(1)**

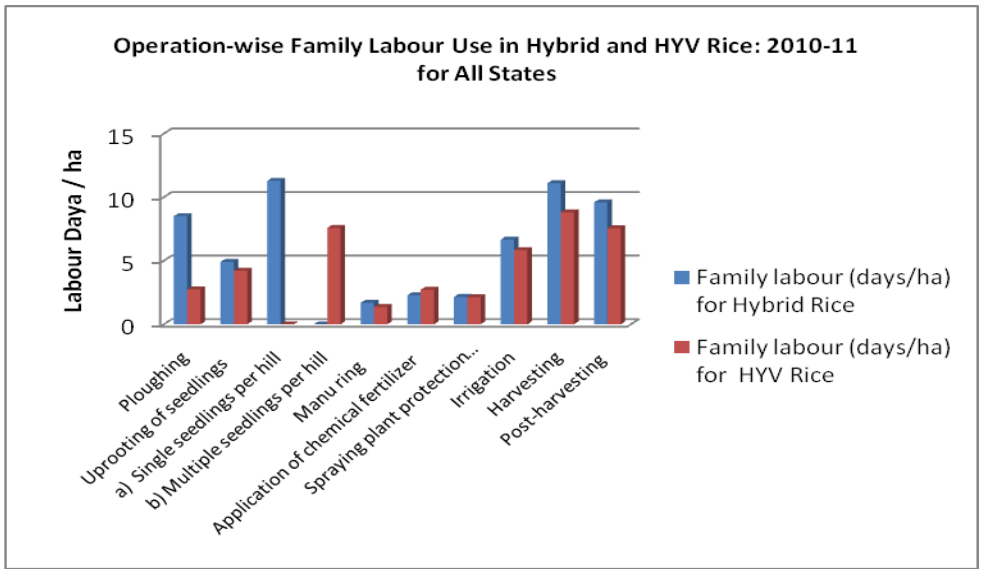



**Figure 5.2-a(2)**

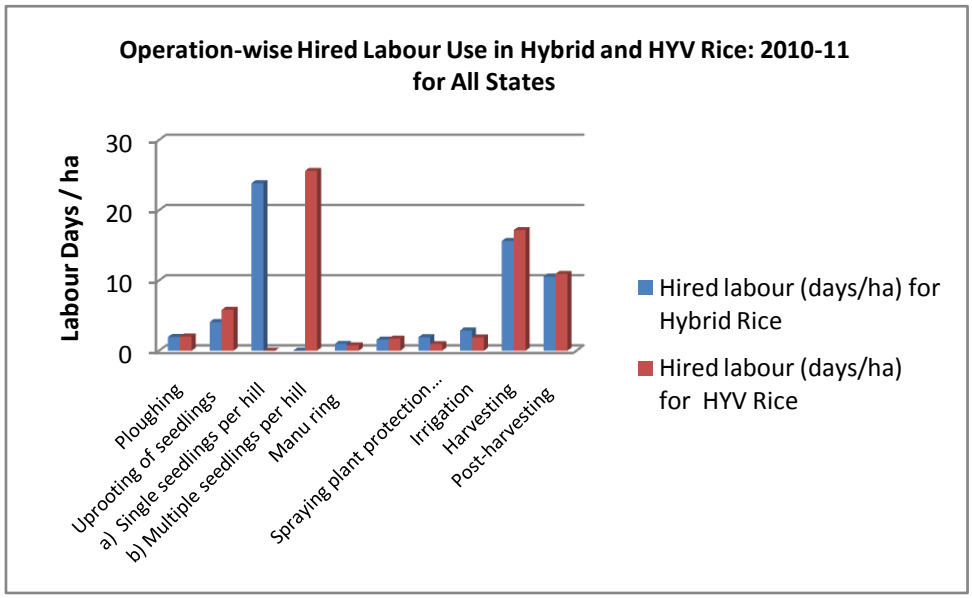



**Figure 5.2-a(3)**

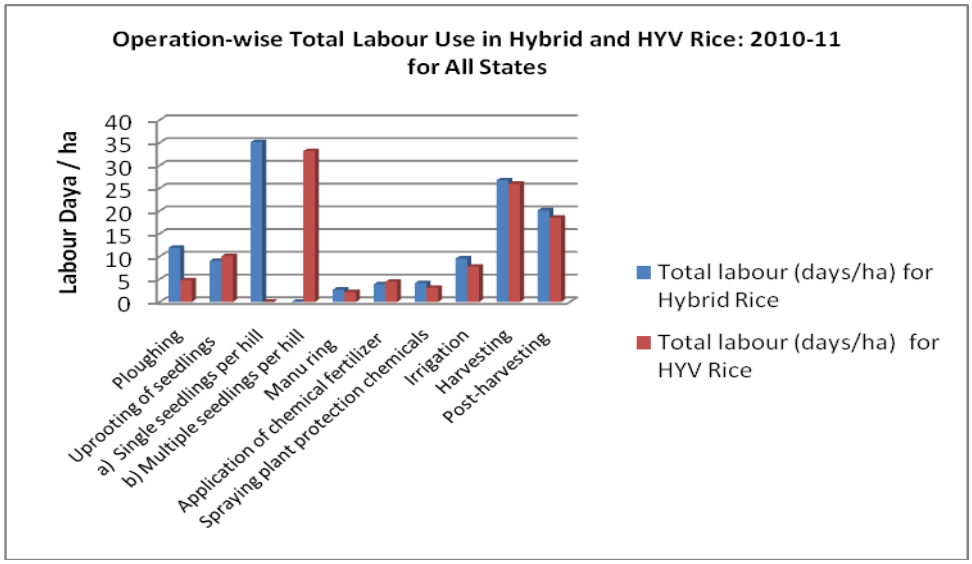


**Table 5.2-b: Female Labour Use per hectare (2010-11) for All States***

(for hybrid adopters only )

| Type of operation | Hybrid rice | | | HYV Rice | | |
|---|---|---|---|---|---|---|
| | Family labour (days/ha) | Hired labour (days/ha) | Total labour (days/ha) | Family labour (days/ha) | Hired labour (days/ha) | Total labour (days/ha) |
| Ploughing | 0.29 | 4.52 | 5.67 | 0.41 | 4.67 | 5.00 |
| Uprooting of seedlings | 4.91 | 8.83 | 43.76 | 3.82 | 9.50 | 37.17 |
| Transplantation of seedlings | | | | | | |
| a) Single seedlings per hill | 26.15 | 35.28 | 72.25 | 0.00 | 0.00 | 0.00 |
| b) Multiple seedlings per hill | 0.00 | 0.00 | 0.00 | 24.57 | 33.07 | 70.87 |
| Manu ring | 0.29 | 2.71 | 10.27 | 0.24 | 2.26 | 13.61 |
| Application of chemical fertilizer | 0.47 | 3.87 | 10.73 | 0.57 | 4.38 | 11.66 |
| Spraying plant protection chemicals | 0.39 | 4.47 | 12.03 | 0.52 | 4.36 | 11.74 |
| Irrigation | 2.80 | 10.03 | 29.44 | 1.75 | 9.49 | 19.76 |
| Harvesting | 15.23 | 26.90 | 59.47 | 16.20 | 26.82 | 63.36 |
| Post-harvesting | 5.55 | 20.63 | 35.92 | 6.28 | 20.64 | 41.98 |
| All operations | 56.09 | 117.49 | 49.94 | 54.34 | 115.25 | 49.65 |

Data source: Primary data

* Simple average of state figures

Farm level data revealed that farmers had to incur higher labour for hybrids as compared to HYVs. Higher labour use associated with hybrid cultivation as compared to HYVs was mainly for transplanting the seedlings of paddy since it involved a cumbersome method of planting one or two seedlings per hill unlike multiple seedlings per hill in inbred varieties.

However, more labour is used in transplantation operation for hybrids (34.84 days) as compared to HYVs (32.11 days). In addition for hybrid paddy, more labour is used for ploughing, spraying plant protection chemicals and for irrigation. Hybrid rice cultivation also involves greater use of female labour in the transplantation operation including uprooting of seedlings in comparison with the cultivation of conventional varieties of HYVs or inbreeds (table-5.2B). Hybrid rice cultivation is thus likely to generate additional employment opportunities for workers in general and specially for female labour rural areas. Further operations associated with higher labour content involved more of hired labour as compared to family labour both in case of hybrids and HYVs.

## 5.3 Cost of Inputs Incurred on Hybrid and HYVs of Rice

During 2009-10 the average cost of production of hybrid rice *per hectare* exceeded that of inbred rice (HYVs) by 16 % in 2010-2011 it was around 17 % (table-5.3). Among the components of total cost, expenditure on human labour formed the single largest item and accounted for 33 %in 2009-2010 and around 36 % in 2010-2011 for hybrid rice and slightly higher at 39 % and 40 % total cost for inbred varieties in 2009-2010, 2010-2011, respectively. Machinery charges accounted for the next most important item at about 20-22 per cent of the total cost in hybrid and HYVs. The cost incurred on fertilizer was the next highest for both varieties. Manure and fertilizer followed, then came cost of irrigation, seeds and pesticides, which were significantly higher in hybrid rice production. Pesticide use was significantly higher for hybrid rice implying that hybrid rice varieties did not possess adequate resistance to pest and diseases and are more susceptible pests and diseases. In other words they were less adapted to local conditions than even HYVs, which were themselves less suited than traditional varieties.

The *unit cost* of production of hybrid rice was less than that of HYV by 15% and 19% respectively, in 2009-2010 and 2010-2011 (for adopters). The difference was slightly less pronounced if the cost of production of inbred by non-adopters is considered. Thus the higher productivity of hybrid cultivation compensated for the higher cost per hectare.

## 5.4 Economic Returns to Hybrid and Inbred Rice Cultivation

The net returns or profitability of any technology is the ultimate factor that determines the long run sustainability of its adoption by the farmers. The details of the costs and returns for hybrids and HYVs are shown in table-5.3 for the two consecutive years viz. 2009-10 and 2010-11 respectively. During the year 2010-11 the farmers growing hybrid rice realised a gross return of Rs. 67497. per hectare while the gross return realised in inbred varieties was Rs. 47893.56. Thus the gross return was 40 per cent higher in hybrid rice cultivation. However the profit (net return) realised in hybrid rice and inbred rice was of the order of Rs. 42739.63 and 26672.66 per hectare respectively. The rate of return on working capital in hybrid cultivation was 27.3% while in inbred rice it was 22.6%. it must be pointed out that there were vast regional variations. For West Bengal the rate of returns were 23.4% and 26% for hybrid and inbred varieties, respectively. Thus the lack of spread in that state could be explained in terms of the lower rate of return due to the much higher cost of cultivation.

## Table 5.3: Comparison of Costs and Returns for Hybrid and Inbred Rice for All States*

(Rs./ha)

| Sl. No. | Particulars | 2009-10 | | | 2010-11 | | |
|---|---|---|---|---|---|---|---|
| | | Hybrid Adopters | | Non-adopters | Hybrid Adopters | | Non-adopters |
| | | Hybrid | HYVs | HYVs | Hybrid | HYVs | HYVs |
| A. | Costs: | | | | | | |
| 1. | Seed (both farm produced and purchased) | 2822.48 | 1071.88 | 1144.40 | 2950.52 | 1244.07 | 1319.07 |
| 2. | Manure (owned and purchased) | 1333.74 | 1061.59 | 1194.31 | 1047.27 | 888.89 | 1072.20 |
| 3. | Chemical fertilisers | 2883.38 | 2710.25 | 2629.05 | 2824.79 | 2555.67 | 2494.16 |
| 4. | Insecticides & Pesticides | 652.57 | 583.96 | 508.35 | 697.11 | 597.51 | 562.87 |
| 5. | Irrigation charges (both owned and hired) | 2626.62 | 1999.27 | 2128.39 | 2338.40 | 1978.82 | 2021.67 |
| 6. | Machinery charges | 4905.03 | 4494.02 | 4613.46 | 5469.81 | 4975.55 | 5082.13 |
| 7. | Hired human labour charges | 7927.44 | 8039.84 | 7463.92 | 8851.25 | 8511.74 | 8355.80 |
| 8. | Bullock labour (owned and hired) | 534.33 | 464.78 | 489.15 | 578.22 | 468.19 | 530.02 |
| 9. | Total cost (1 to 8) | 23687.38 | 20417.20 | 20171.23 | 24757.37 | 21220.84 | 21437.92 |
| 10. | Unit cost of production (Rs. Per Kg.) | 3.65 | 4.32 | 4.52 | 3.72 | 4.40 | 4.60 |
| B. | Returns: | | | | | | |
| 11. | Yield of paddy (qtl/ha) | 62.42 | 43.49 | 43.20 | 63.41 | 43.74 | 44.25 |
| 12. | Market price (Rs./qtl) | 1021.67 | 1036.70 | 1053.23 | 1064.66 | 1085.33 | 1090.50 |
| 13. | Value of grain yield (Rs./ha) | 58961.86 | 40623.32 | 41836.40 | 62119.11 | 41899.34 | 44279.17 |
| 14. | Value of straw yield (Rs./ha) | 5003.13 | 6627.06 | 6480.08 | 5377.89 | 5974.41 | 6003.30 |
| 15. | Gross return (13+14) | 63964.99 | 47250.19 | 48269.48 | 67497.00 | 47893.56 | 50282.67 |
| 16. | Net return (15 – 9) | 40278.46 | 26833.23 | 28097.54 | 42739.63 | 26672.66 | 28845.86 |
| 17. | Benefit cost ratio[1] | 2.70 : 1 | 2.31 : 1 | 2.39 : 1 | 2.73 : 1 | 2.26 : 1 | 2.35 : 1 |

Data source: Primary data

* Simple average of state figures

[1] rate of return on working capital

**Figure 5.3-a(1)**

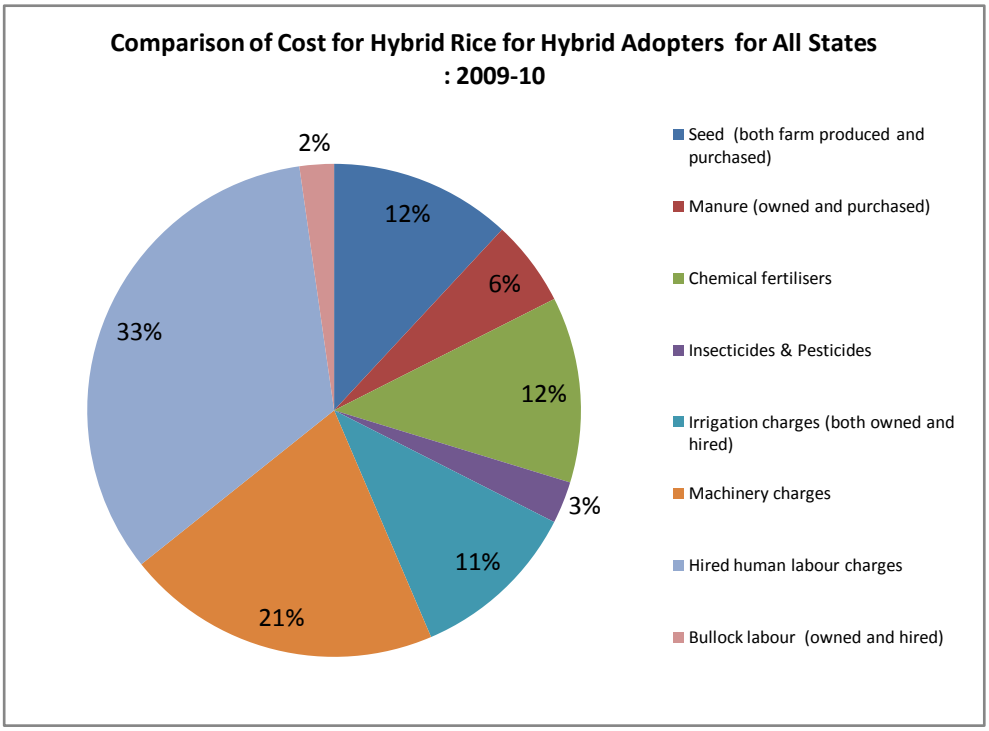



**Figure 5.3-a(2)**

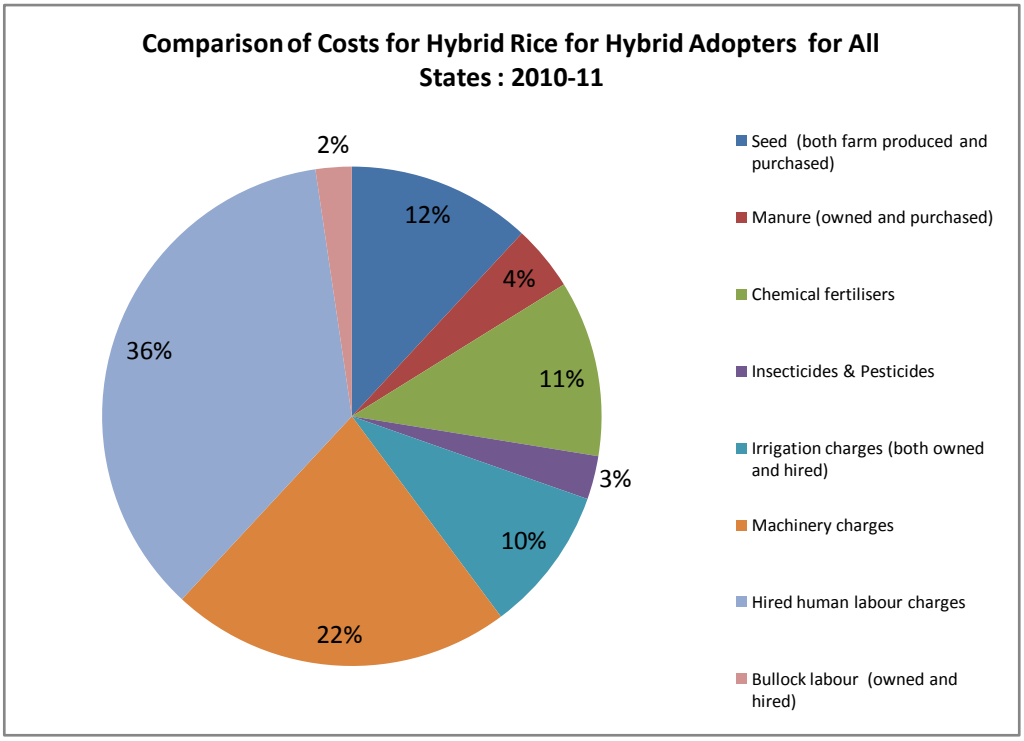


**Figure 5.3-b(1)**

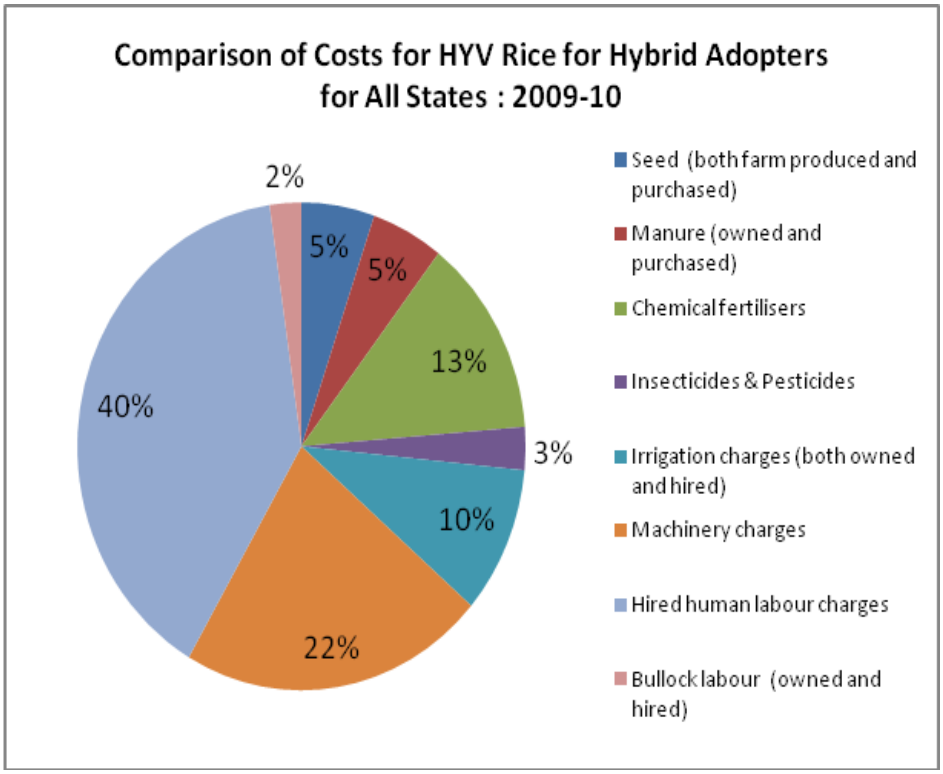



**Figure 5.3-b(2)**

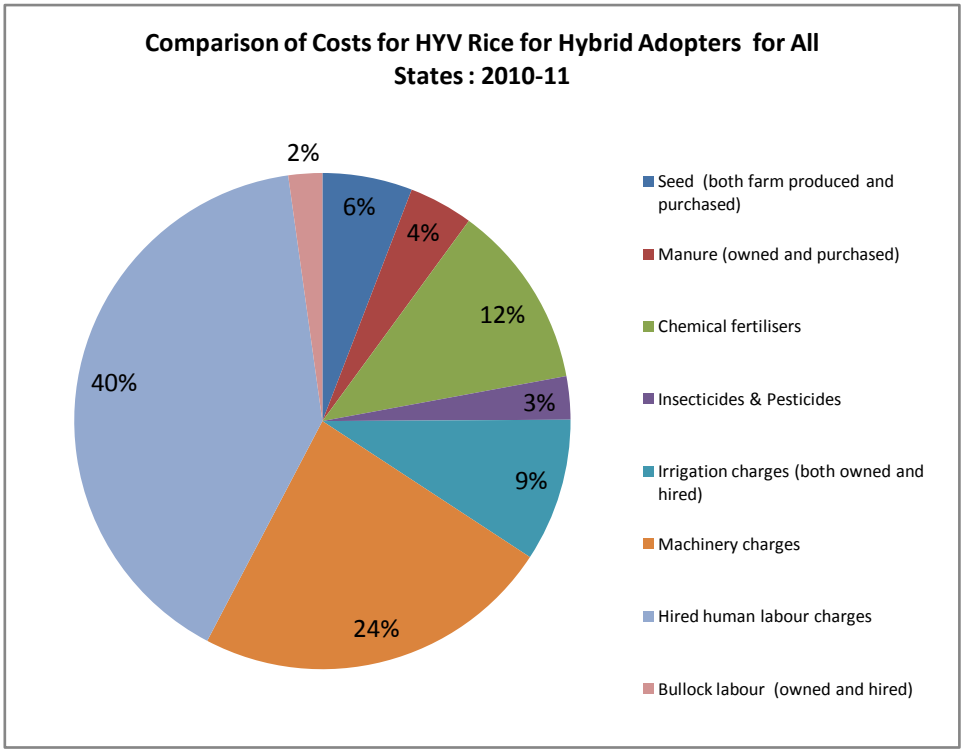


**Figure 5.3-c(1)**

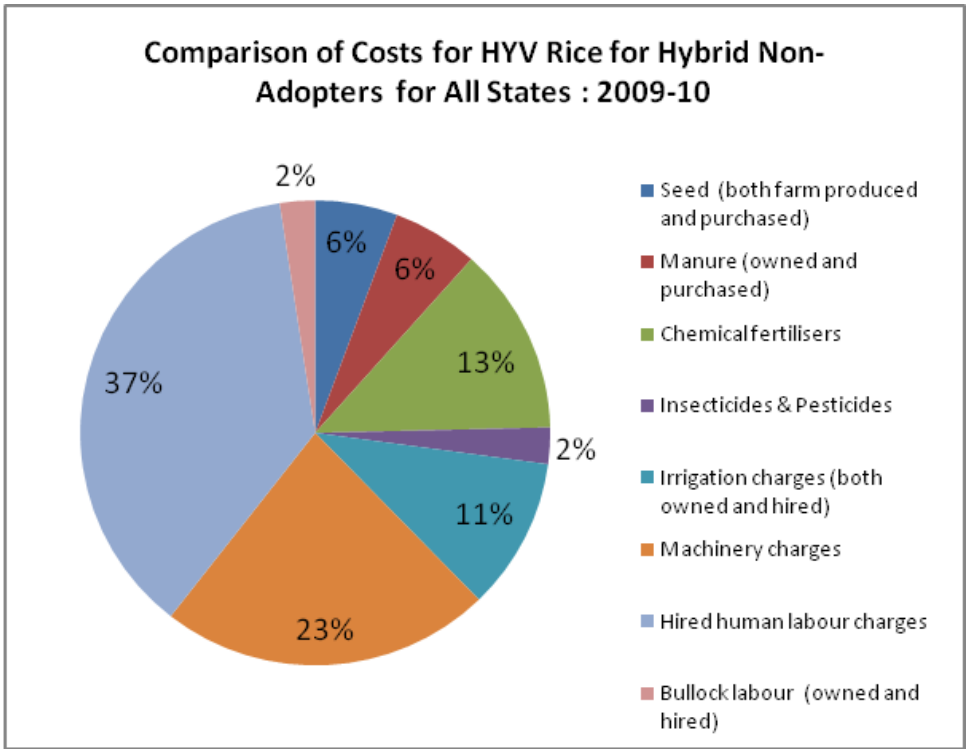



**Figure 5.3-c(2)**

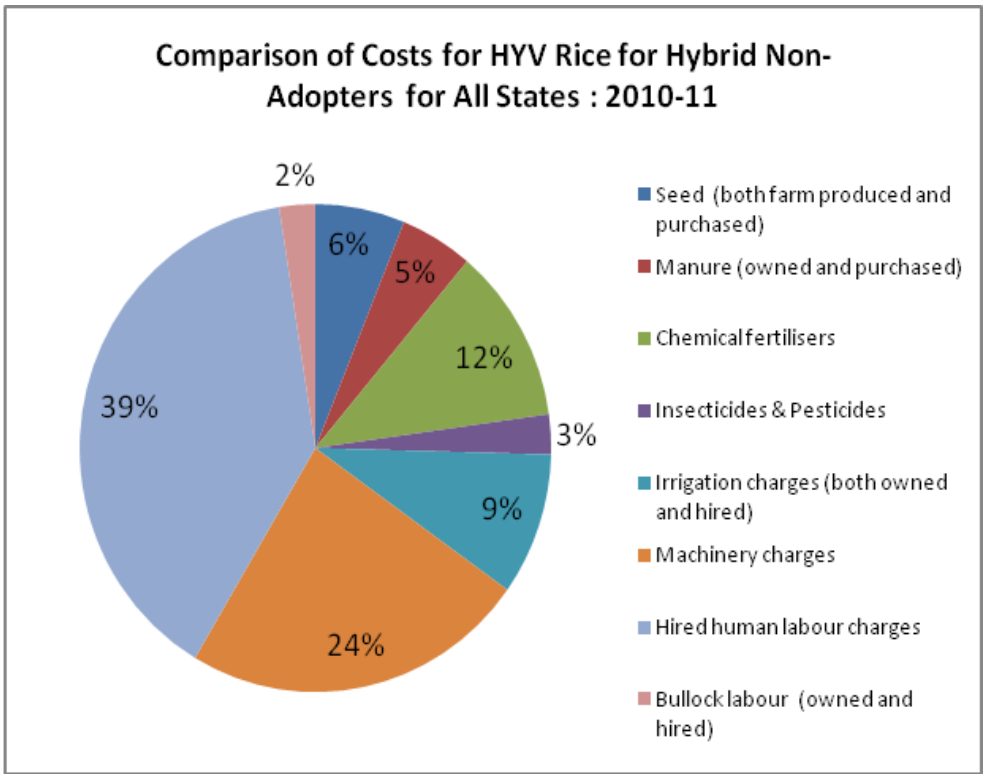
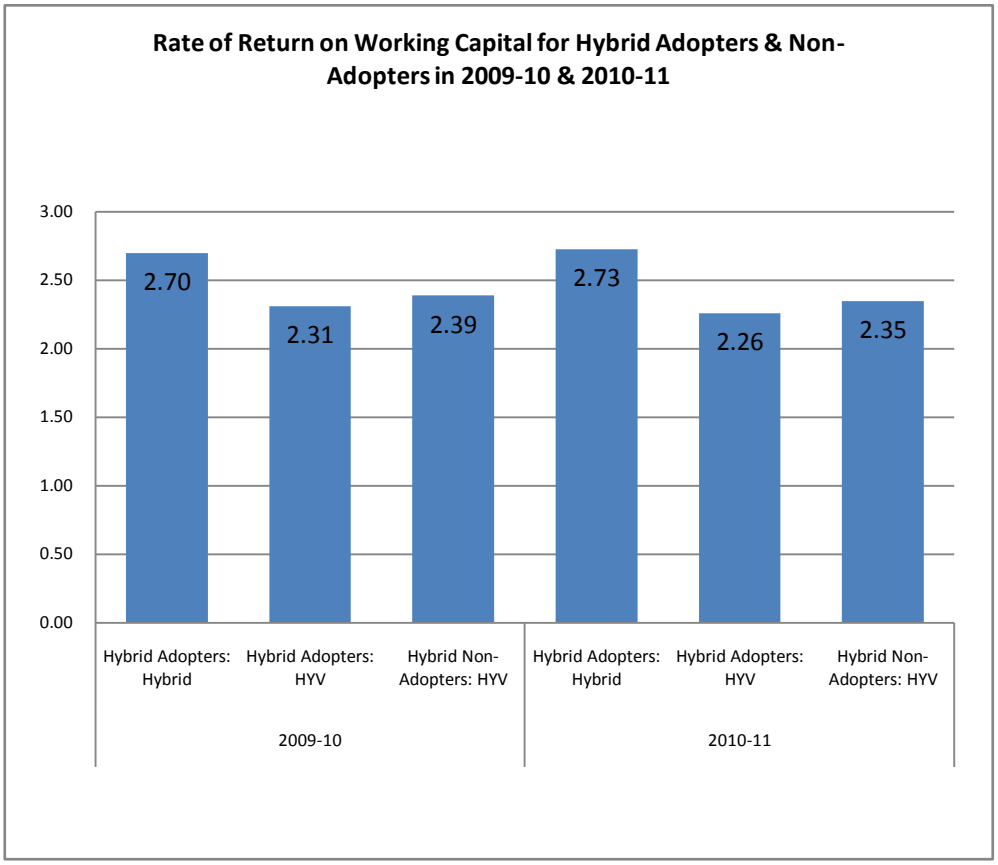


**Figure 5.3-d**


Rate of Return on Working Capital for Hybrid Adopters & Non-Adopters in 2009-10 & 2010-11
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2.70
2.31
2.39
2.73
2.26
2.35
Hybrid Adopters: Hybrid
Hybrid Adopters: HYV
Hybrid Non-Adopters: HYV
Hybrid Adopters: Hybrid
Hybrid Adopters: HYV
Hybrid Non-Adopters: HYV
2009-10
2010-11

# CHAPTER-VI
# Grain Quality Considerations and the Aspect of Marketing

Rice is used almost exclusively as a food item. Quality traits that consumers prefer in rice as a food item therefore assume special significance. For consumer acceptance, it is essential that the hybrids developed possess such quality characteristics apart from high yield potential. Preferences for quality vary from region to region. Best quality type of one region may not be liked at all by another region. Therefore breeding hybrids better suited to local requirement assumes added significance. The price for volume of marketing for farmer's produce is also determined by the degree to which the produce has the preferred quality traits. The present chapter therefore deals with grain quality consideration of hybrid rice vis-à-vis conventional HYVs and also studies the different aspects of marketing including output and sale of paddy, both husked and unhusked and seasonal flow of marketing.

## 6.1 Grain Quality Traits of Hybrid and HYV Rice

A frequently raised concern on the prospects of large-scale adoption of hybrid rice is the acceptability of the quality of hybrid rice grain among consumers. Consumer acceptance is the ultimate factor that determines the price of the product and the marketability of the product which ultimately affects the gross revenues particularly for those who sell the product in the market. The role of consumer acceptance assumes much significance where rice farming is highly commercialised and considered a market-oriented farm enterprise. An important criterion for farmers in selecting a seed variety of rice is consumer demand in the market and their willingness to pay a premium price for the product. Hence quality considerations are of paramount importance for the popularization and large-scale adoption of hybrid rice. We had collected information from the farmers regarding the grain quality characteristics of hybrid rice vis-à-vis the popular inbred varieties.

The mechanical processing of the rice grain usually comprises two steps. First the hull is removed from the grain to obtain brown rice which is the least processed edible form of rice. The rice grain is usually further processed by additionally removing the bran layer to obtain milled rice. Hulled rice is milled to get a whiter grain, which is preferred by the consumers. The predominant form of rice found on today's markets is milled rice. During the

processing of rice grains a good proportion of the grains are broken. Thus high turnout of whole grain (head) i.e. 'head rice recovery' is an important consideration from the view point of quality of rice. A hybrid should possess a good turnout of whole grain i.e. head rice and also percentage of milled rice for the popularization of hybrid rice at the farmers' level. In the following analyses grain quality traits of hybrid rice vis-à-vis conventional inbreds of rice are presented.

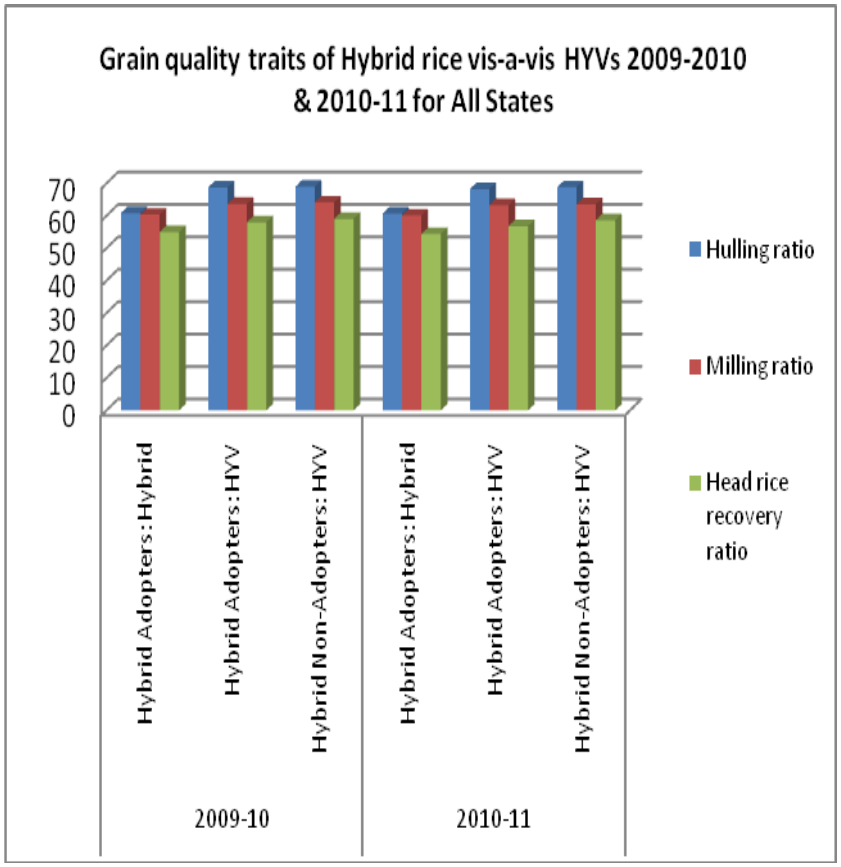
The quality of grain is judged from the view point of three ratios viz. hulling ratio, milling ratio and head rice recovery ratio. Grain quality features of hybrids vis-à-vis HYVs are furnished in table 6.1for the two consecutive years viz. 2009-10 and 2010-11. It is evident that hybrids have inferior grain quality features compared to those of conventional HYVs. Hybrids have milling and head rice recovery ratios of 61 per cent and 54-55 per cent, respectively. The corresponding figures for HYVs were estimated at 63-64 per cent and 57-59 per cent respectively. Over the years under study, the ratios remained more or less unaltered. All these suggest that quality of grains may be a factor inhibiting the spread of hybrid cultivation. It should be mentioned that there are significant variations in grain quality across states. In West Bengal the features are more or less the same for hybrid and conventional HYV grains.

**Table 6.1: Grain quality traits of Hybrid rice vis-a-vis HYVs 2009-2010 & 2010-11 for All States***

| Grain quality traits | 2009-10 | | | 2010-11 | | |
|---|---|---|---|---|---|---|
| | Adopters | | Non-Adopters | Adopters | | Non-Adopters |
| | Hybrid | HYVs | HYVs | Hybrid | HYVs | HYVs |
| Hulling ratio | 60.89 | 68.80 | 69.01 | 60.74 | 68.28 | 68.85 |
| Milling ratio | 60.40 | 63.69 | 64.15 | 60.14 | 63.34 | 63.59 |
| Head rice recovery ratio | 55.02 | 58.02 | 59.07 | 54.41 | 56.86 | 58.68 |

Data source: Primary data
* Simple average of states figures

**Figure 6.1**




## 6.2 The Volume of Marketing

The growth and development of an economy is always associated with an increase in the volume of marketed output in the agricultural sector. It is thus necessary to look into the quantum of marketing of the produce in the market. In the context of the lagging nature of hybrid rice spread in our country, one major concern being raised is; Is hybrid rice grain acceptable to traders and millers? To answer this question we have to examine the proportion of marketed to total output of the hybrid rice produce vis-a-vis those of inbred varieties.

**Table 6.2-a: Output and sale of paddy (unhusked) by size groups of land holdings for All States***

| Size group (Ha) | Crop | 2009-10 | | | | | | | | 2010-11 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hybrid Adopter | | | | Non-Adopters | | | | Hybrid Adopter | | | | Non-Adopters | | | |
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | 23.04 (168) | 18.93 (167) | 81.68 | 971.09 | - | - | - | - | 24.95 (184) | 20.72 (182) | 82.14 | 1006.27 | - | - | - | - |
| | HYVs | 22.60 (134) | 13.47 (134) | 59.61 | 969.66 | 35.42 (46) | 24.90 (45) | 68.77 | 955.01 | 20.14 (135) | 11.47 (135) | 56.95 | 964.57 | 34.08 (48) | 25.15 (46) | 70.71 | 996.09 |
| 1 – 2 | Hybrid | 37.75 (82) | 32.80 (82) | 86.89 | 1024.59 | - | - | - | - | 38.05 (92) | 33.05 (91) | 85.91 | 1049.73 | - | - | - | - |
| | HYVs | 50.57 (80) | 38.78 (80) | 76.68 | 1016.41 | 66.14 (24) | 47.17 (24) | 71.31 | 1032.61 | 47.33 (77) | 35.54 (77) | 75.08 | 1026.16 | 64.10 (24) | 45.71 (24) | 71.32 | 1048.86 |
| 2 – 4 | Hybrid | 55.44 (47) | 48.17 (44) | 81.34 | 1019.83 | - | - | - | - | 58.95 (58) | 50.99 (55) | 82.02 | 1058.68 | - | - | - | - |
| | HYVs | 86.25 (53) | 66.35 (50) | 72.57 | 1021.26 | 100.45 (13) | 74.85 (13) | 74.52 | 1062.48 | 78.62 (51) | 58.50 (48) | 70.04 | 1044.27 | 105.15 (13) | 77.09 (13) | 73.31 | 1077.55 |
| 4 – 10 | Hybrid | 104.61 (27) | 84.74 (25) | 75.01 | 1026.78 | - | - | - | - | 117.41 (33) | 101.67 (31) | 81.35 | 1081.59 | - | - | - | - |
| | HYVs | 112.75 (27) | 80.62 (25) | 66.20 | 1099.59 | 146.52 (7) | 101.19 (7) | 69.06 | 1036.52 | 106.93 (27) | 76.34 (25) | 66.10 | 1115.76 | 145.33 (8) | 101.80 (8) | 70.05 | 1158.33 |
| 10 ha and above | Hybrid | 219.60 (15) | 185.20 (15) | 84.34 | 1024.00 | - | - | - | - | 221.87 (15) | 201.13 (15) | 90.65 | 1098.00 | - | - | - | - |
| | HYVs | 88.31 (13) | 72.31 (13) | 81.88 | 1130.77 | 115.75 (4) | 86.75 (4) | 74.95 | 1072.50 | 109.38 (13) | 81.62 (13) | 74.62 | 1145.77 | 125.75 (4) | 93.50 (4) | 74.35 | 1191.25 |
| All Sizes | Hybrid | 44.91 (339) | 36.62 (333) | 80.10 | 1013.78 | - | - | - | - | 47.80 (382) | 40.30 (374) | 82.55 | 1049.72 | - | - | - | - |
| | HYVs | 50.75 (307) | 36.26 (302) | 70.28 | 1029.11 | 57.82 (94) | 42.13 (93) | 72.09 | 1016.35 | 47.31 (303) | 32.77 (298) | 68.12 | 1047.71 | 58.83 (97) | 42.89 (95) | 71.40 | 1058.29 |

Data source: Primary data
Note: Figures in brackets indicate number of farms
* Weighted average of state figures

**Table 6.2-b: Output and sale of paddy (husked) by size groups of land holdings for All States***

| Size group (Ha) | Crop | 2009-10 | | | | | | | | 2010-11 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hybrid Adopter | | | | Non-Adopters | | | | Hybrid Adopter | | | | Non-Adopters | | | |
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | 3.55 (103) | 0.48 (89) | 11.69 | 1486.39 | - | - | - | - | 4.48 (102) | 0.63 (101) | 14.03 | 1615.68 | - | - | - | - |
| | HYVs | 11.38 (99) | 0.62 (87) | 4.79 | 1584.85 | 15.90 (26) | 1.12 (24) | 6.51 | 1628.28 | 10.56 (99) | 0.65 (99) | 6.19 | 1666.29 | 15.58 (26) | 1.36 (22) | 7.36 | 1721.23 |
| 1 – 2 | Hybrid | 4.42 (43) | 0.65 (36) | 12.33 | 1472.51 | - | - | - | - | 6.36 (43) | 1.54 (43) | 24.28 | 1649.93 | - | - | - | - |
| | HYVs | 24.01 (41) | 1.13 (34) | 3.89 | 1896.84 | 24.76 (10) | 5.09 (9) | 18.51 | 1898.49 | 21.42 (41) | 3.09 (41) | 14.44 | 1907.27 | 23.91 (10) | 5.94 (9) | 22.35 | 1904.46 |
| 2 – 4 | Hybrid | 13.67 (23) | 8.95 (23) | 65.49 | 1473.32 | - | - | - | - | 15.64 (23) | 9.60 (23) | 61.34 | 1590.64 | - | - | - | - |
| | HYVs | 40.88 (18) | 5.40 (18) | 13.22 | 1963.55 | 38.22 (6) | 10.16 (6) | 26.58 | 1895.09 | 38.69 (17) | 8.63 (17) | 22.30 | 1982.82 | 40.04 (7) | 16.65 (7) | 41.59 | 1901.53 |
| 4 – 10 | Hybrid | 16.90 (11) | 12.95 (11) | 76.62 | 1506.42 | - | - | - | - | 18.52 (10) | 14.09 (10) | 76.08 | 1600.65 | - | - | - | - |
| | HYVs | 37.64 (9) | 26.26 (9) | 69.76 | 1990.63 | 45.06 (4) | 25.54 (4) | 56.68 | 1863.74 | 42.55 (9) | 27.63 (9) | 64.94 | 1936.77 | 53.85 (4) | 35.21 (4) | 65.38 | 1890.76 |
| 10 ha and above | Hybrid | 41.50 (1) | 35.60 (1) | 85.78 | 1300.00 | - | - | - | - | 87.50 (2) | 71.30 (2) | 81.49 | 1500.00 | - | - | - | - |
| | HYVs | 15.50 (1) | 7.90 (1) | 50.97 | 1450.00 | - | - | - | - | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | 6.37 (181) | 2.94 (160) | 40.81 | 1444.92 | - | - | - | - | 8.82 (180) | 4.01 (179) | 45.26 | 1556.55 | - | - | - | - |
| | HYVs | 19.04 (168) | 2.63 (149) | 12.26 | 1879.48 | 20.59 (46) | 3.66 (43) | 16.62 | 1797.87 | 17.60 (166) | 3.04 (166) | 17.27 | 1902.61 | 20.24 (47) | 4.51 (43) | 20.37 | 1846.34 |

Data source: Primary data

Note: Figures in brackets indicate number of farms

* Weighted average of state figures.

**Table 6.3: Seasonal flow of marketing (sales) of paddy (un husked) (2009-10 & 2010-11) for All States***

(Sales quantity in qtl.)

| Month | 2009-10 | | | 2010-11 | | |
|---|---|---|---|---|---|---|
| | Hybrid Adopters | | Non-Adopters | Hybrid Adopters | | Non-Adopters |
| | Hybrid | HYVs | HYVs | Hybrid | HYVs | HYVs |
| January | 343.15 (11.25) | 142.69 (7.84) | 170.69 (13.15) | 178.68 (12.55) | 354.31 (10.99) | 176.56 (14.34) |
| February | 299.61 (9.82) | 92.58 (5.09) | 109.64 (8.45) | 151.72 (10.66) | 347.87 (10.79) | 104.27 (8.47) |
| March | 77.58 (2.54) | 52.80 (2.90) | 30.75 (2.37) | 49.36 (3.47) | 79.64 (2.47) | 31.68 (2.57) |
| April | 97.49 (3.19) | 61.38 (3.37) | 36.25 (2.79) | 59.36 (4.17) | 77.65 (2.41) | 49.09 (3.99) |
| May | 210.83 (6.91) | 84.81 (4.66) | 76.50 (5.89) | 84.16 (5.91) | 222.98 (6.92) | 64.55 (5.24) |
| June | 231.32 (7.58) | 96.60 (5.31) | 90.00 (6.93) | 38.43 (2.70) | 128.73 (3.99) | 26.67 (2.17) |
| July | 256.35 (8.40) | 98.03 (5.38) | 99.27 (7.65) | 90.84 (6.38) | 228.45 (7.09) | 114.79 (9.32) |
| August | 55.08 (1.81) | 61.92 (3.40) | 32.67 (2.52) | 9.15 (0.64) | 22.24 (0.69) | 16.81 (1.37) |
| September | 220.30 (7.22) | 98.42 (5.41) | 67.08 (5.17) | 75.03 (5.27) | 179.67 (5.57) | 69.90 (5.68) |
| October | 319.44 (10.47) | 173.35 (9.52) | 118.79 (9.15) | 145.93 (10.25) | 308.44 (9.57) | 115.00 (9.34) |
| November | 590.65 (19.36) | 414.14 (22.75) | 259.44 (19.99) | 266.37 (18.72) | 660.33 (20.49) | 212.32 (17.25) |
| December | 349.58 (11.46) | 443.71 (24.37) | 206.91 (15.94) | 274.26 (19.27) | 612.61 (19.01) | 249.37 (20.26) |

Data source: Primary data

Note: Figures in brackets indicate percentages of total sales

* Simple Average of State Figures

**Figure 6.2-a(1)**

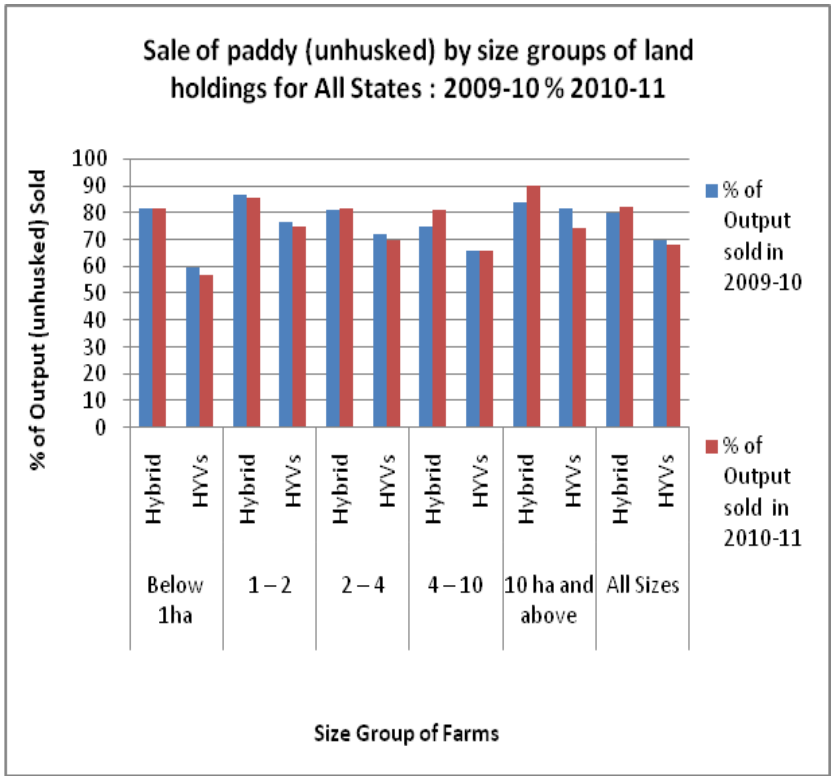



**Figure 6.2-a(2)**

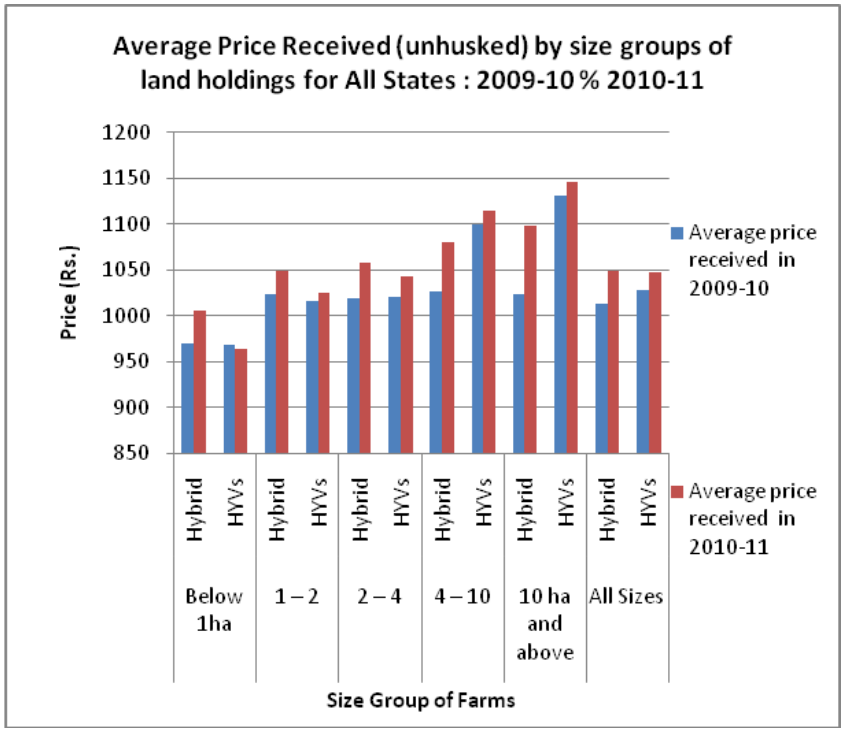


**Figure 6.2-b(1)**

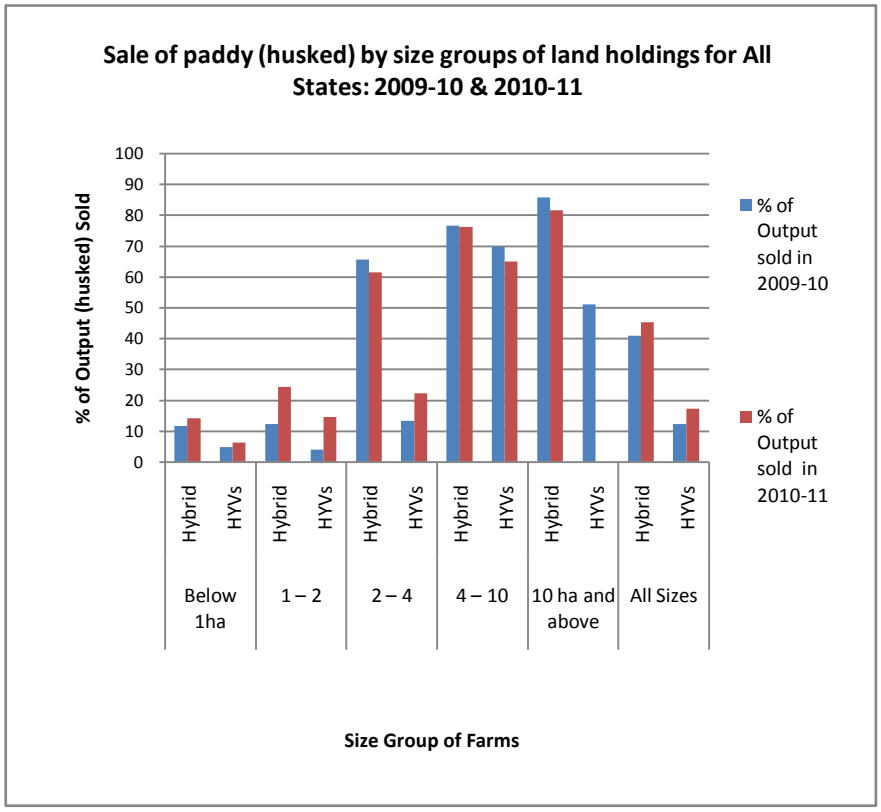



**Figure 6.2-b(2)**

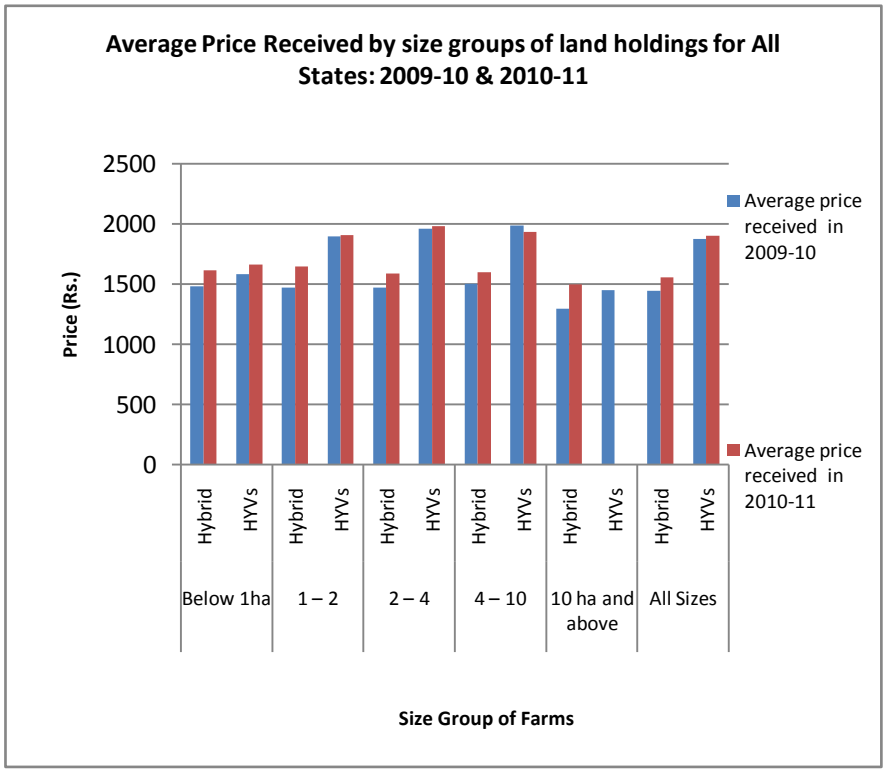


**Figure 6.3-a**

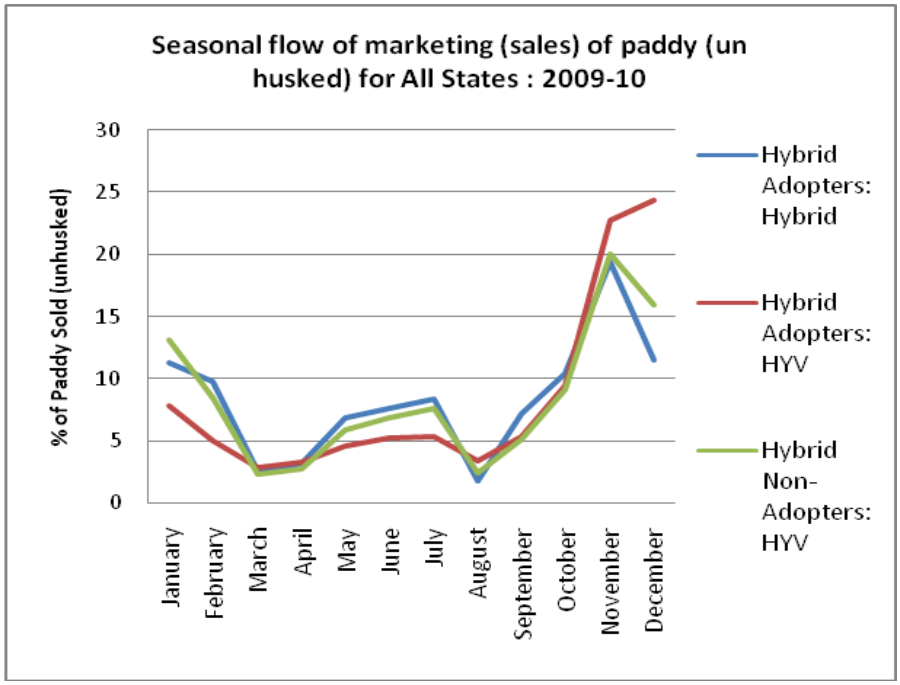



**Figure 6.3-b**

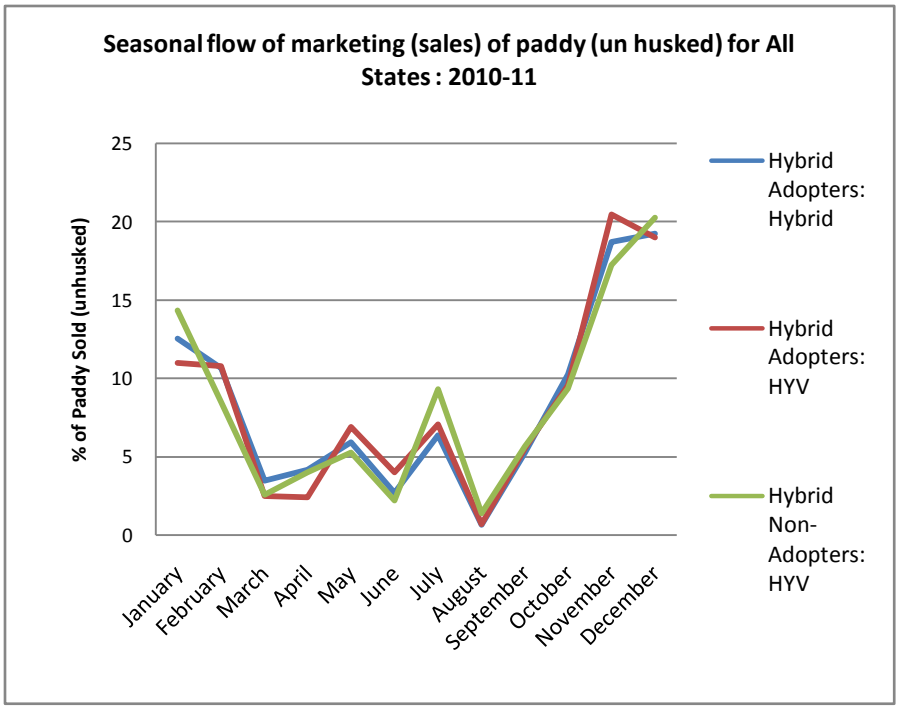


Table **6.2 a** gives statistics of the output of the unhusked hybrid and inbred (HYVs) rice crop and the quantity sold in the market across size classes of operational land holdings during the years 2009-10 and 2010-11.

While, the percentage of paddy output sold was around 80 per cent in the case of hybrid rice, it was around 70 per cent for conventional HYVs during the year 2009-10. The corresponding figures for 2010-2011 were around 83 and 68 per cent, respectively. Across size classes of land holdings, the proportion of output sold increases unmistakably with increase in the size of holdings. The same tendency is noticeable in the case of HYV rice for the years under study where proportions of output sold is consistently on the rise with the increase in the size of holdings.

In case of hybrid non-adopters, of the total output, 72 per cent was sold during the year 2009-10 which fell imperceptibly to 71 per cent in 2010-11. Across size classes of land holdings, the proportion of output sold increased with the increase in the size of holding.

The price fetched in the market for hybrid paddy grain was lower as compared to inbred varieties of rice during the year 2009-10. However, during the year 2010-11 hybrid rice received somewhat higher price in comparison with inbred varieties of rice. On an average, during the year 2009-10 the hybrid rice farmers realised a sale price that was Rs.1013.78 per quintal of paddy sold in the market as against Rs.1029.11 per quintal for HYVs. During 2010-11 price fetched by the farmers was relatively lower both for hybrid and inbred rice with a marginally higher market price realization for hybrid paddy (Rs.1049.72) as compared to HYVs (Rs.1047.71).

In case of sales of husked paddy, of the total outturn of hybrid rice, only 40.18 per cent was sold in the market during the year 2009-10. The corresponding proportion of output of husked paddy sold in the market was estimated at 12.26 per cent for HYVs. Similarly for hybrid non-adopters the comparable figure was 16.62 per cent. What follows therefore is that processed paddy is largely consumed by farmer.

Size-group wise analysis shows that in case of hybrid rice, bigger sized holdings sold relatively higher proportion of output of rice as compared to smaller sized holdings. With regard to price received for milled rice, it is found that on an average hybrid adopters realized a sale price of Rs.1444.92 per quintal for hybrid rice against the corresponding sale price of Rs.1879.48

for HYVs. Thus during the year 2009-10 hybrid adopting farmers realized a sale price of hybrid rice that was lower compared to inbred rice.

During the year 2010-11, 45.26 per cent of husked hybrid rice was sold in the market. The corresponding figure for 2009-2010 was 40.81. For HYVs the corresponding figures were much lower. It was 17.27 per cent for 2010-2011 and 12.26 for 2009-2010. Hybrid rice adopters received market price of Rs.1556.55 which is lesser than that of inbred rice, which was Rs.1902.61. On a closer scrutiny of the figures, it appears that the proportion of milled rice sold in the market bears a fairly stable inverse relationship with the size of holdings both in the case of hybrids and HYVs. The relationship holds similar to the one observed in the previous year 2009-10. It is thus possible to infer the inverse relationship between the size of holdings and the proportion of rice output sold.

## 6.3 Seasonal Flow of Marketing

Agricultural produce usually fetches lower price if sold just after the harvest and a higher price if sold during the lean period. Thus the account of sales will be incomplete without a picture of the seasonal flow of marketing. Month-wise flow of marketing of paddy (un-husked) for the years 2009-10 and 2010-11 presented in **table 6.3** revealed that hybrid adopters sold relatively greater proportion of paddy output immediately after the harvest in the months of October and November, although the marketing was spread over the months. This is discernible both in the case of hybrids and HYVs, which indicated that immediate cash needs compelled them to sell immediately after the harvest. During the year 2009-10, across months, the proportion of sales in the months of October and November ranged between 10.47 and 19.36 per cent for hybrid paddy. In the case of HYV paddy the figure for Oct was 9.52 and that for Nov was 22.75. For non-adopters, the corresponding proportion of sales of paddy accounted for 9.15 per cent and 19.99 per cent, respectively. During the year 2010-11, in case of hybrid adopters, 10.25 per cent and 18.72 per cent of total annual sales of hybrid paddy occurred in the months of October and November as against the corresponding proportions of 9.57 per cent and 20.49 per cent respectively for HYVs. It can be seen that in the case of conventional HYV cultivation the proportion of sale during the month of Dec was also quite high. The proportion of sales in the lean months viz. during March, April and August was rather small in case of hybrids and HYVs

during both the reference years. This is indicative of the fact that sample farmers (both hybrid adopters and non-adopters) have not been able to take advantage of the high prices ruling at this time of the year. In contrast, greater proportion of sales in the months of October and November (and also Dec in the case of HYV) was mainly effected by the small sized landholders who are compelled to sell their produce to meet their bare requirements.

# CHAPTER-VII
# Problems and Prospects for increasing hybrid rice cultivation

To assess farmers' own perceptions regarding their experience with hybrid rice cultivation, farmers' level responses were collected from the sample hybrid growers through personnel interviews with the help of a structured questionnaire. Farmers' awareness about hybrid rice technology, farmers' access to inputs including credit, perception of farmers about hybrid rice cultivation, problems faced by the farmers in marketing were obtained. We also ascertained the reasons for non-adoption of hybrid rice cultivation by non-participants through a structured questionnaire. In this chapter we attempt to gauge the overall perception about hybrid rice cultivation of farmers through analysis of the responses received from the participants and non-participants,.

## 7.1 Farmers' awareness about hybrid rice technology

With regard to hybrid adopters' awareness about hybrid rice technology, the qualitative questions asked to sample hybrid growers included the source of knowledge about hybrid rice technology, whether frontline demonstration programme were organized whether the government organized, training programme, whether farmers had participated in the programmes etc. The answers to these questions are documented in table 7.1.

**Table 7.1: Questions related to Hybrid Adopters' Awareness about Hybrid Rice Technology for All States***

| Sl. No. | Particulars | Answers | % of farmers reporting |
|---|---|---|---|
| 1. | How has he become aware about hybrid rice technology? | Govt. Ext. Worker | 48.25 |
| | | News paper | 7.42 |
| | | Other cultivators | 6.25 |
| | | Relatives & Friends | 9.17 |
| | | Local People | 13.75 |
| | | Progressive Farmer | 10.42 |
| | | Other | 4.75 |
| 2. | Whether front line demonstration programme is organized in your area by the Government to create awareness about the hybrid rice technology? | Yes | 51.40 |
| | | No | 48.60 |
| 3. | If yes have you participated in the programme? | Yes | 60.55 |
| | | No | 39.45 |

| | | | |
|---|---|---|---|
| 4. | Name the hybrids demonstrated and indicate the extent of yield advantage as demonstrated. | Hybrid –1 KRH-II,Yield advantage over HYV(80%) | 14.67 |
| | | Hybrid –2 DRRS-II,Yield advantage over HYV(70%) | 12.67 |
| | | Hybrid –3PAC – 835, Yield advantage over HYV(65%) | 4.67 |
| | | Hybrid – 1 ARIZE-6444 GOLD Yield advantage (%) (70) | 18.75 |
| | | Hybrid – 2 RASI Yield advantage (%) (68) | 14.58 |
| | | PHB – 71 Yield advantage (%) (72) | 14.00 |
| | | US- 312 Yield advantage (%) (65) | 11.67 |
| | | 3 PAC – 835 (58%) | 9.33 |
| 5. | Whether the government organised training programmes for farmers? | Yes | 57.10 |
| | | No | 42.90 |
| 6. | If yes, had he participated? | Yes | 69.90 |
| | | No | 30.10 |
| 7. | If participated mention the number of training programmes participated and their duration. | Trainings participated | - |
| | | Duration : one day | 78.58 |
| | | : two days | 21.42 |

Data source: Primary data
* Derived from available state figures

When asked how he became aware about hybrid rice technology, 48.25 percent of the sample farmers reported extension worker of the state department of agriculture as their source of awareness about the hybrid rice technology. The other sources were reported to be news paper (7.42 percent) and cultivators (6.25 percent). When asked whether front line demonstration programme was conducted in the area, majority of the respondents (51.40 percent) reported that frontline demonstration programme was organized by the government in order to create awareness about hybrid rice technology. With regard to their participation in the demonstration programme, 78.58 per cent of the farmers reported that they have participated in one-day training programmes. There were vast regional differences as the annexure tables indicate. In some regions extension activity has been very effective in disseminating knowledge. Participation has also been very pronounced in these regions. ***Obviously the government has to introduce some monitoring of extension activity to ensure uniformity and greater effectiveness, particularly in lagging regions.***

Asked whether the government organized training programme for the farmers, 57.10 per cent of the farmers responded affirmatively and of them 69.90 per cent reported their participation in the training programme. Substantial regional variations are observed in this case also***. This area too needs to be monitored better.***

## 7.2 Problems faced by the farmers in input accessibility, production and marketing

Easy availability of seeds of reasonable prices in right time is one of the pre conditions for the promotion of new variety of technology in any crop. To assess accessibility of hybrid seed input, information was solicited from the farmers regarding sources of seed, quality of seed, yield gain from hybrid seed and replacement of seed over the years. One of the easily available policy options on the part of government to promote hybrid rice cultivation is subsidizing the seed supply at the initial stage of adoption. Thus when asked what is the usual source of seed for the farmers 56.14 percent of farmers reported government supply as source of seed (table 7.2a). This is surprising. The great regional variation (see annexure Tables No.7.2-a) is significant. ***This indicates there is scope for expanding seed provision activities of government in some regions.*** 66.55 % of farmers receiving seeds reported that they received seeds on time. ***This is an area that also has to be improved.*** Importantly seeds were not available at reasonable price. Only 15.35 per cent of farmers reported availability of seeds at reasonable price. However this may not be a fact as most respondents would not say that the price they paid was fair, in the hope that the government would increase its subsidy. More detailed and objective study is necessary in this area. As far as quality of seeds is concerned, a total of 66.50 per cent of farmers reported to be satisfied with the quality of seeds. ***This aspect needs further enquiry to ascertain the precise reasons for behind perception of poor quality. The main reason has been 'poor germination' as 71.25 % of those who are dissatisfied with quality reported 'poor quality' as the reason.*** In response to the question related to yield superiority of hybrid rice over conventional HYVs, hybrid adopters almost unanimously (97.25 per cent) reported that hybrid seed yields better results than the inbred seeds. Most (59.55) recollected a yield gain of 15-25 %. The adoption of hybrid seeds prevented traditional practice of saving and exchanging of seeds. When asked how often they replaced hybrid seed varieties, 57.50 percent of the hybrid adopters indicated that they replace seeds every year.

We may thus infer from the above analyses that the higher yield potential of hybrid rice is clearly demonstrated in farmers' fields. This technology has good potential to increase rice yield provided quality seeds are made available at reasonable prices in right time. Although, government is the major source of supply of seed, poor germination of seed makes seeds costlier resulting in enhancement of cost of cultivation. Higher seed cost in turn reduces the profitability of hybrid rice cultivation. Thus the availability of quality hybrid seed at reasonable price is

crucial to the success of hybrid rice technology. ***For the popularization of hybrids there is a case for government sector intervention in quality seed production and distribution and knowledge dissemination***. One aspect that is worrisome about hybrid cultivation is its spread adversely affects traditional practice of saving and exchanging seeds. 84.25 % reported this. This may be ultimately detrimental to local knowledge practices.

**Table 7.2-a: Questions related to Hybrid Adopting Farmers' access to Hybrid Seed input for All States***

| Sl. No. | Particulars | Answers | % of farmers reporting |
|---|---|---|---|
| 1. | Have you used hybrid seed? | Yes | 100.00 |
| | | No | 0.00 |
| 2. | If yes, why used - | Higher yield | 82.38 |
| | | Free supply of hybrid seed | 47.50 |
| | | Interested | 0.00 |
| | | Easy Available | 0.00 |
| | | Demonstration | 7.81 |
| 3. | Is the hybrid seed easily available? | Yes | 67.65 |
| | | No | 32.35 |
| 4. | What is the usual source of your seeds? | Govt. supply | 56.14 |
| | | Pvt. supply | 43.86 |
| 5. | Is a good quality hybrid seed available in your area? | Yes | 66.50 |
| | | No | 33.50 |
| 6. | If yes, do you get seeds (a) during planting time and (b) at a reasonable price | Available during planting time | 65.55 |
| | | Available at reasonable price | 15.35 |
| 7. | Are you satisfied with quality of seed? | Yes | 70.60 |
| | | No | 29.40 |
| 8. | If no, reasons there for (poor germination etc.) | Poor germination | 71.25 |
| | | Other | 28.75 |
| 9. | Are you convinced that hybrid seed yield better results than the inbred seeds? | Yes | 97.25 |
| | | No | 2.75 |
| 10. | If yes, indicate the percentage of yield increase. | 5-10% | 10.15 |
| | | 10-15% | 12.60 |
| | | 15-20% | 59.55 |
| | | 20% & Above | 17.70 |
| 11. | If Hybrid seeds bring lesser yields, indicate the percentage of yield loss due to hybrid rice. | 5-10% | 0.00 |
| | | 10-15% | 0.00 |
| | | 15-20% | 0.00 |
| 12. | Do you purchase new seeds of hybrid varieties every crop season/year? | Yes | 85.75 |
| | | No | 14.25 |
| 13. | Do you feel that adoption of hybrid seeds prevented traditional practice of saving and exchanging of seeds? | Yes | 84.25 |
| | | No | 15.65 |
| 14. | How often do you replace hybrid seed varieties? | replacing every year | 57.50 |
| | | replacing every alternative year | 16.25 |
| | | replacing every 3 years | 12.75 |
| | | replacing after 3 years or more | 13.50 |

Data source: Primary data
* Derived from available state figures

The questions related to hybrid adopters' access to fertilizer input and its use are documented in table 7.2 b. Almost all the sample hybrid adopters reported that they have used

fertilizer input in hybrid rice cultivation. Asked whether they have received information from any source regarding what to use and the required doses, a good majority of the farmers (78.4 percent) reported affirmative. The proportion (56.43 percent) of farmers who reported to have used fertilizer input in recommended doses was rather low. There was also significant regional variation in this respect. ***This perhaps indicates that the farmers in all regions have not been properly informed about the benefits of using fertilizers in proper doses and of problems created by not using them as recommended. Again this highlights a problem that we have already mentioned. In case of traditional varieties, local knowledge bases are sufficient. But when an alien technology like hybrid technology is introduced, local knowledge is discounted and so traditional routes of knowledge dissemination no longer work. They have to be supplanted with formal external knowledge dissemination processes. These require constant monitoring by external agencies.***

**Table 7.2-b: Questions related to Hybrid Adopting Farmers access to Fertiliser input and its use for All States***

| Sl. No. | Particulars | Answers | % of farmers reporting |
|---|---|---|---|
| 1. | Have you used chemical fertilizer? | Yes | 97.25 |
| | | No | 2.75 |
| 2. | Whether received information from any source regarding what to use and the required doses? | Yes | 78.40 |
| | | No | 21.60 |
| 3. | If yes, have you applied recommended doses of fertilizer? | Yes | 56.43 |
| | | No | 43.57 |
| 4. | If not, state reasons there for | Reason 1 Financial constrain | 48.98 |
| | | Reason 2 Lack of knowledge | 51.02 |
| 5. | If fertilizer not used at all what are the reasons | Reason 1 | 0.00 |
| | | Reason 2 | 0.00 |
| 6. | Is fertiliser easily available? | Yes | 62.00 |
| | | No | 38.00 |
| 7. | If yes, the source where it is available | Source : Pvt. Outlet at market | 100.00 |
| 8. | Do you feel that hybrid seeds require more fertilizer than inbred seeds | Yes | 73.50 |
| | | No | 26.50 |

Data source: Primary data
* Derived from available state figures

Of the sample farmers those who have not used fertilizer in recommended doses, almost an equal percentage cited lack of knowledge and financial constraints. Easy availability of fertilizer is reported by a large percentage (62) of the farmers, the source of fertilizer being mainly private traders. When asked whether hybrid seeds require more fertilizer than inbred seeds, all the sample hybrid adopters unanimously reported affirmative.

The responses of questions relating to hybrid adopters' access to pesticide input and its use are presented in table 7.2c. Sometimes it is argued that hybrid adapts well to varying agro-climatic situations and have resistance to pests and disease attacks. Farmers' level responses received in course of this study do not support this argument. While 37 % of area under hybrid cultivation was affected by pests, the corresponding figure for HYV was 23 %. While pesticides are easily available across regions, there is great regional variation regarding knowledge of proper application. On an average only 56.65 % reported knowing the correct dosage. ***This suggests that in some regions the problem of knowledge dissemination about proper fertiliser usage has not been properly addressed.*** 65.60 percent of farmers thought that hybrid rice cultivation is highly sensitive to crop management practices – use of key inputs and time bound operations. Most of the sample farmers (65.25 %) believe that the extent of yield loss due to pests and diseases for inbred variety is lower as compared to hybrids. This perception of the farmers may not match reality as there are significant regional differences in response to this question.

**Table 7.2-c: Questions related to Hybrid Adopting Farmers access to Pesticide input and its use for All States***

| Sl. No. | Particulars | Answers | % of farmers reporting |
|---|---|---|---|
| 1. | Whether hybrid rice crop or any other variety of rice crops was attacked with pests and diseases? | Yes | 52.75 |
| | | No | 47.25 |
| 2. | If yes, which variety (Hybrid/ Hyvs) with area | Hybrid (area) | 37.00 |
| | | HYVs (area) | 23.00 |
| 3. | Have you applied pesticides? | Yes | 56.55 |
| | | No | 43.45 |
| 4. | If not, why not used? | Lack of money | 26.95 |
| | | Costly | 14.20 |
| | | Not needed | 9.30 |
| | | Lack of knowledge | 13.05 |
| 5. | Is the pesticide easily available? | Yes | 77.25 |
| | | No | 22.75 |

| | | | |
|---|---|---|---|
| 6. | Do you know the correct way of using and doses of plant protection pesticides? | Yes | 56.65 |
| | | No | 43.35 |
| 7. | Do you feel that hybrid rice varieties are more susceptible to pests and diseases? | Yes | 60.65 |
| | | No | 39.35 |
| 8. | Do you know the correct does of pesticides for hybrid seed varieties ? | Yes | 56.15 |
| | | No | 43.85 |
| 9. | Do you feel that hybrid rice cultivation is highly sensitive to crop management practices - use of key inputs and time bound operations? | Yes | 65.60 |
| | | No | 34.40 |
| 10. | Do you feel that the extent of yield loss due to pests and diseases for inbred variety is lower as compared to hybrids | Yes | 65.25 |
| | | No | 34.75 |

Data source: Primary data
* Derived from available state figures

**Table 7.2-d: Questions related to Hybrid Adopting Farmers' access to credit for All States***

| Sl. No. | Particulars | Answers | % of farmers reporting |
|---|---|---|---|
| 1. | Do you require more credit for using hybrid seed? | Yes-1 | 62.95 |
| | | No-2 | 37.05 |
| 2. | Do you get required credit from the Cooperative Credit Society or any other institutional sources? | Yes-1 | 49.68 |
| | | No-2 | 50.32 |
| 3. | If yes, which source | Bank | 88.89 |
| | | Co-operative | 11.11 |
| 4. | If not, what are the problems in getting credit | Security | 33.87 |
| | | Other | 66.13 |

Data source: Primary data
* Derived from available state figures

Farmers' response relating to their need and access to credit are summarized in table 7.2d. Hybrid rice cultivation being costlier than inbred varieties demand more capital compared to that for HYVs. That is why most (62.95) reported that hybrid cultivation needs more credit. Of those who require credit, 49.68 percent reported that they get credit from the institutional sources, either commercial banks or co-operatives. Most of these farmers receive credit from commercial banks.

A frequently raised concern on the spread of hybrid rice is the acceptability of the quality of hybrid rice grain among consumers. Consumer acceptance is the ultimate factor that determines the price of the product as also marketability of the product. Thus to study the issue of marketing farmers' level responses were collected regarding their perception about marketing of hybrid rice. Asked whether they face problems in marketing of hybrid rice produce, most of the hybrid adopting farmers (70.40 %) reported that they face problems in marketing of hybrid

rice. Lack of consumer demand for hybrid rice grain, lower head rice recovery and ultimately lower price received in the market were the major problems faced by the hybrid growers. All the sample farmers reported these problems in the field of marketing of hybrid rice (table 7.2e).

**Table 7.2-e: Questions related to Hybrid Adopters' Perception about Marketing of Hybrid Rice for All States***

| Sl. No. | Particulars | Answers | % of farmers reporting |
|---|---|---|---|
| 1. | Do you face problems in marketing of hybrid rice produce? | Yes | 70.40 |
| | | No | 29.60 |
| 2. | If yes, state the nature of the problem faced | Lower market price | 63.70 |
| | | Poor cooking and keeping quality | 50.85 |
| | | Lower head – rice recovery (percentage of clean rice after milling) | 62.25 |
| | | More broken rice after milling | 46.15 |
| | | Lack of consumer demand for hybrid rice grain | 62.40 |
| | | Poor grain quality and as a result lack of market acceptance | 55.60 |
| | | Traders not accepting hybrid rice grain lack of demand from millers and consumers | 53.80 |

Data source: Primary data
* Derived from available state figures

Other problems reported by the adopters included poor cooking and keeping quality (50.85 percent), poor grain quality and as a result lack of market acceptance (55.60 percent), traders not accepting hybrid rice grain lack of demand from milliers and consumers (53.8 percent) and more broken rice after milling (46.15 percent).

## 7.3 Famers' overall perception of hybrid rice cultivation

**Table 7.3: Hybrid Adopting Farmers' overall Perception about Hybrid Rice Cultivation for All States***

| Sl. No. | Particulars | Answers | % of farmers reporting |
|---|---|---|---|
| 1. | Is there any yield gain from cultivation of hybrids over the best popular inbred rice varieties? | Yes | 95.50 |
| | | No | 4.50 |
| 2. | Is hybrid rice production profitable? | Yes | 90.15 |
| | | No | 9.85 |

| | | | |
|---|---|---|---|
| 3. | Do consumers perceive hybrid as inferior to inbred in respect of grain quality? | **Hybrids inferior in respect of** | - |
| | | Poor grain quality | 79.20 |
| | | No taste | 38.50 |
| | | Poor cooking quality | 62.70 |
| | | Stickiness of cooked rice | 56.25 |
| 4. | Is hybrid rice grain acceptable to traders and millers? | Yes | 55.80 |
| | | No | 44.20 |
| 5. | Is he convinced with the economic viability of hybrid rice cultivation? | Yes | 85.25 |
| | | No | 14.75 |
| 6. | It no, reasons therefore | Reason – 1: Less/non availability of seeds, higher cost of cultivation, | 23.50 |
| | | Reason – 2: More susceptible to pest and diseases, | 14.00 |
| | | Reason – 3:Poor quality of grain, | 33.50 |
| | | Reason – 4:Poor knowledge about hybrid cultivation, technology and management | 23.00 |
| | | Reason – 5: Poor marketing of hybrid rice | 6.00 |
| 7. | Do you like to continue cultivating of hybrid rice? | Yes | 93.25 |
| | | No | 6.75 |
| 8. | If yes, reasons for continuing hybrid rice production | **Reasons for continuing hybrid rice cultivation** | - |
| | | Expecting to get new hybrids with better quality in the near future | 60.15 |
| | | Higher yield of hybrid rice | 64.60 |

Data source: Primary data
* Derived from available state figures

Table 7.3 gives a summary of farmers' overall perception of hybrid rice cultivation. When asked whether there is any yield gain from cultivation of hybrids over the best popular inbred rice varieties, farmers almost unanimously reported that there was yield gain in hybrids over conventional HYVs (inbred). Also hybrid rice production was reported to be profitable as conceived most (90.15 percent) of sample farmers.

Hybrid rice varieties are however inferior to currently available inbred varieties in terms of consumers' preference. 79.20 percent of the sample farmers reported that grain quality of hybrid rice is poor compared with the grain quality of the existing popular HYVs of rice. A total of 38.5 percent of farmers felt hybrid rice is not suited to the taste of consumers. Many farmer respondents (62.70 percent) said hybrid rice has poor cooking quality. High stickiness of cooked rice is also reported by majority of the farmers (56.25 percent). Asked whether hybrid rice grain is acceptable to traders and millers, 44.20 percent of farmers respondent reported that traders and

millers do not want to accept hybrid rice grain from them on account of its poor grain quality. Farmers are however convinced with the economic viability of hybrid rice cultivation. A good majority (85.25 percent) of the farmers reported that they are convinced that hybrid rice cultivation is economically viable. Those who are not convinced mainly cited poor quality of grain. Among hybrid growers 6.75 per cent were not in favour of continuing cultivation of hybrid rice. ***In short, analysis of farmers' overall perception about hybrid rice cultivation hinted that future research on hybrid rice development should focus on improvement of grain quality besides yield in the next generation hybrids.***

## 7.4 Reasons for non-adoption of hybrid rice cultivation (non-adopters' experience)

When we asked non-adopters of hybrid rice cultivation about their experiences, (table-7.4) 27.6 per cent of sample non-adopters indicated that they have not heard any of the new hybrid varieties of rice. When asked whether they have heard of the government's hybrid rice promotion programme, 56.4 per cent of the farmers reported affirmative. Asked whether they have seen any standing rice crop of hybrid variety, negative responses were received from 40.4 per cent of non-adopting farmers. 45.8 per cent of the sample non-adopters reported that nobody had suggested to grow hybrid variety of rice on their farms. Among those (65.00 per cent) who received suggestions from any source, the largest chunk (35.78 per cent) reported that they have received suggestions from Agricultural Extension Officer (AEO) of the state department of agriculture. The next in importance from whom suggestion was received were relatives and other cultivators.

64.6 per cent of the sample non-adopters had expressed their willingness to grow the hybrid variety of rice next year. According to non-adopting farmers, cost of seed was the major inhibiting factor (45 per cent); anticipation of lower price of hybrid rice as compared to inbred variety is the next major reason for non-adoption of hybrid rice (39 per cent). Poor seed quality, low perceived yield, slow germination rate were other important reasons cited. Also all the non-adopting farmers unanimously reported that they are ready to accept new hybrid rice varieties in future considering higher yield potential.

## Table7.4: Questions related to Reasons for non-adoption of hybrid rice (reaction of non-participants) for All States*

| Sl. No. | Particulars | Answers | % of farmers reporting |
|---|---|---|---|
| 1. | Have you heard of any of the new hybrid varieties of rice? | Yes-1 | 67.40 |
| | | No-2 | 27.60 |
| 2. | If yes, what are they? | KRH-II | 22.62 |
| | | DRRS-II | 17.86 |
| | | PAC - 835 | 14.68 |
| | | ARIZE-6444- GOLD | 5.00 |
| | | RASI | 15.00 |
| | | SRI | 11.67 |
| | | 6444 & PHB-71 | 13.33 |
| 3. | Have you heard of the Govts. Hybrid rice promotion programme? | Yes-1 | 56.40 |
| | | No-2 | 43.60 |
| 4. | Have you seen any standing rice crop of hybrid variety in your area? | Yes-1 | 59.60 |
| | | No-2 | 40.40 |
| 5. | Did anybody suggest you to grow this variety? | Yes-1 | 54.20 |
| | | No-2 | 45.80 |
| 6. | If yes, state who suggested? | V.L.W | 16.29 |
| | | BDO | 2.27 |
| | | AEO | 35.78 |
| | | Relative | 20.55 |
| | | Other cultivators | 19.00 |
| | | Known from government demonstration | 27.57 |
| | | Others (Media) | 19.34 |
| 7. | Will you be growing this variety next year? | Yes | 64.60 |
| | | No | 35.40 |
| 8. | What are the reasons for your not using this year? | Not heard of the variety | 23.67 |
| | | Not heard of the Govt. assistance for expansion of hybrid rice seeds. | 43.00 |
| | | Non-availability of seed | - |
| | | a. Not at all | 24.00 |
| | | b. Not in time | 14.33 |
| | | c. Pure hybrid seed not available | 23.67 |
| | | Seed is too costly | 45.40 |
| | | Seed available, but at too far a distance | 4.00 |
| | | Pre-treatment of seed is necessary and have never done it before. | 18.00 |
| | | Govt. Seed germination rate too low | 33.20 |
| | | Not convinced that the seed is of high quality | 34.00 |

| | | | |
|---|---|---|---|
| | | Not convinced that its yield is sufficiently high | 35.00 |
| | | Lower yield for hybrid than for inbred | 3.00 |
| | | Yield gain but lower profitability of Hybrid rice | 26.30 |
| | | Variety too coarse | 29.00 |
| | | Higher risks | 13.00 |
| | | Will fetch lower price as compared to inbred variety | 39.00 |
| | | Needs too much of fertilizers | 27.65 |
| | | Soil type not suitable | 25.00 |
| | | Not insects pests and disease resistant. | 29.00 |
| | | The extent of yield loss due to pests and diseases is higher for hybrids. | 19.09 |
| | | Needs more water | 9.00 |
| | | Fodder quality not good | 23.00 |
| | | Credit – not available in time | 7.00 |
| | | Credit not at all available | 5.86 |
| | | Restrictions on disposal i.e. should be sold to a particular agency | 27.00 |
| | | Any other (Specify) | 0.00 |
| 9. | Are you ready to accept new hybrid rice varieties in future considering superior grain quality and higher yield potential? | Yes | 100.00 |
| | | No | 0.00 |
| 10. | If no, reasons therefore. | Reasons – 1 | 0.00 |
| | | Reasons – 2 | 0.00 |

Data source: Primary data

* Derived from available state figures

# CHAPTER-VIII

# Summary and Policy Recommendations

## 7.1 Background

Hybrid rice is any genealogy of rice produced by crossbreeding different kinds of rice. As with other types of hybrids, hybrid rice typically displays heterosis (or hybrid vigor) such that when it is grown under the same conditions as comparable high-yielding inbred rice varieties it can produce up to 30% more rice. High-yield crops, like hybrid rice, are one of the most important tools for combating world food crises. The earliest high-yield rice was cultivated by Henry 'Hank' Beachell in 1966, but it was not until the 1974 that the first hybrid rice varieties were released in China.

In crop breeding, although the use of heterosis in first-generation seeds (or $F_1$) is well known, its application in rice was limited because of the self-pollination character of that crop. In 1974, Chinese scientists successfully transferred the male sterility gene from wild rice to create the cytoplasmic genetic male-sterile (CMS) line and hybrid combination. The first generation of hybrid rice varieties were three-line hybrids and produced yields that were about 15 to 20 percent greater than those of improved or high-yielding varieties of the same growth duration.

In the 1970s Yuan Longping made his seminal discovery of the genetic basis of heterosis in rice. This was a unique discovery because it had been previously thought that heterosis was not possible for self-pollinating crops such as rice. In China, hybrid rice is estimated to be planted on more than 50% of rice-growing land there and it is credited with helping the country increase its rice yields, which are among the highest within Asia. Hybrid rice is also grown in many other important rice producing countries including Indonesia, Vietnam, Myanmar, Bangladesh, India, Sri Lanka, Brazil, USA, and the Philippines. A 2010 study published by the International Rice Research Institute (IRRI), reports that the profitability of hybrid rice in three Indian states varied from being equally profitable as other rice to 34% more profitable. Outside of China other institutes are also researching hybrid rice, including the International Rice Research Institute, which also coordinates the Hybrid Rice Development Consortium.

The Indian Council of Agricultural Research (ICAR) initiated a national program for development and large scale adoption of hybrid rice in the country in December 1989. There has been some success in spreading this technique, but the lack of research about the problems relating to further increasing area under hybrid rice needed to be addressed. Hence this study.

## 7.2 Major Findings and Recommendations

- Yield and productivity under paddy in all states together increased in all the periods. Area fluctuated and there was no upward trend. In fact the area under paddy at the end of the entire study period was lower than at the beginning. This indicates that the scope of increasing output through extension of area has been exhausted and it is imperative to concentrate on yield improvement, through Hybrid seeds, etc. It is also noticeable that yield and productivity performed substantially better during the pre-hybrid period (1984-85 to 1993-94). This probably indicates the fact that HYV performance tapered off since the 90s. Hybrid cultivation did not spread sufficiently so as to compensate.
- It can also be observed that the increase in production can be attributed more to gain in productivity than to increase in area under crop, which in fact declined, as we have already indicated. Both yield and production showed similar and substantial gains.
- For both years surveyed the receptivity by size class to hybrid cultivation takes the form of a U, with the size class 2 to 4 ha being the least receptive.
- In striking contrast the receptivity to HYV takes the form of an inverted U, with the same size class being most receptive.
- Further apart from the largest farms, area under hybrid cultivation has increased between 2009-10 and 2010-2011. Correspondingly, there has been a decline in area under HYV. Though the time span is too short, the result is intuitively expected. With time information about and confidence in hybrid cultivation is likely to increase.
- A significantly higher proportion of head of households adopting hybrid farming to younger households.

- The ability to read literature on hybrid cultivation is sufficient for adoption of new technology and that higher formal education is unnecessary.
- A significantly larger proportion of SC, ST farmers compared to general caste cultivators go in for hybrid cultivation.
- The state plays predominant role in dissemination of information of new agricultural technology mainly through extension workers and, next through training programmes.
- **Training programmes have to be toned up**, as the extension workers are more effective in persuading farmers to adopt appropriate input mix while participation in training programmes yields much poorer results. Participation in demonstration programmes is even less effective for disseminating knowledge about proper input mix.
- There is also great regional variation in effectiveness of government servants and programmes in disseminating information. **This suggests that some monitoring devise has to be positioned.**
- Hybrid technology is substantially more productive compared to HYV across farm sizes. It is noticeably more productive in the largest farm size. **This suggests that the spread of the technology may have regressive impact on distribution.**
- Hybrid cultivation is more labour intensive than HYV cultivation. Hybrid rice cultivation also involves greater use of female labour. Hybrid rice cultivation is thus likely to generate additional employment opportunities for workers in general and specially for female labour rural areas.
- Area wise the cost of hybrid cultivation was significantly higher. But the higher productivity compensated. Thus the cost per quintal was lower for hybrid. **This suggests that to popularise hybrid cultivation credit needs have to be addressed.**
- The average rate of return on working capital was higher for hybrid cultivation, though in some states the opposite obtained.
- Grain quality of hybrid rice, in terms of hulling and milling ratios is inferior to HYV rice. **This suggests that research must concentrate on improving this aspect of hybrid rice.**

- A greater percentage of hybrid output is marketed compared to HYV. **This suggests that hybrid cultivation is suitable to the expansion of grain markets.**
- The price of hybrid rice is lower than that of HYV rice, on an average.
- Though government is the main source of hybrid seeds, there is great regional variation in the proportion of seeds supplied by government sources. **There is, therefore, scope for improving government intervention in this area.** Also seeds are not often supplied in time. **This needs to be looked into.**
- There is a perception of poor quality of seeds supplied. The reasons for this are not clear. This needs investigation.
- Hybrid cultivators are often using inputs in incorrect proportion. Though lack of financial ability has been indicated as a reason, lack of knowledge has also played a significant role. **Thus the government needs to improve the quality of knowledge dissemination and also provide sufficient credit. The need for proper credit provision is more pronounced because hybrid cultivation is costlier.**
- The quality of hybrid rice, in the perception of the consumer, is poorer than HYV rice. This makes marketing difficult. **This suggests that research should concentrate on improving quality like decreasing stickiness of cooked hybrid rice. The rate of degeneration or 'keeping quality' also needs to be improved.**

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*Annexure to Chapter II*

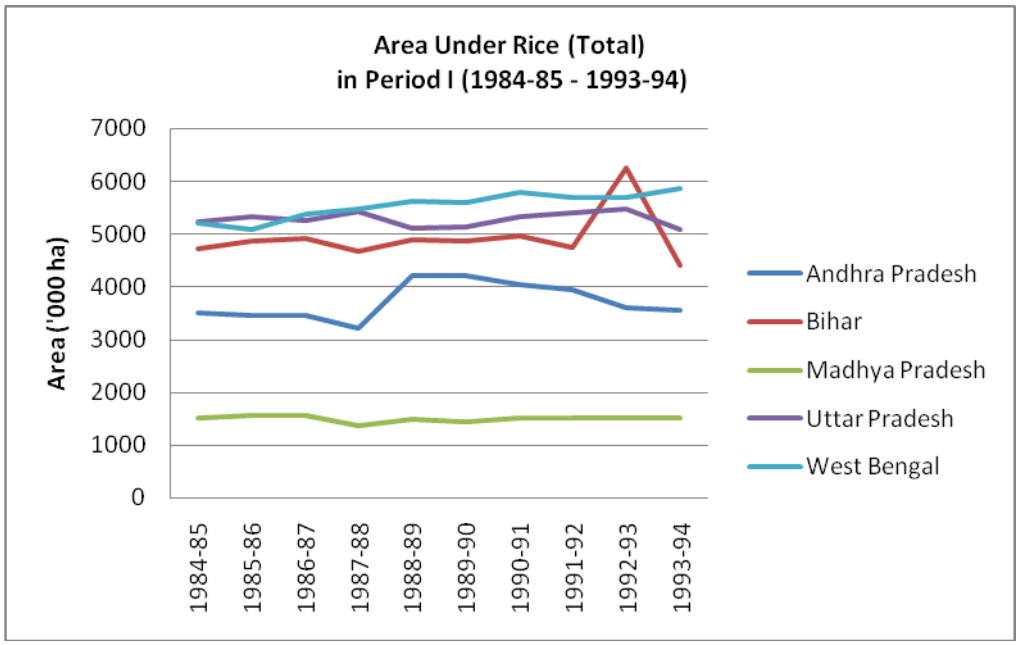
***Annexure Table 2.1*: Trend and Composition of Rice (Total) across States**

| Year | Andhra Pradesh | | | Bihar | | | Madhya Pradesh | | | Uttar Pradesh | | | West Bengal | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | P | Y | A | P | Y | A | P | Y | A | P | Y | A | P | Y |
| 1984-85 | 3498 | 6909 | 2021 | 4710 | 5704 | 1211 | 1530 | 750 | 493 | 5228 | 6666 | 1275 | 5199 | 8093 | 1557 |
| 1985-86 | 3452 | 7613 | 2264 | 4875 | 6493 | 1331 | 1570 | 1330 | 851 | 5322 | 7862 | 1177 | 5079 | 7991 | 1573 |
| 1986-87 | 3459 | 6591 | 1951 | 4912 | 5132 | 1045 | 1560 | 980 | 633 | 5264 | 6986 | 1327 | 5376 | 8463 | 1574 |
| 1987-88 | 3207 | 7087 | 2258 | 4677 | 4341 | 928 | 1380 | 960 | 697 | 5421 | 6046 | 1337 | 5476 | 9272 | 1693 |
| 1988-89 | 4218 | 10621 | 2572 | 4887 | 5924 | 1212 | 1490 | 1260 | 847 | 5115 | 8901 | 1740 | 5622 | 10560 | 1878 |
| 1989-90 | 4206 | 9959 | 2403 | 4870 | 5982 | 1228 | 1460 | 1000 | 683 | 5123 | 8900 | 1737 | 5614 | 10924 | 1946 |
| 1990-91 | 4036 | 9654 | 2442 | 4952 | 7096 | 1433 | 1520 | 1390 | 914 | 5329 | 9671 | 1815 | 5813 | 10437 | 1795 |
| 1991-92 | 3936 | 9249 | 2400 | 4730 | 5374 | 1136 | 1520 | 950 | 622 | 5413 | 9411 | 1739 | 5713 | 11954 | 2092 |
| 1992-93 | 3604 | 8792 | 2495 | 6265 | 5842 | 932 | 1530 | 1150 | 747 | 5477 | 9709 | 1773 | 5695 | 11445 | 2010 |
| 1993-94 | 3547 | 9562 | 2759 | 4397 | 6665 | 1516 | 1530 | 1310 | 854 | 5083 | 9640 | 1897 | 5876 | 12111 | 2061 |
| 1994-95 | 3637 | 9277 | 2609 | 4519 | 6859 | 1518 | 1580 | 1420 | 900 | 5283 | 9784 | 1852 | 5773 | 12236 | 2120 |
| 1995-96 | 3692 | 9014 | 2498 | 4674 | 7239 | 1549 | 1580 | 1180 | 746 | 5280 | 9788 | 1854 | 5954 | 11887 | 1997 |
| 1996-97 | 4110 | 10686 | 2654 | 4727 | 7934 | 1678 | 1600 | 1310 | 815 | 5560 | 11751 | 2113 | 5801 | 12637 | 2179 |
| 1997-98 | 3500 | 8510 | 2471 | 4787 | 7501 | 1567 | 1620 | 1190 | 735 | 5442 | 11678 | 2146 | 5900 | 13237 | 2243 |
| 1998-99 | 4317 | 11878 | 2812 | 4756 | 5159 | 1085 | 1630 | 1380 | 847 | 5881 | 11387 | 1936 | 5904 | 13316 | 2255 |
| 1999-00 | 4014 | 10638 | 2710 | 4671 | 5996 | 1284 | 1640 | 1670 | 1019 | 6086 | 13247 | 2177 | 6150 | 13760 | 2237 |
| 2000-01 | 4243 | 12458 | 2936 | 3656 | 5444 | 1489 | 1700 | 830 | 614 | 5907 | 11679 | 1977 | 5435 | 12428 | 2287 |
| 2001-02 | 3825 | 11390 | 2978 | 3552 | 5203 | 1465 | 1770 | 1690 | 849 | 6071 | 12856 | 2117 | 6069 | 15257 | 2514 |
| 2002-03 | 2822 | 7327 | 2597 | 3585 | 4986 | 1391 | 1670 | 1040 | 608 | 5213 | 9596 | 1841 | 5842 | 14389 | 2463 |
| 2003-04 | 3975 | 8953 | 3011 | 3578 | 5314 | 1485 | 1710 | 1870 | 978 | 5721 | 12478 | 2181 | 5857 | 14662 | 2504 |
| 2004-05 | 3086 | 9601 | 3111 | 3140 | 2529 | 805 | 1680 | 1290 | 804 | 5948 | 10783 | 1813 | 5784 | 14885 | 2574 |
| 2005-06 | 3982 | 11704 | 2939 | 3251 | 3709 | 1141 | 1710 | 1690 | 1045 | 5884 | 11741 | 1996 | 5783 | 14511 | 2509 |
| 2006-07 | 3978 | 11872 | 2984 | 3473 | 5121 | 1475 | 1680 | 1400 | 874 | 5836 | 10912 | 1870 | 5687 | 14746 | 2593 |
| 2007-08 | 3984 | 13324 | 3345 | 3472 | 4478 | 1287 | 1650 | 1330 | 853 | 5778 | 11884 | 2057 | 5720 | 14720 | 2573 |
| 2008-09 | 4387 | 14241 | 3246 | 3495 | 5578 | 1047 | 1720 | 1580 | 969 | 5992 | 13047 | 2177 | 5936 | 15037 | 2533 |
| 2009-10 | 3441 | 10838 | 3150 | 3213 | 3626 | 1128 | 1600 | 1360 | 896 | 5626 | 11795 | 2096 | 5630 | 14341 | 2547 |

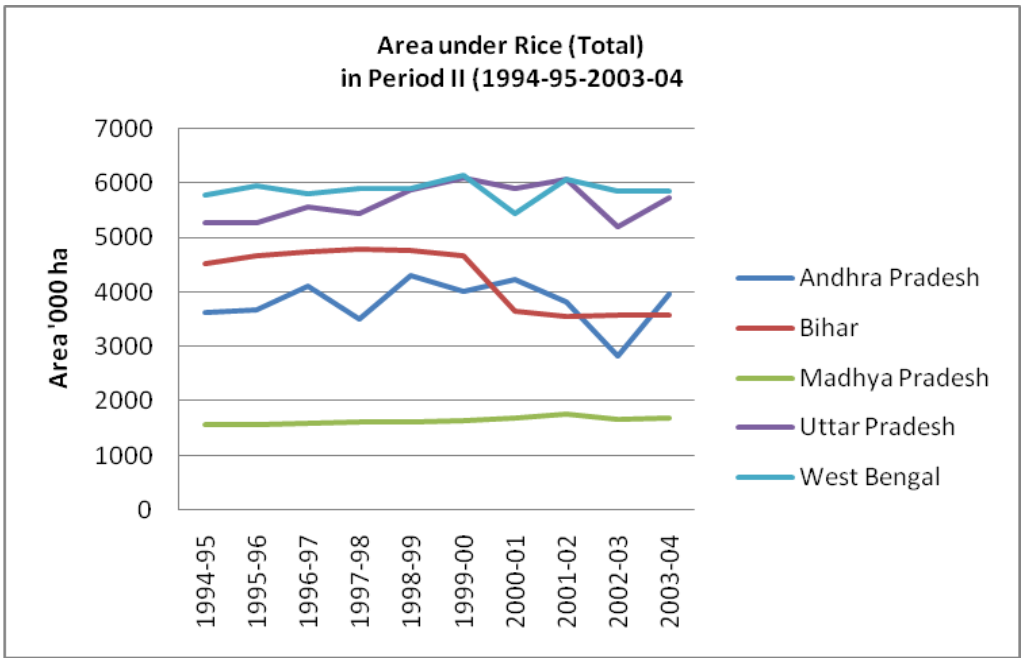
A = Area in thousand hectare, P = Production in thousand tonnes, Y = Yield in Kg/ Hectare.

Source: Directorate of Agriculture, West Bengal; Directorate of Agriculture Uttar Pradesh, Lucknow; Directorate of Statistics & Evaluation, Patna, Bihar, Directorate of Economics and Statistics, Government of Andhra Pradesh, Hyderabad

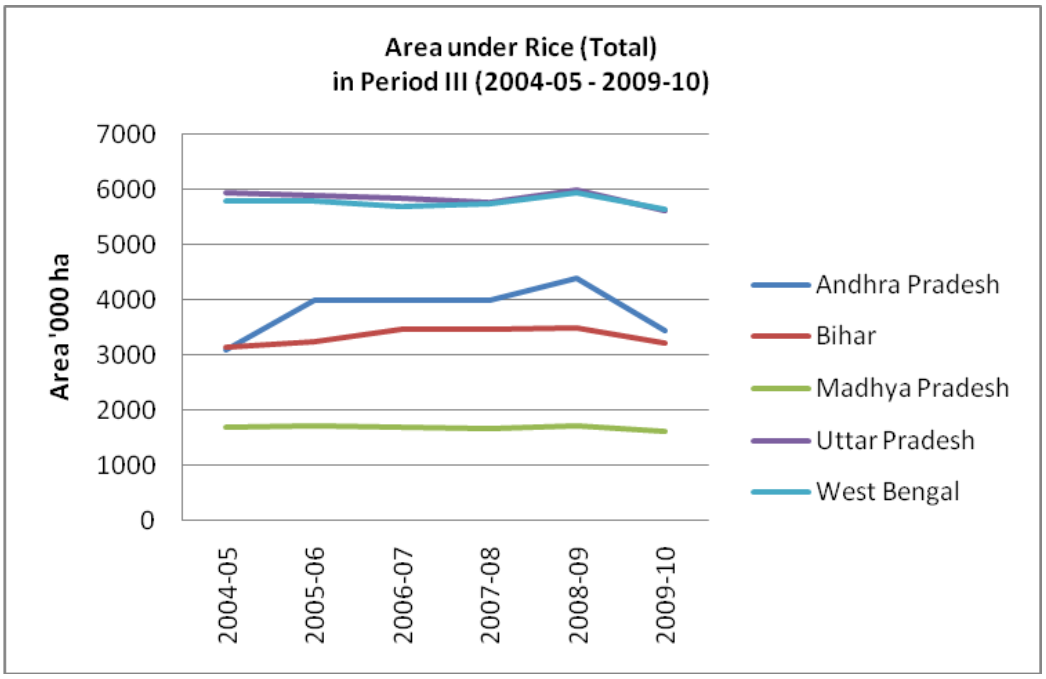
**Annexure Figure: 2.1**



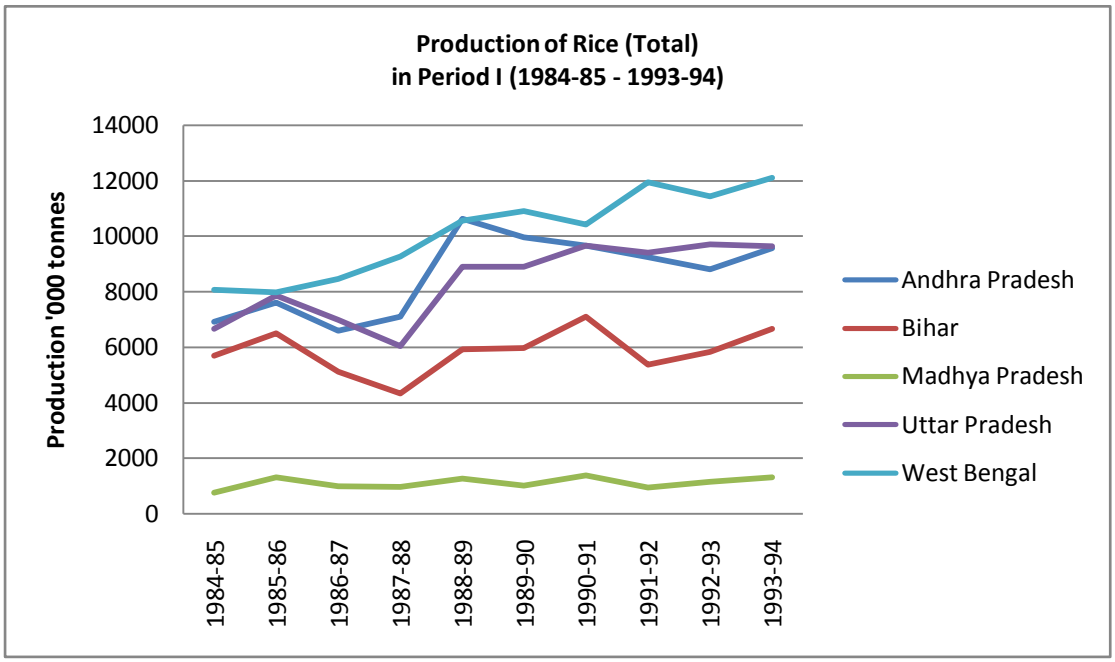

**Annexure Figure: 2.2**



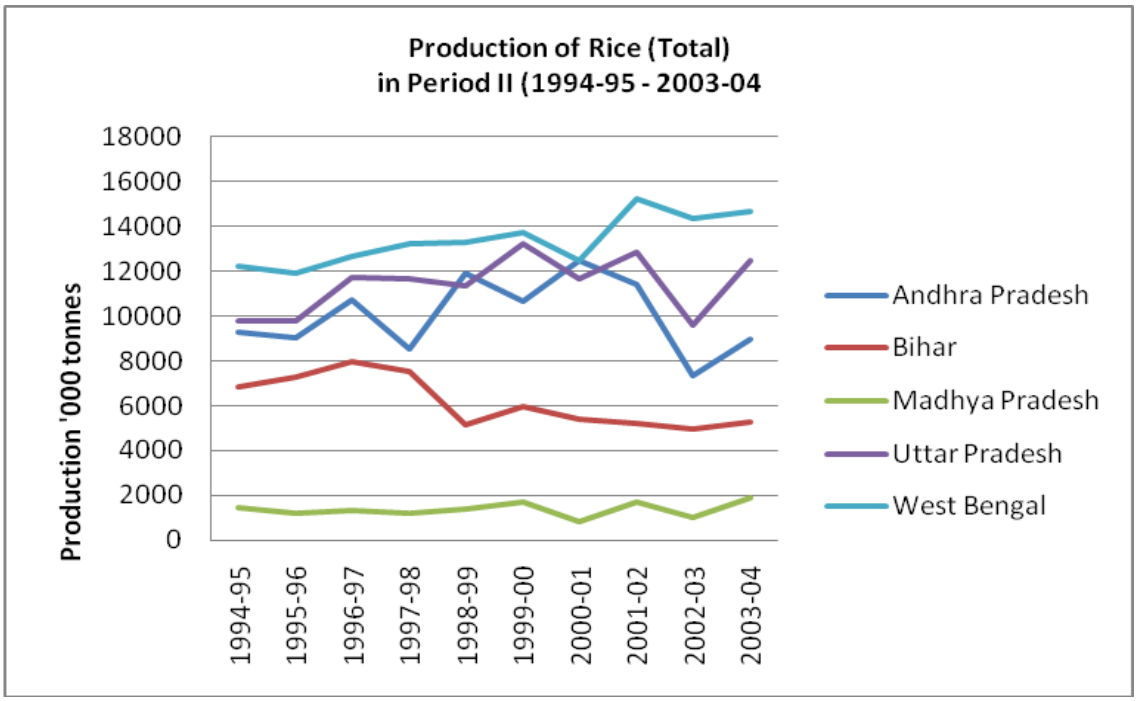
**Annexure Figure: 2.3**



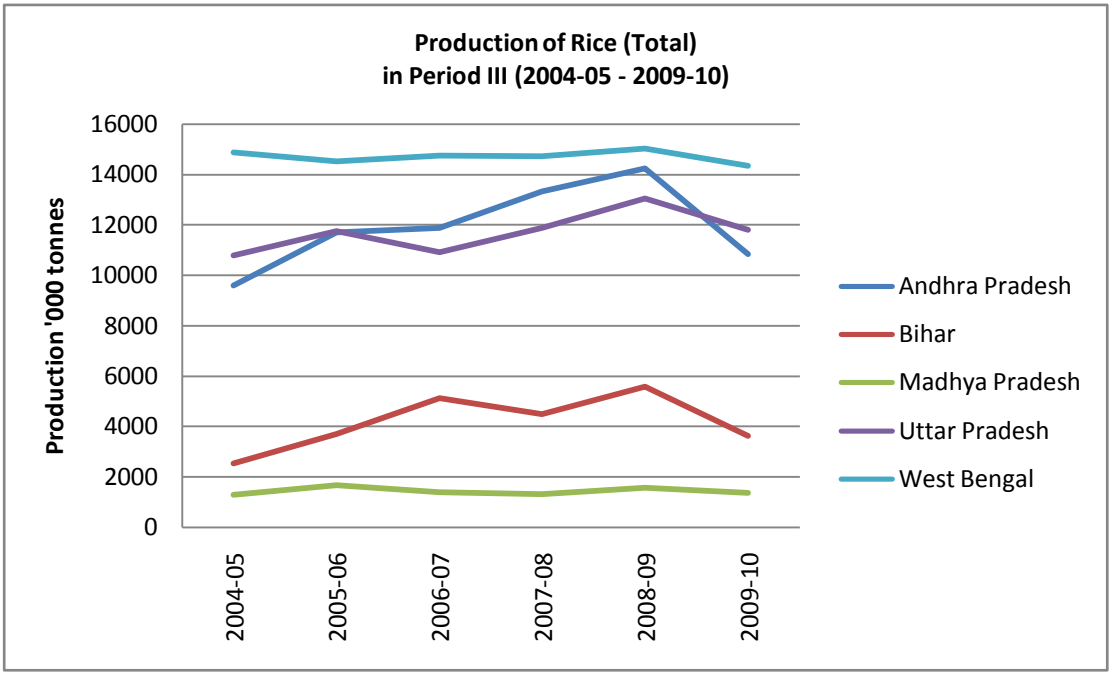

**Annexure Figure: 2.4**



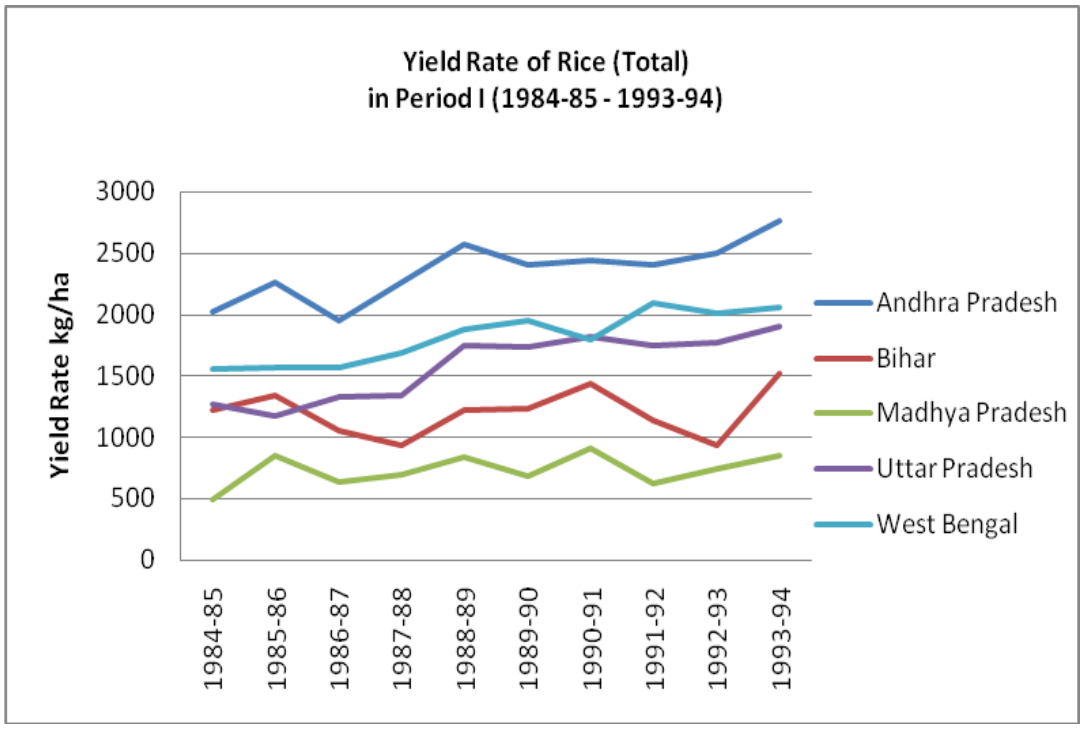
**Annexure Figure: 2.5**



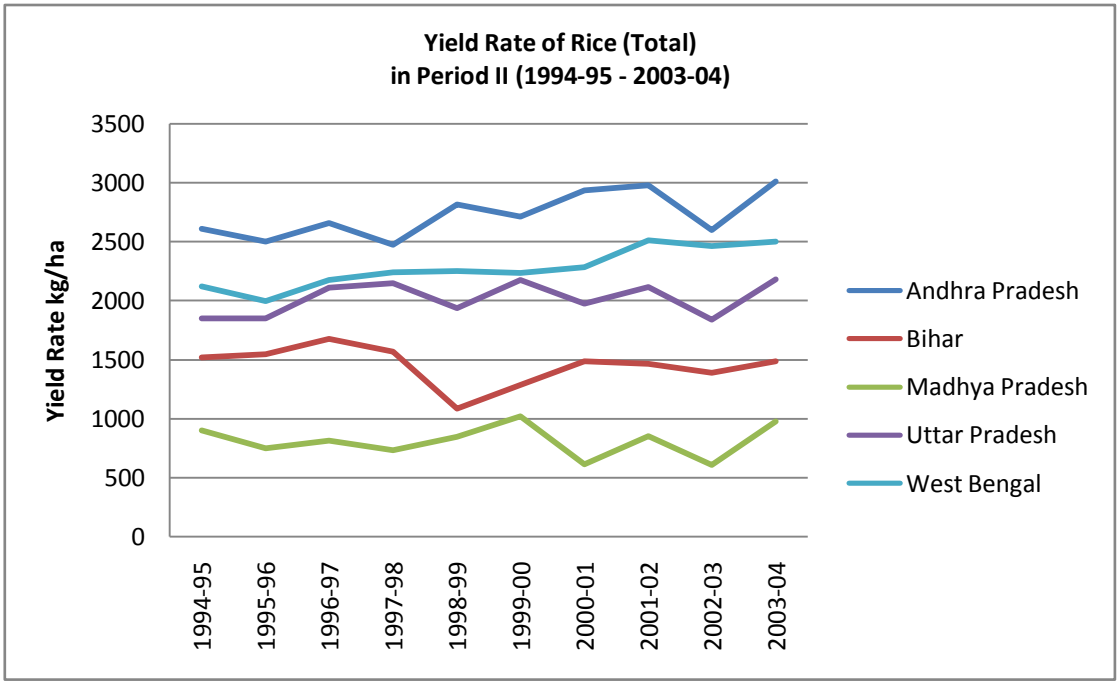

**Annexure Figure: 2.6**



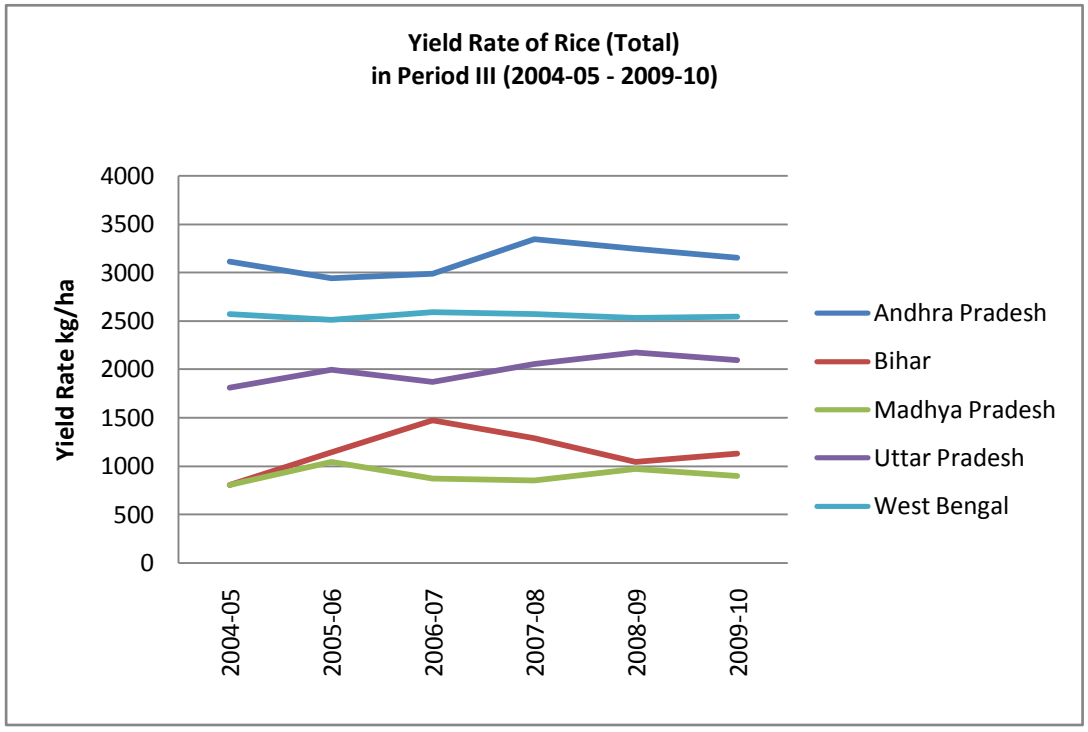
**Annexure Figure: 2.7**




**Annexure Figure: 2.8**



**Annexure Figure: 2.9**



*Annexure to Chapter III*

***Annexure Table 3.1*: Distribution of sample farmers according to farm size across States**

| States | Size classes of operational holdings (ha) | Hybrid adopters | | Non-adopters | |
|---|---|---|---|---|---|
| | | No of farms | Percent of farms | No of farms | Percent of farms |
| Andhra Pradesh | Below 1ha | 32 | 40.00 | 8 | 40.00 |
| | 1 – 2 | 24 | 30.00 | 6 | 30.00 |
| | 2 – 4 | 16 | 20.00 | 4 | 20.00 |
| | 4 – 10 | 8 | 10.00 | 2 | 10.00 |
| | 10 ha and above | - | - | - | - |
| | Total | 80 | 100.00 | 20 | 100.00 |
| Bihar | Below 1ha | 37 | 46.25 | 8 | 40.00 |
| | 1 – 2 | 25 | 31.25 | 6 | 30.00 |
| | 2 – 4 | 12 | 15.00 | 4 | 20.00 |
| | 4 – 10 | 6 | 7.50 | 2 | 10.00 |
| | 10 ha and above | - | - | - | - |
| | Total | 80 | 100.00 | 20 | 100.00 |
| Madhya Pradesh | Below 1ha | 16 | 20.00 | 4 | 20.00 |
| | 1 – 2 | 16 | 20.00 | 4 | 20.00 |
| | 2 – 4 | 16 | 20.00 | 4 | 20.00 |
| | 4 – 10 | 16 | 20.00 | 4 | 20.00 |
| | 10 ha and above | 16 | 20.00 | 4 | 20.00 |
| | Total | 80 | 100.00 | 20 | 100.00 |
| Uttar Pradesh | Below 1ha | 45 | 56.25 | 12 | 60.00 |
| | 1 – 2 | 15 | 18.75 | 6 | 30.00 |
| | 2 – 4 | 14 | 17.50 | 1 | 5.00 |
| | 4 – 10 | 6 | 7.50 | 1 | 5.00 |
| | 10 ha and above | - | - | - | - |
| | Total | 80 | 100.00 | 20 | 100.00 |
| West Bengal | Below 1ha | 60 | 75.00 | 16 | 80.00 |
| | 1 – 2 | 18 | 22.50 | 3 | 15.00 |
| | 2 – 4 | 2 | 2.50 | 1 | 5.00 |
| | 4 – 10 | - | - | - | - |
| | 10 ha and above | - | - | - | - |
| | Total | 80 | 100.00 | 20 | 100.00 |

Data source: Primary data

***Annexure Table 3.2-a*: The extent of adoption of hybrid rice technology by farm size in 2009-10**

(For hybrid adopters only)

| States | Farm size classes (ha) | Average farm size (ha) | Average rice area (ha) | Average rice area (ha) under | | Percent of rice area under | |
|---|---|---|---|---|---|---|---|
| | | | | HYVs | Hybrid | HYVs | Hybrid |
| Andhra Pradesh | Below 1ha | 1.35 | 1.15 | 0.37 | 0.78 | 32.17 | 67.83 |
| | 1 – 2 | 2.92 | 2.19 | 1.22 | 0.97 | 55.71 | 44.29 |
| | 2 – 4 | 5.23 | 3.18 | 2.31 | 0.88 | 72.64 | 27.67 |
| | 4 – 10 | 5.04 | 3.1 | 1.3 | 1.8 | 41.94 | 58.06 |
| | 10 ha & above | - | - | - | - | - | - |
| | All sizes | 3.64 | 2.41 | 1.30 | 1.11 | 53.94 | 46.06 |
| Bihar | Below 1ha | 0.41 | 0.31 | 0.27 | 0.04 | 87.10 | 12.90 |
| | 1 – 2 | 1.07 | 0.63 | 0.54 | 0.09 | 85.71 | 14.29 |
| | 2 – 4 | 2.09 | 1.35 | 1.18 | 0.18 | 87.41 | 13.33 |
| | 4 – 10 | 6.30 | 3.59 | 3.11 | 0.48 | 86.63 | 13.37 |
| | 10 ha & above | - | - | - | - | - | - |
| | All sizes | 1.31 | 0.82 | 0.71 | 0.11 | 86.59 | 13.41 |
| Madhya Pradesh | Below 1ha | 0.7 | 0.67 | 0.27 | 0.4 | 40.30 | 59.70 |
| | 1 – 2 | 1.49 | 1.34 | 0.52 | 0.82 | 38.81 | 61.19 |
| | 2 – 4 | 2.42 | 1.75 | 0.8 | 0.94 | 45.71 | 53.71 |
| | 4 – 10 | 4.81 | 3.54 | 1.64 | 1.9 | 46.33 | 53.67 |
| | 10 ha & above | 12.16 | 6.86 | 2.59 | 4.26 | 37.76 | 62.10 |
| | All sizes | 4.31 | 2.83 | 1.17 | 1.66 | 41.34 | 58.66 |
| Uttar Pradesh | Below 1ha | 0.78 | 0.73 | 0.56 | 0.17 | 76.71 | 23.29 |
| | 1 – 2 | 1.67 | 1.35 | 0.89 | 0.46 | 65.93 | 34.07 |
| | 2 – 4 | 3.29 | 2.8 | 2.04 | 0.77 | 72.86 | 27.50 |
| | 4 – 10 | 6.04 | 4.92 | 3.42 | 1.5 | 69.51 | 30.49 |
| | 10 ha & above | - | - | - | - | - | - |
| | All sizes | 1.78 | 1.52 | 1.42 | 0.1 | 93.42 | 6.58 |
| West Bengal | Below 1ha | 0.52 | 0.6 | 0.49 | 0.11 | 81.67 | 18.33 |
| | 1 – 2 | 1.28 | 1.62 | 1.42 | 0.19 | 87.65 | 11.73 |
| | 2 – 4 | 2.5 | 3.76 | 3.33 | 0.43 | 88.56 | 11.44 |
| | 4 – 10 | - | - | - | - | - | - |
| | 10 ha & above | - | - | - | - | - | - |
| | All sizes | 0.77 | 0.96 | 0.82 | 0.14 | 85.42 | 14.58 |

Data source: Primary data

***Annexure Table 3.2-b*: The extent of adoption of hybrid rice technology by farm size in 2010-11**

(For hybrid adopters only)

| States | Farm size classes (ha) | Average farm size (ha) | Average rice area (ha) | Average rice area (ha) under | | Percent of rice area under | |
|---|---|---|---|---|---|---|---|
| | | | | HYVs | Hybrid | HYVs | Hybrid |
| Andhra Pradesh | Below 1ha | 1.36 | 1.15 | 0.26 | 0.9 | 22.61 | 78.26 |
| | 1 – 2 | 2.92 | 2.19 | 1.03 | 1.16 | 47.03 | 52.97 |
| | 2 – 4 | 5.15 | 3.13 | 1.66 | 1.47 | 53.04 | 46.96 |
| | 4 – 10 | 4.77 | 3.06 | 1.39 | 1.66 | 45.42 | 54.25 |
| | 10 ha & above | - | - | - | - | - | - |
| | All sizes | 3.55 | 2.38 | 1.09 | 1.3 | 45.80 | 54.62 |
| Bihar | Below 1ha | 0.41 | 0.38 | 0.27 | 0.11 | 71.05 | 28.95 |
| | 1 – 2 | 1.07 | 0.68 | 0.56 | 0.12 | 82.35 | 17.65 |
| | 2 – 4 | 2 | 1.37 | 1.17 | 0.2 | 85.40 | 14.60 |
| | 4 – 10 | 6.3 | 3.62 | 3.1 | 0.52 | 85.64 | 14.36 |
| | 10 ha & above | - | - | - | - | - | - |
| | All sizes | 1.31 | 0.85 | 0.7 | 0.15 | 82.35 | 17.65 |
| Madhya Pradesh | Below 1ha | 0.7 | 0.68 | 0.18 | 0.5 | 26.47 | 73.53 |
| | 1 – 2 | 1.49 | 1.39 | 0.53 | 0.86 | 38.13 | 61.87 |
| | 2 – 4 | 2.42 | 1.86 | 0.8 | 1.06 | 43.01 | 56.99 |
| | 4 – 10 | 4.81 | 4.09 | 1.57 | 2.52 | 38.39 | 61.61 |
| | 10 ha & above | 12.16 | 7.24 | 2.93 | 4.31 | 40.47 | 59.53 |
| | All sizes | 4.31 | 3.05 | 1.2 | 1.85 | 39.34 | 60.66 |
| Uttar Pradesh | Below 1ha | 0.78 | 0.75 | 0.21 | 0.54 | 28.00 | 72.00 |
| | 1 – 2 | 1.67 | 1.38 | 0.62 | 0.68 | 44.93 | 49.28 |
| | 2 – 4 | 3.29 | 2.8 | 2.05 | 0.75 | 73.21 | 26.79 |
| | 4 – 10 | 6.04 | 4.96 | 3.46 | 1.5 | 69.76 | 30.24 |
| | 10 ha & above | - | - | - | - | - | - |
| | All sizes | 1.78 | 1.54 | 0.86 | 0.67 | 55.84 | 43.51 |
| West Bengal | Below 1ha | 0.52 | 0.58 | 0.44 | 0.14 | 75.86 | 24.14 |
| | 1 – 2 | 1.28 | 1.55 | 1.25 | 0.3 | 80.65 | 19.35 |
| | 2 – 4 | 2.5 | 3.56 | 3.03 | 0.53 | 85.11 | 14.89 |
| | 4 – 10 | - | - | - | - | - | - |
| | 10 ha & above | - | - | - | - | - | - |
| | All sizes | 0.77 | 0.92 | 0.73 | 0.2 | 79.35 | 21.74 |

Data source: Primary data

## *Annexure Table 3.3-a*: Household Size of sample farm households across States

| States | Particulars | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|---|
| Andhra Pradesh# | Male[1] | 2.43 | 2.15 | 2.37 |
| | % [2] | 52.72 | 51.19 | 52.43 |
| | Female [3] | 2.18 | 2.05 | 2.15 |
| | % [4] | 47.28 | 48.81 | 47.57 |
| | Total [5] | 4.60 | 4.20 | 4.52 |
| | % [6] | 100.00 | 100.00 | 100.00 |
| Bihar | Male | 4.65 | 4.55 | 4.63 |
| | % | 62.59 | 62.76 | 62.66 |
| | Female | 2.78 | 2.70 | 2.76 |
| | % | 37.41 | 37.24 | 37.34 |
| | Total | 7.40 | 7.25 | 7.39 |
| | % | 100.00 | 100.00 | 100.00 |
| Madhya Pradesh* | Male | *77* | *19* | *96* |
| | % | *96.25* | *95.00* | *96.00* |
| | Female | *3* | *1* | *4* |
| | % | *3.75* | *5.00* | *4.00* |
| | Total | *80* | *20* | *100* |
| | % | *100.00* | *100.00* | *100.00* |
| Uttar Pradesh | Male | 6.01 | 5.30 | 5.87 |
| | % | 54.17 | 53.81 | 54.10 |
| | Female | 5.09 | 4.55 | 4.98 |
| | % | 45.83 | 46.19 | 45.90 |
| | Total | 11.10 | 9.85 | 10.85 |
| | % | 100.00 | 100.00 | 100.00 |
| West Bengal | Male | 3.48 | 2.95 | 3.37 |
| | % | 55.94 | 50.00 | 54.80 |
| | Female | 2.74 | 2.95 | 2.78 |
| | % | 44.06 | 50.00 | 45.20 |
| | Total | 6.21 | 5.90 | 6.15 |
| | % | 100.00 | 100.00 | 100.00 |

Data source: Primary data

# Data for Andhra Pradesh obtained by dividing supplied data on members by total no. of household

[1] Average no. of male members per household

[2] Percentage of male members to total population

[3] Average no. of female members per household

[4] Percentage of female members to total population

[5] Average no. of male & female members per household

[6] Percentage of male & female members to total household size

* Data for Madhya Pradesh relates to Head of the Household instead of no. of average no. of male/female members.

## *Annexure Table 3.3-b*: Size of Workers of sample farm households across States

| States | Particulars | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|---|
| Andhra Pradesh# | Male[1] | 1.48 | 1.55 | 1.49 |
| | % [2] | 53.39 | 52.54 | 53.21 |
| | Female [3] | 1.29 | 1.40 | 1.31 |
| | % [4] | 46.61 | 47.46 | 46.79 |
| | Total [5] | 2.76 | 2.95 | 2.80 |
| | % [6] | 100.00 | 100.00 | 100.00 |
| Bihar | Male | 2.35 | 2.30 | 2.34 |
| | % | 57.74 | 58.97 | 57.92 |
| | Female | 1.72 | 1.60 | 1.70 |
| | % | 42.26 | 41.03 | 42.08 |
| | Total | 4.07 | 3.90 | 4.04 |
| | % | 100.00 | 100.00 | 100.00 |
| Madhya Pradesh* | Male | *2* | *2* | *2* |
| | % | *66.66* | *66.66* | *66.66* |
| | Female | *1* | *1* | *1* |
| | % | *33.33* | *33.33* | *33.33* |
| | Total | *3* | *3* | *3* |
| | % | *100.00* | *100.00* | *100.00* |
| Uttar Pradesh | Male | 3.06 | 2.65 | 2.98 |
| | % | 57.78 | 53.54 | 56.98 |
| | Female | 2.24 | 2.30 | 2.25 |
| | % | 42.22 | 46.46 | 43.02 |
| | Total | 5.30 | 4.95 | 5.23 |
| | % | 100.00 | 100.00 | 100.00 |
| West Bengal | Male | 1.93 | 1.50 | 1.84 |
| | % | 63.37 | 58.82 | 62.59 |
| | Female | 1.11 | 1.05 | 1.10 |
| | % | 36.63 | 41.18 | 37.41 |
| | Total | 3.04 | 2.55 | 2.94 |
| | % | 100.00 | 100.00 | 100.00 |

Data source: Primary data

# Data for Andhra Pradesh obtained by dividing supplied data on members by total no. of household

[1] Average no. of male workers per household

[2] Percentage of male workers to total no. of workers

[3] Average no. of female workers per household

[4] Percentage of female workers to total no. of workers

[5] Average no. of male & female worker per household

[6] Percentage of male & female workers to total no. of workers

* Data for Madhya Pradesh relates to Head of the Household instead of average no. of male/female worker.

## *Annexure Table 3.3-c*: Age group of Head of sample farm households across States

| States | Age Groups | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|---|
| Andhra Pradesh* | < 18 | *87* | *18* | *105* |
| | % | *23.64* | *21.43* | *23.23* |
| | 18 – 60 | *281* | *66* | *347* |
| | % | *76.36* | *78.57* | *76.77* |
| | > 60 | *9* | *4* | *13* |
| | % | *10.98* | *20* | *12.75* |
| | Total | *377* | *88* | *465* |
| | % | *100.00* | *100.00* | *100.00* |
| Bihar | < 18 | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | 18 – 60 | 74 | 18 | 92 |
| | % | 92.50 | 90.00 | 92.00 |
| | > 60 | 6 | 2 | 8 |
| | % | 7.50 | 10.00 | 8.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |
| Madhya Pradesh | < 18 | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | 18 – 60 | 72 | 17 | 89 |
| | % | 90.00 | 85.00 | 89.00 |
| | > 60 | 8 | 3 | 11 |
| | % | 10.00 | 15.00 | 11.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |
| Uttar Pradesh | < 18 | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | 18 – 60 | 57 | 13 | 70 |
| | % | 71.25 | 65.00 | 70.00 |
| | > 60 | 23 | 7 | 30 |
| | % | 28.75 | 35.00 | 30.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |
| West Bengal | < 18 | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | 18 – 60 | 79 | 16 | 95 |
| | % | 98.75 | 80.00 | 95.00 |
| | > 60 | 1 | 4 | 5 |
| | % | 1.25 | 20.00 | 5.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |

Data source: Primary data

* Data for Andhra Pradesh relates to all members of the households instead of head of households.

## *Annexure Table 3.3-d*: Educational Status of Head of sample farm households across States

| States | Educational Levels | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|---|
| Andhra Pradesh | Illiterate | 22 | 9 | 31 |
| | % | 27.50 | 45.00 | 31.00 |
| | Up to Primary | 37 | 5 | 42 |
| | % | 46.25 | 25.00 | 42.00 |
| | Up to secondary | 12 | 2 | 14 |
| | % | 15.00 | 10.00 | 14.00 |
| | Up to Graduate | 2 | 0 | 2 |
| | % | 2.50 | 0.00 | 2.00 |
| | Above Graduate | 7 | 4 | 11 |
| | % | 8.75 | 20.00 | 11.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |
| Bihar | Illiterate | 12 | 4 | 16 |
| | % | 15.00 | 20.00 | 16.00 |
| | Up to Primary | 28 | 8 | 36 |
| | % | 35.00 | 40.00 | 36.00 |
| | Up to secondary | 22 | 6 | 28 |
| | % | 27.50 | 30.00 | 28.00 |
| | Up to Graduate | 14 | 2 | 16 |
| | % | 17.50 | 10.00 | 16.00 |
| | Above Graduate | 4 | 00 | 4 |
| | % | 5.00 | 0.00 | 4.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |
| Madhya Pradesh | Illiterate | 8 | 4 | 12 |
| | % | 10.00 | 20.00 | 12.00 |
| | Up to Primary | 10 | 2 | 12 |
| | % | 12.50 | 10.00 | 12.00 |
| | Up to secondary | 42 | 11 | 53 |
| | % | 52.50 | 55.00 | 53.00 |
| | Up to Graduate | 15 | 3 | 18 |
| | % | 18.75 | 15.00 | 18.00 |
| | Above Graduate | 5 | 0 | 5 |
| | % | 6.25 | 0.00 | 5.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |
| Uttar Pradesh | Illiterate | 11 | 3 | 14 |
| | % | 13.75 | 15.00 | 14.00 |
| | Up to Primary | 12 | 2 | 14 |
| | % | 15.00 | 10.00 | 14.00 |
| | Up to secondary | 41 | 12 | 53 |
| | % | 51.25 | 60.00 | 53.00 |
| | Up to Graduate | 13 | 2 | 15 |
| | % | 016.25 | 10.00 | 15.00 |
| | Above Graduate | 3 | 1 | 4 |
| | % | 3.75 | 5.00 | 4.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |

*Table 3.3d: continued.....*

| | | | | |
|---|---|---|---|---|
| West Bengal | Illiterate | 3 | 0 | 3 |
| | % | 3.75 | 0.00 | 3.00 |
| | Up to Primary | 30 | 6 | 36 |
| | % | 37.50 | 30.00 | 36.00 |
| | Up to secondary | 45 | 13 | 58 |
| | % | 56.25 | 65.00 | 58.00 |
| | Up to Graduate | 2 | 1 | 3 |
| | % | 2.50 | 5.00 | 3.00 |
| | Above Graduate | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |

Data source: Primary data

## *Annexure Table 3.3-e*: Caste Composition of sample farm households across States

| States | Castes | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|---|
| Andhra Pradesh | SC | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | ST | 61 | 10 | 71 |
| | % | 76.25 | 50.00 | 71.00 |
| | OBC | 13 | 4 | 17 |
| | % | 16.25 | 20.00 | 17.00 |
| | General | 6 | 6 | 12 |
| | % | 7.50 | 30.00 | 12.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |
| Bihar | SC | 8 | 2 | 10 |
| | % | 10.00 | 10.00 | 10.00 |
| | ST | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | OBC | 46 | 14 | 60 |
| | % | 57.50 | 70.00 | 60.00 |
| | General | 26 | 4 | 30 |
| | % | 32.50 | 20.00 | 30.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |
| Madhya Pradesh | SC | 11 | 2 | 13 |
| | % | 13.75 | 10.00 | 13.00 |
| | ST | 10 | 1 | 11 |
| | % | 12.50 | 5.00 | 11.00 |
| | OBC | 46 | 12 | 58 |
| | % | 57.50 | 60.00 | 58.00 |
| | General | 13 | 5 | 18 |
| | % | 16.25 | 25.00 | 18.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |
| Uttar Pradesh | SC | 18 | 1 | 19 |
| | % | 22.50 | 5.00 | 19.00 |
| | ST | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | OBC | 25 | 8 | 33 |
| | % | 31.25 | 40.00 | 33.00 |
| | General | 37 | 11 | 48 |
| | % | 46.25 | 55.00 | 48.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |
| West Bengal | SC | 20 | 5 | 25 |
| | % | 25.00 | 25.00 | 25.00 |
| | ST | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | OBC | 1 | 0 | 1 |
| | % | 1.25 | 0.00 | 1.00 |
| | General | 59 | 15 | 74 |
| | % | 73.75 | 75.00 | 74.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |

Data source: Primary data

***Annexure Table 3.3-f*: Main Occupation of the Head of sample farm households across States**

| States | Nature of Employment | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|---|
| Andhra Pradesh* | Self-employed Farming | na | na | na |
| | % | na | na | na |
| | Self-employed Non-farming/ Business | na | na | na |
| | % | na | na | na |
| | Salaried Person | na | na | na |
| | % | na | na | na |
| | Agriculture Labour | na | na | na |
| | % | na | na | na |
| | Non-agricultural Labour | na | na | na |
| | % | na | na | na |
| | Pensioner | na | na | na |
| | % | na | na | na |
| | Household Work | na | na | na |
| | % | na | na | na |
| | Student | na | na | na |
| | % | na | na | na |
| | Others (specify) | na | na | na |
| | % | na | na | na |
| | Total | na | na | na |
| | % | na | na | na |
| Bihar | Self-employed Farming | 52 | 11 | 63 |
| | % | 65.00 | 55.00 | 63.00 |
| | Self-employed Non-farming/ Business | 6 | 4 | 10 |
| | % | 7.50 | 20.00 | 10.00 |
| | Salaried Person | 4 | 1 | 5 |
| | % | 5.00 | 5.00 | 5.00 |
| | Agriculture Labour | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Non-agricultural Labour | 2 | 2 | 4 |
| | % | 2.50 | 10.00 | 4.00 |
| | Pensioner | 2 | 0 | 2 |
| | % | 2.50 | 0.00 | 2.00 |
| | Household Work | 14 | 2 | 16 |
| | % | 17.50 | 10.00 | 16.00 |
| | Student | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Others (specify) | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |

*Table 3.3-f: continued.....*

| | | | | |
|---|---|---|---|---|
| Madhya Pradesh | Self-employed Farming | 59 | 13 | 72 |
| | % | 73.75 | 65.00 | 72.00 |
| | Self-employed Non-farming/ Business | 3 | 1 | 4 |
| | % | 3.75 | 5.00 | 4.00 |
| | Salaried Person | 2 | 0 | 2 |
| | % | 2.50 | 0.00 | 2.00 |
| | Agriculture Labour | 9 | 4 | 13 |
| | % | 11.25 | 20.00 | 13.00 |
| | Non-agricultural Labour | 6 | 1 | 7 |
| | % | 7.50 | 5.00 | 7.00 |
| | Pensioner | 1 | 1 | 2 |
| | % | 1.25 | 5.00 | 2.00 |
| | Household Work | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Student | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Others (specify) | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |
| Uttar Pradesh | Self-employed Farming | 66 | 13 | 79 |
| | % | 82.50 | 65.00 | 79.00 |
| | Self-employed Non-farming/ Business | 3 | 3 | 6 |
| | % | 3.75 | 15.00 | 6.00 |
| | Salaried Person | 1 | 2 | 3 |
| | % | 1.25 | 10.00 | 3.00 |
| | Agriculture Labour | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Non-agricultural Labour | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Pensioner | 3 | 0 | 3 |
| | % | 3.75 | 0.00 | 3.00 |
| | Household Work | 1 | 2 | 3 |
| | % | 1.25 | 10.00 | 3.00 |
| | Student | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Others (specify) | 6 | 0 | 6 |
| | % | 7.50 | 0.00 | 6.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |

*Table 3.3-f: continued.....*

| | | | | |
|---|---|---|---|---|
| West Bengal | Self-employed Farming | 71 | 18 | 89 |
| | % | 88.75 | 90.00 | 89.00 |
| | Self-employed Non-farming/ Business | 1 | 2 | 3 |
| | % | 1.25 | 10.00 | 3.00 |
| | Salaried Person | 7 | 0 | 7 |
| | % | 8.75 | 0.00 | 7.00 |
| | Agriculture Labour | 1 | 0 | 1 |
| | % | 1.25 | 0.00 | 1.00 |
| | Non-agricultural Labour | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Pensioner | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Household Work | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Student | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Others (specify) | 0 | 0 | 0 |
| | % | 0.00 | 0.00 | 0.00 |
| | Total | 80 | 20 | 100 |
| | % | 100.00 | 100.00 | 100.00 |

Data source: Primary data

* Data for Andhra Pradesh not furnished.

***Annexure Table 3.3-g*: Average size of Holding of sample farm households across States**

| States | Nature of Landholding | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|---|
| Andhra Pradesh | Ownership holdings (ha) | 5.08 | 4.21 | 4.91 |
| | Operational holdings (ha) | 5.10 | 4.21 | 4.93 |
| Bihar | Ownership holdings (ha) | 1.31 | 1.28 | 1.30 |
| | Operational holdings (ha) | 1.25 | 1.22 | 1.24 |
| Madhya Pradesh | Ownership holdings (ha) | 4.29 | 3.66 | 3.98 |
| | Operational holdings (ha) | 4.73 | 4.09 | 4.41 |
| Uttar Pradesh | Ownership holdings (ha) | 1.78 | 1.36 | 1.69 |
| | Operational holdings (ha) | 1.78 | 1.36 | 1.69 |
| West Bengal | Ownership holdings (ha) | 0.72 | 0.67 | 0.71 |
| | Operational holdings (ha) | 0.77 | 0.71 | 0.76 |

Data source: Primary data

***Annexure Table 3.3-h*: Season wise average size of irrigated land (ha) of sample farm households across States**

| States | Characteristics | Hybrid adopters | Non-adopters | Aggregate |
|---|---|---|---|---|
| Andhra Pradesh | Kharif | 4.07 | 2.88 | 3.88 |
| | % | 60.00 | 58.00 | 60.00 |
| | Rabi | 2.68 | 2.12 | 2.60 |
| | % | 40.00 | 42.00 | 40.00 |
| | Summer | 0.00 | 0.00 | 0.00 |
| | % | 0.00 | 0.00 | 0.00 |
| | Total (All Seasons) | 6.75 | 5.00 | 6.47 |
| | % | 100.00 | 100.00 | 100.00 |
| Bihar | Kharif | 0.80 | 0.79 | 0.79 |
| | % | 64.52 | 62.20 | 63.20 |
| | Rabi | 0.44 | 0.48 | 0.46 |
| | % | 35.48 | 37.80 | 36.80 |
| | Summer | 0.00 | 0.00 | 0.00 |
| | % | 0.00 | 0.00 | 0.00 |
| | Total (All Seasons) | 1.24 | 1.27 | 1.25 |
| | % | 100.00 | 100.00 | 100.00 |
| Madhya Pradesh | Kharif | 4.64 | 3.82 | 4.23 |
| | % | 98.10 | 93.40 | 95.75 |
| | Rabi | 4.58 | 3.74 | 4.16 |
| | % | 96.83 | 91.44 | 94.14 |
| | Summer | 0.00 | 0.00 | 0.00 |
| | % | 0.00 | 0.00 | 0.00 |
| | Total (All Seasons) | 9.22 | 7.56 | 8.39 |
| | % | 100.00 | 100.00 | 100.00 |
| Uttar Pradesh | Kharif | 1.78 | 1.36 | 1.69 |
| | % | 100.00 | 100.00 | 100.00 |
| | Rabi | 1.78 | 1.36 | 1.69 |
| | % | 100.00 | 100.00 | 100.00 |
| | Summer | 0.00 | 0.00 | 0.00 |
| | % | 0.00 | 0.00 | 0.00 |
| | Total (All Seasons) | 3.56 | 2.72 | 3.38 |
| | % | 1.78 | 1.36 | 1.69 |
| West Bengal | Kharif | 0.55 | 0.50 | 0.54 |
| | % | 39.48 | 45.12 | 40.42 |
| | Rabi | 0.33 | 0.18 | 0.30 |
| | % | 24.02 | 16.06 | 22.69 |
| | Summer | 0.51 | 0.43 | 0.49 |
| | % | 36.50 | 38.82 | 36.89 |
| | Total (All Seasons) | 1.39 | 1.11 | 1.33 |
| | % | 100.00 | 100.00 | 100.00 |

Data source: Primary data

## *Annexure Table 3.4-a*: Cropping pattern for the years 2009-10 for Hybrid Adopters

| Seasons/Crops | Andhra Pradesh | | Bihar | | Madhya Pradesh* | | Uttar Pradesh | | West Bengal | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent |
| **Kharif** | **142.59** | **60.14** | **99.25** | **71.66** | **354.40** | **49.11** | **142.30** | **50.00** | **46.29** | **43.74** |
| Hybrid Rice | 41.89 | 17.67 | | | 132.80 | 18.40 | | | 1.20 | 1.13 |
| Inbred Rice | 77.42 | 32.66 | | | 97.60 | 13.53 | | | 39.43 | 37.26 |
| Rice (undefined) | | | 65.25 | 47.11 | | | 121.85 | 42.81 | | |
| Jute | | | | | | | | | 2.53 | 2.39 |
| Betel leaf (Pan) | | | | | | | | | 3.13 | 2.96 |
| Groundnut | 9.11 | 3.84 | | | | | | | | |
| Turmeric | 7.49 | 3.16 | | | | | | | | |
| Soya been | 2.23 | 0.94 | | | 100.80 | 13.97 | | | | |
| Maize | 2.02 | 0.85 | 18.13 | 13.09 | | | | | | |
| Sugarcane | 2.43 | 1.02 | | | | | 9.90 | 3.48 | | |
| Others (undefined) | | | 15.87 | 11.46 | 1.60 | 0.22 | 10.55 | 3.71 | | |
| Urd & Moong | | | | | 15.20 | 2.11 | | | | |
| Arhar | | | | | 6.40 | 0.89 | | | | |
| **Rabi** | **94.49** | **39.86** | **39.25** | **28.34** | **367.20** | **50.89** | **142.30** | **50.00** | **22.27** | **21.05** |
| Hybrid Paddy | 35.81 | 15.10 | | | | | | | | |
| Hyv Paddy | 10.12 | 4.27 | | | | | | | | |
| Wheat | | | 26.50 | 19.13 | 267.20 | 37.03 | 107.70 | 37.84 | 8.23 | 7.78 |
| Maize | 2.63 | 1.11 | 2.83 | 2.04 | | | | | 10.27 | 9.71 |
| Mustard | | | | | | | | | 1.67 | 1.58 |
| Potato | | | | | | | | | 0.47 | 0.44 |
| Maskalai | | | | | | | | | 1.63 | 1.54 |
| black gram | 8.70 | 3.67 | | | | | | | | |
| Seasmum | 9.51 | 4.01 | | | | | | | | |
| Groundnut | 21.85 | 9.22 | | | | | | | | |
| G.GRAM | 1.82 | 0.77 | | | | | | | | |
| Turmeric | 4.05 | 1.71 | | | | | | | | |
| Pulse (undefined) | | | 8.25 | 5.96 | | | | | | |
| Others (undefined) | | | 1.67 | 1.21 | 5.60 | 0.78 | | | | |
| Gram (undefined) | | | | | 60.00 | 8.31 | 7.82 | 2.75 | | |
| Sugarcane & others | | | | | | | 26.78 | 9.41 | | |
| Masoor | | | | | 27.20 | 3.77 | | | | |
| Pea | | | | | 7.20 | 1.00 | | | | |
| **Summer** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **37.26** | **35.21** |
| Hybrid Rice | | | | | | | | | 10.13 | 9.57 |
| Inbred Rice | | | | | | | | | 26.20 | 24.76 |
| Maize | | | | | | | | | 0.93 | 0.88 |
| **GCA** | **237.08** | **100.00** | **138.50** | **100.00** | **721.60** | **100.00** | **284.60** | **100.00** | **105.82** | **100.00** |

Data source: Primary data

* Average data converted into total by multiplying by 80 (no. of adopter households) for Madhya Pradesh

## *Annexure Table 3.4-b*: Cropping pattern for the years 2010-11 for Hybrid Adopters

| Seasons/Crops | Andhra Pradesh | | Bihar | | Madhya Pradesh* | | Uttar Pradesh | | West Bengal | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent |
| **Kharif** | **145.01** | **62.07** | **100.42** | **73.48** | **360.80** | **49.02** | **142.30** | **50.00** | **44.89** | **42.82** |
| Hybrid Rice | 57.06 | 24.42 | | | 148.00 | 20.11 | | | 2.73 | 2.60 |
| Inbred Rice | 64.67 | 27.68 | | | 96.80 | 13.15 | | | 37.50 | 35.77 |
| Rice (undefined) | | | 68.00 | 49.75 | | | 123.20 | 43.29 | | |
| Jute | | | | | | | | | 1.53 | 1.46 |
| Betel leaf (Pan) | | | | | | | | | 3.13 | 2.99 |
| Groundnut | 9.11 | 3.90 | | | | | | | | |
| Turmeric | 7.49 | 3.21 | | | | | | | | |
| Soya been | 2.23 | 0.95 | | | 99.20 | 13.48 | | | | |
| Maize | 2.02 | 0.86 | 17.50 | 12.80 | | | | | | |
| Sugarcane | 2.43 | 1.04 | | | | | 9.25 | 3.25 | | |
| Others (undefined) | | | 14.92 | 10.92 | 1.60 | 0.22 | 9.85 | 3.46 | | |
| Urd & Moong | | | | | 11.20 | 1.52 | | | | |
| Arhar | | | | | 4.00 | 0.54 | | | | |
| **Rabi** | **88.63** | **37.93** | **36.25** | **26.52** | **375.20** | **50.98** | **142.30** | **50.00** | **23.00** | **21.94** |
| Hybrid Paddy | 36.62 | 15.67 | | | | | | | | |
| Hyv Paddy | 5.67 | 2.43 | | | | | | | | |
| Wheat | | | 27.50 | 20.12 | 261.60 | 35.54 | 111.65 | 39.23 | 7.83 | 7.47 |
| Maize | 1.62 | 0.69 | 2.26 | 1.65 | | | | | 11.80 | 11.26 |
| Mustard | | | | | | | | | 1.47 | 1.40 |
| Potato | | | | | | | | | 0.50 | 0.48 |
| Maskalai | | | | | | | | | 1.40 | 1.34 |
| black gram | 8.30 | 3.55 | | | | | | | | |
| Seasmum | 8.90 | 3.81 | | | | | | | | |
| Groundnut | 21.65 | 9.27 | | | | | | | | |
| G.GRAM | 1.82 | 0.78 | | | 69.60 | 9.46 | 6.84 | 2.40 | | |
| Turmeric | 4.05 | 1.73 | | | | | | | | |
| Pulse (undefined) | | | 4.30 | 3.15 | | | | | | |
| Others (undefined) | | | 2.19 | 1.60 | 6.40 | 0.87 | | | | |
| Gram (undefined) | | | | | | | | | | |
| Sugarcane & others | | | | | | | 23.81 | 8.37 | | |
| Masoor | | | | | 26.40 | 3.59 | | | | |
| Pea | | | | | 11.20 | 1.52 | | | | |
| **Summer** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **36.94** | **35.24** |
| Hybrid Rice | | | | | | | | | 12.87 | 12.28 |
| Inbred Rice | | | | | | | | | 20.87 | 19.91 |
| Maize | | | | | | | | | 3.20 | 3.05 |
| **GCA** | **233.64** | **100.00** | **136.67** | **100.00** | **736.00** | **100.00** | **284.60** | **100.00** | **104.83** | **100.00** |

Data source: Primary data

* Average data converted into total by multiplying by 80 (no. of adopter households) for Madhya Pradesh

## *Annexure Table 3.4-c*: Cropping pattern for the years 2009-10 for Non-Adopters

| Seasons/Crops | Andhra Pradesh | | Bihar | | Madhya Pradesh* | | Uttar Pradesh | | West Bengal | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent |
| **Kharif** | **30.25** | **62.81** | **24.80** | **73.48** | **75.60** | **48.90** | **27.18** | **50.00** | **10.24** | **47.92** |
| Hybrid Rice | | | | | | | | | | |
| Inbred Rice | 24.08 | 50.00 | | | 45.80 | 29.62 | | | 9.67 | 45.25 |
| Rice (undefined) | | | 16.61 | 49.21 | | | 23.85 | 43.87 | | |
| Jute | | | | | | | | | 0.20 | 0.94 |
| Betel leaf (Pan) | | | | | | | | | 0.37 | 1.73 |
| Groundnut | | | | | | | | | | |
| Turmeric | 6.17 | 12.81 | | | | | | | | |
| Soya been | | | | | 20.20 | 13.07 | | | | |
| Maize | | | 4.02 | 11.91 | | | | | | |
| Sugarcane | | | | | | | 1.65 | 3.04 | | |
| Others (undefined) | | | 4.17 | 12.36 | 2.00 | 1.29 | 1.68 | 3.09 | | |
| Urd & Moong | | | | | 4.40 | 2.85 | | | | |
| Arhar | | | | | 3.20 | 2.07 | | | | |
| **Rabi** | **17.91** | **37.19** | **8.95** | **26.52** | **79.00** | **51.10** | **27.18** | **50.00** | **2.87** | **13.43** |
| Hybrid Paddy | | | | | | | | | | |
| Hyv Paddy | 12.95 | 26.89 | | | | | | | | |
| Wheat | | | 6.11 | 18.10 | 50.60 | 32.73 | 22.10 | 40.65 | 0.80 | 3.74 |
| Maize | | 0.00 | 1.02 | 3.02 | | | | | 1.27 | 5.94 |
| Mustard | | | | | | | | | 0.40 | 1.87 |
| Potato | | | | | | | | | 0.10 | 0.47 |
| Maskalai | | | | | | | | | 0.30 | 1.40 |
| black gram | 0.81 | 1.68 | | | | | | | | |
| Seasmum | 0.40 | 0.83 | | | | | | | | |
| Groundnut | 3.24 | 6.73 | | | | | | | | |
| G.GRAM | | | | | 18.00 | 11.64 | 1.43 | 2.63 | | |
| Turmeric | 0.51 | 1.06 | | | | | | | | |
| Pulse (undefined) | | | 1.09 | 3.23 | | | | | | |
| Others (undefined) | | | 0.73 | 2.16 | 1.20 | 0.78 | | | | |
| Gram (undefined) | | | | | | | | | | |
| Sugarcane & others | | | | | | | 3.65 | 6.71 | | |
| Masoor | | | | | 7.40 | 4.79 | | | | |
| Pea | | | | | 1.80 | 1.16 | | | | |
| **Summer** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **8.26** | **38.65** |
| Hybrid Rice | | | | | | | | | | |
| Inbred Rice | | | | | | | | | 8.13 | 38.04 |
| Maize | | | | | | | | | 0.13 | 0.61 |
| **GCA** | **48.16** | **100.00** | **33.75** | **100.00** | **154.60** | **100.00** | **54.36** | **100.00** | **21.37** | **100.00** |

Data source: Primary data

* Average data converted into total by multiplying by 20 (no. of non-adopter households) for Madhya Pradesh

## *Annexure Table 3.4-d*: Cropping pattern for the years 2010-11 for Non-Adopters

| Seasons/Crops | Andhra Pradesh | | Bihar | | Madhya Pradesh* | | Uttar Pradesh | | West Bengal | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent | Area (ha) | percent |
| **Kharif** | **30.25** | **62.81** | **24.14** | **73.42** | **77.00** | **48.61** | **27.18** | **50.00** | **10.24** | **47.92** |
| Hybrid Rice | | | | | | | | | | |
| Inbred Rice | 24.08 | 50.00 | | | 47.60 | 30.05 | | | 9.67 | 45.25 |
| Rice (undefined) | | | 15.97 | 48.57 | | | 23.65 | 43.51 | | |
| Jute | | | | | | | | | 0.2 | 0.94 |
| Betel leaf (Pan) | | | | | | | | | 0.37 | 1.73 |
| Groundnut | | | | | | | | | | |
| Turmeric | 6.17 | 12.81 | | | | | | | | |
| Soya been | | | | | 23.40 | 14.77 | | | | |
| Maize | | | 3.89 | 11.83 | | | | | | |
| Sugarcane | | | | | | | 1.6 | 2.94 | | |
| Others (undefined) | | | 4.28 | 13.02 | 1.60 | 1.01 | 1.93 | 3.55 | | |
| Urd & Moong | | | | | 2.60 | 1.64 | | | | |
| Arhar | | | | | 1.80 | 1.14 | | | | |
| **Rabi** | **17.91** | **37.19** | **8.74** | **26.58** | **81.40** | **51.39** | **27.18** | **50.00** | **2.86** | **13.38** |
| Hybrid Paddy | | | | | | | | | | |
| Hyv Paddy | 12.95 | 26.89 | | | | | | | | |
| Wheat | | | 5.87 | 17.85 | 53.60 | 33.84 | 21.98 | 40.43 | 0.6 | 2.81 |
| Maize | | | 1.03 | 3.13 | | | | | 1.53 | 7.16 |
| Mustard | | | | | | | | | 0.33 | 1.54 |
| Potato | | | | | | | | | 0.1 | 0.47 |
| Maskalai | | | | | | | | | 0.3 | 1.40 |
| black gram | 0.81 | 1.68 | | | | | | | | |
| Seasmum | 0.4 | 0.83 | | | | | | | | |
| Groundnut | 3.24 | 6.73 | | | | | | | | |
| G.GRAM | | | | | 18.60 | 11.74 | 1.5 | 2.76 | | |
| Turmeric | 0.51 | 1.06 | | | | | | | | |
| Pulse (undefined) | | | 1.11 | 3.38 | | | | | | |
| Others (undefined) | | | 0.73 | 2.22 | 0.80 | 0.51 | | | | |
| Gram (undefined) | | | | | | | | | | |
| Sugarcane & others | | | | | | | 3.7 | 6.81 | | |
| Masoor | | | | | 6.40 | 4.04 | | | | |
| Pea | | | | | 2.00 | 1.26 | | | | |
| **Summer** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **8.27** | **38.70** |
| Hybrid Rice | | | | | | | | | | |
| Inbred Rice | | | | | | | | | 7.2 | 33.69 |
| Maize | | | | | | | | | 1.07 | 5.01 |
| **GCA** | **48.16** | **100.00** | **32.88** | **100.00** | **158.40** | **100.00** | **54.36** | **100.00** | **21.37** | **100.00** |

Data source: Primary data

* Average data converted into total by multiplying by 20 (no. of non-adopter households) for Madhya Pradesh

***Annexure Table 3.5-a*: Farmers accessing source of information on hybrid rice technology across States**

**(**For Hybrid adopters only)

| States | Source | Number of farmers reporting | Percent of farmers reporting |
|---|---|---|---|
| Andhra Pradesh | Frontline demonstration programme conducted by government | 70 | 87.50 |
| | Participation in training programme organized by the government | 30 | 37.50 |
| | Krishi Vigyan Kendra | 0 | 0.00 |
| | Extension worker of state department of agriculture | 63 | 78.75 |
| | Television | 35 | 43.75 |
| | Radio | 14 | 17.50 |
| | Newspaper | 32 | 40.00 |
| | Input dealer | 40 | s50.00 |
| | Progressive farmer | 25 | 31.25 |
| | Private agency/ NGO | 64 | 80.00 |
| | Output buyers/food processor | 20 | 25.00 |
| | Credit agency | 5 | 6.25 |
| | Others | 0 | 0.00 |
| Bihar | Frontline demonstration programme conducted by government | 0 | 0.00 |
| | Participation in training programme organized by the government | 36 | 45.00 |
| | Krishi Vigyan Kendra | 4 | 5.00 |
| | Extension worker of state department of agriculture | 49 | 61.25 |
| | Television | 0 | 0.00 |
| | Radio | 0 | 0.00 |
| | Newspaper | 0 | 0.00 |
| | Input dealer | 0 | 0.00 |
| | Progressive farmer | 17 | 21.25 |
| | Private agency/ NGO | 0 | 0.00 |
| | Output buyers/food processor | 0 | 0.00 |
| | Credit agency | 0 | 0.00 |
| | Others | 0 | 0.00 |
| Madhya Pradesh | Frontline demonstration programme conducted by government | 27 | 33.75 |
| | Participation in training programme organized by the government | 15 | 18.75 |
| | Krishi Vigyan Kendra | 48 | 60 |
| | Extension worker of state department of agriculture | 68 | 85 |
| | Television | 27 | 33.75 |
| | Radio | 32 | 40 |
| | Newspaper | 16 | 20 |
| | Input dealer | 37 | 46.25 |
| | Progressive farmer | 11 | 13.75 |
| | Private agency/ NGO | 1.0 | 1.25 |
| | Output buyers/food processor | 3.0 | 3.75 |
| | Credit agency | 2.0 | 2.5 |
| | Others | 0.0 | 0.0 |

*Table 3.5-a: continued.....*

| | | | |
|---|---|---|---|
| Uttar Pradesh | Frontline demonstration programme conducted by government | 0 | 0.00 |
| | Participation in training programme organized by the government | 0 | 0.00 |
| | Krishi Vigyan Kendra | 0 | 0.00 |
| | Extension worker of state department of agriculture | 77 | 96.25 |
| | Television | 0 | 0.00 |
| | Radio | 0 | 0.00 |
| | Newspaper | 37 | 46.25 |
| | Input dealer | 13 | 16.25 |
| | Progressive farmer | 16 | 20.00 |
| | Private agency/ NGO | 0 | 0.00 |
| | Output buyers/food processor | 0 | 0.00 |
| | Credit agency | 0 | 0.00 |
| | Others | 0 | 0.00 |
| West Bengal | Frontline demonstration programme conducted by government | 0 | 0.00 |
| | Participation in training programme organized by the government | 61 | 76.25 |
| | Krishi Vigyan Kendra | 0 | 0.00 |
| | Extension worker of state department of agriculture | 65 | 81.25 |
| | Television | 0 | 0.00 |
| | Radio | 0 | 0.00 |
| | Newspaper | 0 | 0.00 |
| | Input dealer | 0 | 0.00 |
| | Progressive farmer | 0 | 0.00 |
| | Private agency/ NGO | 0 | 0.00 |
| | Output buyers/food processor | 0 | 0.00 |
| | Credit agency | 0 | 0.00 |
| | Others | 0 | 0.00 |

Data source: Primary data

***Annexure Table 3.5-b*: Farmers reporting quality of information received among those accessing the source across States**

**(**For hybrid adopters only)

| States | Source | Hybrid adopters reporting quality of information received | | |
|---|---|---|---|---|
| | | **Good** | **Satisfactory** | **Poor** |
| Andhra Pradesh | Participation in training programme conducted by the government | 5 (16.67) | 12 (40.00) | 13 (43.33) |
| | Participation in demonstration programme organized by the government | 10 (14.29) | 40 (57.14). | 20 (28.57) |
| | Extension worker of state department of agriculture | 13 (20.63) | 35 (55.56) | 15 (23.81) |
| | Krishi vigyan Kendra | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| Bihar | Participation in training programme conducted by the government | 27 (75.00) | 9 (25.00) | 0 (0.00) |
| | Participation in demonstration programme organized by the government | 3 (75.00) | 1 (25.00) | 0 (0.00) |
| | Extension worker of state department of agriculture | 37 (75.51) | 8 (16.33) | 4 (8.16) |
| | Krishi vigyan Kendra | 5 (29.41) | 12 (70.59) | 0 (0.00) |
| Madhya Pradesh | Participation in training programme conducted by the government | 14 (51.85) | 9.0 (33.33) | 4.0 (14.81) |
| | Participation in demonstration programme organized by the government | 9.0 (56.25) | 5.0 (31.25) | 2.0 (12.50) |
| | Extension worker of state department of agriculture | 21 (30.88) | 34 (50.00) | 13 (19.12) |
| | Krishi vigyan Kendra | 12 (25.00) | 28 (58.33) | 8.0 (16.67) |
| Uttar Pradesh | Participation in training programme conducted by the government | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | Participation in demonstration programme organized by the government | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | Extension worker of state department of agriculture | 0 (0.00) | 77 (96.25) | 3 (3.75) |
| | Krishi vigyan Kendra | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| West Bengal | Participation in training programme conducted by the government | 32 (52.46) | 29 (47.54) | 0 (0.00) |
| | Participation in demonstration programme organized by the government | 0 (0.00) | 0 (0.00) | 0 (0.00) |
| | Extension worker of state department of agriculture | 34 (52.31) | 31 (47.69) | 0 (0.00) |
| | Krishi vigyan Kendra | 0 (0.00) | 0 (0.00) | 0 (0.00) |

Data source: Primary data

Note: Figures in brackets ( ) indicate percentages; figures in [ ] indicate percentage to total no. of hybrid adopters

## *Annexure Table 3.5-c*: Farmers reporting adopted recommended package of practices in rice cultivation across States

(Percent of farmers reporting)

| States | Source of information | Hybrid Adopters | | Non-Adopters |
|---|---|---|---|---|
| | | Hybrid Rice | HYV Rice | HYV Rice |
| Andhra Pradesh | Participation in training programme conducted by the government | 37.50 | 80.00 | 75.00 |
| | Participation in demonstration programme organized by the government | 87.50 | 60.00 | 60.00 |
| | Extension worker of state department of agriculture | 78.75 | 50.00 | 50.00 |
| | Krishi Vigyan Kendra | 0.00 | 0.00 | 0.00 |
| Bihar | Participation in training programme conducted by the government | 61.11 | 0.00 | 0.00 |
| | Participation in demonstration programme organized by the government | 0.00 | 0.00 | 0.00 |
| | Extension worker of state department of agriculture | 46.94 | 0.00 | 0.00 |
| | Krishi Vigyan Kendra | 52.00 | 0.00 | 0.00 |
| | Progressive Farmer | 52.94 | 0.00 | 0.00 |
| Madhya Pradesh | Participation in training programme conducted by the government | 22.50 | 16.25 | 26.25 |
| | Participation in demonstration programme organized by the government | 15.00 | 10.00 | 20.00 |
| | Extension worker of state department of agriculture | 57.50 | 47.50 | 38.75 |
| | Krishi Vigyan Kendra | 45.00 | 52.50 | 42.50 |
| Uttar Pradesh | Participation in training programme conducted by the government | 0.00 | 0.00 | 0.00 |
| | Participation in demonstration programme organized by the government | 0.00 | 0.00 | 0.00 |
| | Extension worker of state department of agriculture | 96.25 | 60.00 | 25.00 |
| | Krishi Vigyan Kendra | 0.00 | 0.00 | 0.00 |
| West Bengal | Participation in training programme conducted by the government | 58.00 | 0.00 | 0.00 |
| | Participation in demonstration programme organized by the government | 0.00 | 0.00 | 0.00 |
| | Extension worker of state department of agriculture | 57.00 | 0.00 | 0.00 |
| | Krishi Vigyan Kendra | 0.00 | 0.00 | 0.00 |

Data source: Primary data

***Annexure Table- 3.5-d*: Farmers accessing sources of seed for Hybrid rice cultivation**

**(**For hybrid adopters only)

| **States** | **Sources of seed** | **2009-10** | | **2010-11** | |
|---|---|---|---|---|---|
| | | **Number of farmers reporting** | **Percent of farmers reporting** | **Number of farmers reporting** | **Percent of farmers reporting** |
| Andhra Pradesh | Public on full subsidy | 0 | 0.00 | 0 | 0.00 |
| | Public on partial subsidy | 30 | 38.00 | 40 | 50.00 |
| | Private | 50 | 62.00 | 40 | 50.00 |
| Bihar | Public on full subsidy | 32 | 40.00 | 36 | 45.00 |
| | Public on partial subsidy | 26 | 32.50 | 24 | 30.00 |
| | Private (Input Dealers) | 22 | 27.50 | 20 | 25.00 |
| Madhya Pradesh | Public on full subsidy | 11 | 13.75 | 13 | 16.25 |
| | Public on partial subsidy | 23 | 28.75 | 15 | 18.75 |
| | Private | 46 | 57.50 | 52 | 65.00 |
| Uttar Pradesh | Public on full subsidy | 4 | 5.00 | 7 | 8.75 |
| | Public on partial subsidy | 58 | 72.50 | 53 | 66.25 |
| | Private | 18 | 22.50 | 20 | 25.00 |
| West Bengal | Public on full subsidy | 56 | 70.00 | 58 | 72.50 |
| | Public on partial subsidy | 0 | 0.00 | 0 | 0.00 |
| | Private | 24 | 30.00 | 22 | 27.50 |

Data source: Primary data

*Annexure to Chapter IV*

***Annexure Table 4.1-a*: Mean yield levels of hybrids and HYVs of rice by farm size of sample farms during 2009-10**

(Hybrid adopters only)

| States | Farm size classes (ha) | Mean yield (Kg/ha) | | Percent difference |
|---|---|---|---|---|
| | | Hybrid | HYVs | |
| Andhra Pradesh | Below 1ha | 6871 | 5305 | 22.79 |
| | 1 – 2 | 6813 | 5607 | 17.70 |
| | 2 – 4 | 8062 | 5353 | 33.60 |
| | 4 – 10 | 7001 | 5113 | 26.97 |
| | 10 ha and above | - | - | - |
| | All sizes | 7093 | 5400 | 23.87 |
| Bihar | Below 1ha | 6137 | 3892 | 36.58 |
| | 1 – 2 | 6260 | 3917 | 37.43 |
| | 2 – 4 | 6352 | 4012 | 36.84 |
| | 4 – 10 | 6381 | 4052 | 36.50 |
| | 10 ha and above | - | - | - |
| | All sizes | 6288 | 3955 | 37.10 |
| Madhya Pradesh | Below 1ha | 4261 | 2588 | 39.27 |
| | 1 – 2 | 5047 | 2696 | 46.58 |
| | 2 – 4 | 5238 | 3135 | 40.15 |
| | 4 – 10 | 5371 | 2937 | 45.31 |
| | 10 ha and above | 4983 | 2819 | 43.41 |
| | All sizes | 4980 | 2835 | 43.07 |
| Uttar Pradesh | Below 1ha | 6376 | 4127 | 35.27 |
| | 1 – 2 | 6386 | 4219 | 33.93 |
| | 2 – 4 | 6530 | 4182 | 35.96 |
| | 4 – 10 | 6528 | 4177 | 36.01 |
| | 10 ha and above | - | - | - |
| | All sizes | 6434 | 4178 | 35.06 |
| West Bengal | Below 1ha | 6412 | 5217 | 18.64 |
| | 1 – 2 | 6426 | 5414 | 15.75 |
| | 2 – 4 | 6363 | 5671 | 10.88 |
| | 4 – 10 | - | - | - |
| | 10 ha and above | - | - | - |
| | All sizes | 6409 | 5378 | 16.09 |

Data source: Primary data

***Annexure Table 4.1-b*: Mean yield levels of hybrids and HYVs of rice by farm size of sample farms during 2010-11**

(Hybrid adopters only)

| States | Farm size classes (ha) | Mean yield (Kg/ha) | | Percent difference |
|---|---|---|---|---|
| | | Hybrid | HYVs | |
| Andhra Pradesh | Below 1ha | 6975 | 5356 | 23.21 |
| | 1 – 2 | 6904 | 5638 | 18.34 |
| | 2 – 4 | 7125 | 5196 | 27.07 |
| | 4 – 10 | 7025 | 5140 | 26.83 |
| | 10 ha and above | - | - | - |
| | All sizes | 6999 | 5337 | 23.75 |
| Bihar | Below 1ha | 6185 | 3925 | 36.54 |
| | 1 – 2 | 6272 | 3996 | 36.29 |
| | 2 – 4 | 6384 | 4085 | 36.01 |
| | 4 – 10 | 6405 | 4196 | 34.49 |
| | 10 ha and above | - | - | - |
| | All sizes | 6311 | 4051 | 35.81 |
| Madhya Pradesh | Below 1ha | 4224 | 2435 | 42.36 |
| | 1 – 2 | 4930 | 2788 | 43.45 |
| | 2 – 4 | 5852 | 3082 | 47.34 |
| | 4 – 10 | 5533 | 3251 | 41.25 |
| | 10 ha and above | 5053 | 3034 | 39.95 |
| | All sizes | 5118 | 2918 | 42.99 |
| Uttar Pradesh | Below 1ha | 6676 | 4248 | 36.37 |
| | 1 – 2 | 6724 | 4344 | 35.40 |
| | 2 – 4 | 6771 | 4211 | 37.81 |
| | 4 – 10 | 6807 | 4240 | 37.71 |
| | 10 ha and above | - | - | - |
| | All sizes | 6676 | 4248 | 36.37 |
| West Bengal | Below 1ha | 6804 | 5331 | 21.65 |
| | 1 – 2 | 6229 | 5300 | 14.92 |
| | 2 – 4 | 6178 | 5430 | 12.11 |
| | 4 – 10 | - | - | - |
| | 10 ha and above | - | - | - |
| | All sizes | 6551 | 5341 | 18.48 |

Data source: Primary data

*Annexure to Chapter V*

**Table 5.1: Input Use Pattern of Cultivation of Hybrid and Inbred Rice (2010-11)**

| States | Inputs | Hybrid Adopters | | Non-adopters |
|---|---|---|---|---|
| | | Hybrid | HYVs | HYVs |
| Andhra Pradesh | Seed (kg/ha) | 15.00 | 55.00 | 57.00 |
| | Manure (tonne/ha) | 5.25 | 5.00 | 5.20 |
| | Chemical fertiliser (kg/ha) | 250.00 | 250.00 | 260.00 |
| | Pesticide (no. of sprays) | 3.00 | 3.00 | 4.00 |
| | *Irrigation (charges in Rs/ha)* | *1400.00* | *1410.00* | *1440.00* |
| | Human labour (days/ha) | 78.28 | 99.52 | 99.52 |
| | Bullock labour (days/ha) | 6.04 | 6.45 | 6.86 |
| Bihar | Seed (kg/ha) | 14.32 | 62.84 | 63.28 |
| | Manure (tonne/ha) | 1.28 | 1.05 | 0.96 |
| | Chemical fertiliser (kg/ha) | 225.18 | 178.75 | 181.64 |
| | Pesticide (no. of sprays) | 1.59 | 2.05 | 2.08 |
| | Irrigation (no. of application) | 2.25 | 1.98 | 1.67 |
| | Human labour (days/ha) | 94.50 | 86.71 | 88.65 |
| | Bullock labour (days/ha) | 5.25 | 3.28 | 3.78 |
| Madhya Pradesh | Seed (kg/ha) | 15.19 | 53.62 | 61.51 |
| | Manure (tonne/ha) | 1.35 | 2.14 | 1.83 |
| | Chemical fertiliser (kg/ha) | 311.50 | 278.68 | 271.25 |
| | Pesticide (no. of sprays) | 1.08 | 0.67 | 0.80 |
| | Irrigation (no. of application) | 1.29 | 0.63 | 0.95 |
| | Human labour (days/ha) | 90.12 | 83.28 | 80.11 |
| | Bullock labour (days/ha) | 0.30 | 0.17 | 0.34 |
| Uttar Pradesh | Seed (kg/ha) | 13.72 | 40.40 | 41.06 |
| | Manure (tonne/ha) | 6.62 | 4.31 | 5.20 |
| | Chemical fertiliser (kg/ha) | 260.00 | 250.27 | 259.00 |
| | Pesticide (no. of sprays) | 0.00 | 0.00 | 0.00 |
| | Irrigation (no. of application) | *5.00* | *5.00* | *5.00* |
| | Human labour (days/ha) | 114.81 | 109.93 | 117.65 |
| | Bullock labour (days/ha) | 0.00 | 0.00 | 0.00 |
| West Bengal | Seed (kg/ha) | 11.51 | 68.57 | 68.37 |
| | Manure (tonne/ha) | 1.39 | 0.29 | 0.26 |
| | Chemical fertiliser (kg/ha) | 347.82 | 304.09 | 330.82 |
| | Pesticide (no. of sprays) | 2.26 | 3.14 | 2.68 |
| | Irrigation (no. of application) | 4.39 | 3.90 | 3.95 |
| | Human labour (days/ha) | 167.50 | 145.08 | 148.24 |
| | Bullock labour (days/ha) | 4.29 | 2.68 | 3.20 |

Data source: Primary data

## Table 5.2-a: Operation-wise Human Labour Use in Hybrid and HYV Rice: 2010-11

(for hybrid adopters only)

| | Type of operation | Hybrid rice | | | HYV Rice | | |
|---|---|---|---|---|---|---|---|
| | | Family labour (days/ha) | Hired labour (days/ha) | Total labour (days/ha) | Family labour (days/ha) | Hired labour (days/ha) | Total labour (days/ha) |
| Andhra Pradesh | Ploughing | 3.55 | 2.19 | 5.75 | 5.63 | 3.74 | 9.36 |
| | Uprooting of seedlings | 3.17 | 3.41 | 6.54 | 4.34 | 3.33 | 7.78 |
| | Transplantation of seedlings | | | | | | |
| | a) Single seedlings per hill | 3.41 | 13.91 | 17.14 | 0.00 | 0.00 | 0.00 |
| | b) Multiple seedlings per hill | 0.00 | 0.00 | 0.00 | 4.58 | 16.46 | 20.86 |
| | Manu ring | 2.44 | 1.24 | 3.68 | 1.69 | 0.78 | 2.47 |
| | Application of chemical fertilizer | 3.26 | 1.36 | 4.62 | 5.77 | 1.92 | 7.69 |
| | Spraying plant protection chemicals | 3.00 | 0.51 | 3.65 | 4.65 | 1.19 | 5.84 |
| | Irrigation | 10.45 | 0.03 | 10.50 | 11.26 | 0.14 | 11.40 |
| | Harvesting | 4.02 | 12.06 | 16.12 | 5.08 | 16.42 | 21.50 |
| | Post-harvesting | 4.18 | 6.69 | 10.87 | 5.35 | 7.73 | 13.08 |
| | All operations | 37.47 | 41.33 | 78.28 | 48.51 | 51.87 | 99.52 |
| Bihar | Ploughing | 3.12 | 1.78 | 4.90 | 2.52 | 1.09 | 3.61 |
| | Uprooting of seedlings | 4.18 | 6.55 | 10.73 | 4.78 | 7.36 | 12.14 |
| | Transplantation of seedlings | | | | | | |
| | a) Single seedlings per hill | 12.05 | 13.09 | 25.14 | 0.00 | 0.00 | 0.00 |
| | b) Multiple seedlings per hill | 0.00 | 0.00 | 0.00 | 7.84 | 13.34 | 21.18 |
| | Manu ring | 1.68 | 1.45 | 3.13 | 1.46 | 1.48 | 2.94 |
| | Application of chemical fertilizer | 2.06 | 3.02 | 5.08 | 2.09 | 3.14 | 5.23 |
| | Spraying plant protection chemicals | 2.38 | 3.65 | 6.03 | 2.04 | 1.59 | 3.63 |
| | Irrigation | 4.96 | 3.78 | 8.74 | 3.08 | 1.13 | 4.21 |
| | Harvesting | 10.08 | 18.24 | 28.32 | 9.06 | 16.15 | 25.21 |
| | Post-harvesting | 12.04 | 24.32 | 36.36 | 11.15 | 22.26 | 33.41 |
| | All operations | 52.55 | 78.88 | 128.43 | 44.02 | 67.54 | 111.56 |
| Madhya Pradesh | Ploughing | 1.32 | 1.05 | 2.37 | 1.40 | 1.04 | 2.44 |
| | Uprooting of seedlings | 2.65 | 4.56 | 7.20 | 3.38 | 3.39 | 6.78 |
| | Transplantation of seedlings | | | | | | |
| | a) Single seedlings per hill | *6.70* | *28.40* | *35.10* | 0.00 | 0.00 | 0.00 |
| | b) Multiple seedlings per hill | 0.00 | 0.00 | 0.00 | *7.27* | *22.28* | *29.55* |
| | Manu ring | 0.88 | 0.63 | 1.51 | 0.69 | 0.28 | 0.97 |
| | Application of chemical fertilizer | 1.20 | 1.04 | 2.24 | 1.47 | 1.35 | 2.83 |
| | Spraying plant protection chemicals | 1.21 | 1.09 | 2.31 | 1.38 | 1.03 | 2.42 |
| | Irrigation | 2.84 | 5.43 | 8.27 | 3.16 | 6.13 | 9.30 |
| | *Weeding*[1] | *0.65* | *0.88* | *1.53* | *0.49* | *0.26* | *0.75* |
| | Harvesting | 9.52 | 14.94 | 24.45 | 13.89 | 9.33 | 23.22 |
| | Post-harvesting | 2.71 | 2.42 | 5.13 | 3.04 | 2.01 | 5.05 |
| | All operations | 29.68 | 60.44 | 90.12 | 36.17 | 47.11 | 83.28 |

*Table 5.2-a.....continued.....*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Uttar Pradesh | Ploughing | 31.14 | 2.79 | 40.93 | 2.26 | 1.18 | 3.44 |
| | Uprooting of seedlings | 2.22 | 0.27 | 2.49 | 1.44 | 0.32 | 1.76 |
| | Transplantation of seedlings | | | | | | |
| | a) Single seedlings per hill | 12.62 | 50.64 | 63.27 | 0 | 0 | 0 |
| | b) Multiple seedlings per hill | 0 | 0 | 0 | 8.97 | 53.03 | 62.00 |
| | Manu ring | 1.98 | 0.23 | 2.21 | 1.40 | 0.38 | 1.78 |
| | Application of chemical fertilizer | 2.65 | 0.37 | 3.03 | 1.74 | 0.16 | 1.90 |
| | Spraying plant protection chemicals | 0 | 0 | 0 | 0 | 0 | 0 |
| | Irrigation | 7.69 | 0.33 | 8.02 | 7.90 | 0.88 | 8.78 |
| | Harvesting | 8.95 | 18.03 | 26.98 | 5.90 | 18.99 | 24.88 |
| | Post-harvesting | 4.03 | 0.69 | 4.71 | 4.13 | 1.24 | 5.37 |
| | All operations | 43.44 | 71.36 | 114.80 | 33.74 | 76.19 | 109.93 |
| West Bengal | Ploughing | 3.43 | 1.99 | 5.42 | 1.89 | 3.00 | 4.89 |
| | Uprooting of seedlings | 12.34 | 5.61 | 17.95 | 7.12 | 14.72 | 21.83 |
| | Transplantation of seedlings | | | | | | |
| | a) Single seedlings per hill | 21.67 | 13.17 | 34.84 | 0.00 | 0.00 | 0.00 |
| | b) Multiple seedlings per hill | 0.00 | 0.00 | 0.00 | 9.23 | 22.89 | 32.11 |
| | Manu ring | 1.47 | 1.33 | 2.80 | 1.63 | 0.91 | 2.54 |
| | Application of chemical fertilizer | 2.23 | 2.10 | 4.33 | 2.54 | 1.94 | 4.48 |
| | Spraying plant protection chemicals | 4.20 | 4.36 | 8.56 | 2.64 | 0.91 | 3.55 |
| | Irrigation | 7.34 | 4.90 | 12.24 | 3.79 | 1.13 | 4.93 |
| | Harvesting | 22.92 | 14.84 | 37.76 | 10.12 | 24.96 | 34.96 |
| | Post-harvesting | 24.98 | 18.62 | 43.61 | 14.12 | 21.40 | 35.51 |
| | All operations | 100.58 | 66.92 | 167.50 | 53.25 | 91.83 | 145.08 |

Data source: Primary data

[1] Madhya Pradesh additionally provided data on weeding

## Table 5.2-b: Female Labour Use per hectare (2010-11)

(for hybrid adopters only )

| | Type of operation | Hybrid rice | | | HYV Rice | | |
|---|---|---|---|---|---|---|---|
| | | Family labour (days/ha) | Hired labour (days/ha) | Total labour (days/ha) | Family labour (days/ha) | Hired labour (days/ha) | Total labour (days/ha) |
| Andhra Pradesh | Ploughing | 1.29 | 5.75 | 22.42 | 1.95 | 9.36 | 20.84 |
| | Uprooting of seedlings | 3.44 | 6.54 | 52.57 | 3.74 | 7.78 | 48.09 |
| | Transplantation of seedlings | | | | | | |
| | a) Single seedlings per hill | 13.67 | 17.14 | 79.74 | 0 | 0 | 0 |
| | b) Multiple seedlings per hill | 0 | 0 | 0 | 16.44 | 20.86 | 78.82 |
| | Manu ring | 1.15 | 3.68 | 31.23 | 0.77 | 2.47 | 31.13 |
| | Application of chemical fertilizer | 1.54 | 4.62 | 33.32 | 2.03 | 7.69 | 26.39 |
| | Spraying plant protection chemicals | 1.46 | 3.65 | 39.99 | 2.02 | 5.84 | 34.57 |
| | Irrigation | 3.18 | 10.50 | 30.28 | 2.84 | 11.40 | 24.91 |
| | Harvesting | 10.52 | 16.12 | 65.27 | 15.81 | 21.50 | 73.54 |
| | Post-harvesting | 4.95 | 10.87 | 45.55 | 6.87 | 13.08 | 52.52 |
| | All operations | 40.48 | 78.28 | 51.71 | 51.72 | 99.52 | 51.97 |
| Bihar | Ploughing | 0.00 | 4.90 | 0.00 | 0.00 | 3.61 | 0.00 |
| | Uprooting of seedlings | 2.08 | 10.43 | 19.38 | 2.03 | 12.14 | 16.72 |
| | Transplantation of seedlings | | | | | | |
| | a) Single seedlings per hill | 19.95 | 25.14 | 79.38 | 0.00 | 0.00 | 0.00 |
| | b) Multiple seedlings per hill | 0.00 | 0.00 | 0.00 | 17.05 | 21.18 | 80.52 |
| | Manu ring | 0.00 | 3.13 | 0.00 | 0.00 | 2.94 | 0.00 |
| | Application of chemical fertilizer | 0.00 | 5.08 | 0.00 | 0.00 | 5.23 | 0.00 |
| | Spraying plant protection chemicals | 0.00 | 6.03 | 0.00 | 0.00 | 3.63 | 0.00 |
| | Irrigation | 2.03 | 8.74 | 23.22 | 0.76 | 4.21 | 18.05 |
| | Harvesting | 18.65 | 28.32 | 65.88 | 16.45 | 25.21 | 65.29 |
| | Post-harvesting | 14.04 | 36.36 | 38.62 | 13.78 | 33.41 | 41.26 |
| | All operations | 56.75 | 128.43 | 43.70 | 50.21 | 111.56 | 45.01 |
| Madhya Pradesh | Ploughing | 0.13 | 2.37 | 5.70 | 0.07 | 2.44 | 2.99 |
| | Uprooting of seedlings | 3.35 | 7.20 | 46.58 | 3.00 | 6.78 | 44.24 |
| | Transplantation of seedlings | | | | | | |
| | a) Single seedlings per hill | 19.99 | 35.10 | 56.95 | 0.00 | 0.00 | 0.00 |
| | b) Multiple seedlings per hill | 0.00 | 0.00 | 0.00 | 15.76 | 29.55 | 53.35 |
| | Manu ring | 0.26 | 1.51 | 17.41 | 0.28 | 0.97 | 29.03 |
| | Application of chemical fertilizer | 0.43 | 2.24 | 19.00 | 0.57 | 2.83 | 20.26 |
| | Spraying plant protection chemicals | 0.47 | 2.31 | 20.18 | 0.58 | 2.42 | 24.14 |
| | Irrigation | 4.86 | 8.27 | 58.73 | 4.85 | 9.30 | 52.18 |
| | *Weeding*[1] | 0.26 | 1.53 | 16.74 | 0.14 | 0.75 | 18.06 |
| | Harvesting | 12.80 | 24.45 | 52.33 | 12.42 | 23.22 | 53.50 |
| | Post-harvesting | 2.32 | 5.13 | 45.26 | 2.18 | 5.05 | 43.09 |
| | All operations | 44.87 | 90.12 | 49.79 | 39.85 | 83.28 | 47.85 |

*Table 5.2-b.....continued.....*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Uttar Pradesh | Ploughing | 0.009 | 4.09 | 0.22 | 0.04 | 3.45 | 1.16 |
| | Uprooting of seedlings | 0.31 | 2.49 | 12.49 | 0.04 | 1.76 | 22.72 |
| | Transplantation of seedlings | | | | | | |
| | a) Single seedlings per hill | 57.98 | 63.26 | 91.65 | 0 | 0 | 0 |
| | b) Multiple seedlings per hill | 0 | 0 | 0 | 58.69 | 62.00 | 94.66 |
| | Manu ring | 0.06 | 2.21 | 2.71 | 0.14 | 1.78 | 7.87 |
| | Application of chemical fertilizer | 00.4 | 3.03 | 1.32 | 0.25 | 1.90 | 13. 16 |
| | Spraying plant protection chemicals | 0 | 0 | 0 | 0 | 0 | 0 |
| | Irrigation | 1.44 | 8.02 | 17.96 | 0.32 | 8.78 | 3.64 |
| | Harvesting | 22.71 | 26.98 | 84.17 | 21.77 | 24.88 | 87.5 |
| | Post-harvesting | 1.90 | 4.71 | 40.34 | 3.32 | 5.38 | 61.71 |
| | All operations | 85.37 | 114.80 | 74.36 | 84.92 | 109.93 | 77.25 |
| West Bengal | Ploughing | 0.00 | 5.48 | 0.00 | 0.00 | 4.50 | 0.00 |
| | Uprooting of seedlings | 15.35 | 17.48 | 87.78 | 10.30 | 19.05 | 54.09 |
| | Transplantation of seedlings | | | | | | |
| | a) Single seedlings per hill | 19.15 | 35.78 | 53.53 | 0.00 | 0.00 | 0.00 |
| | b) Multiple seedlings per hill | 0.00 | 0.00 | 0.00 | 14.93 | 31.74 | 47.02 |
| | Manu ring | 0.00 | 3.01 | 0.00 | 0.00 | 3.14 | 0.00 |
| | Application of chemical fertilizer | 0.00 | 4.39 | 0.00 | 0.00 | 4.23 | 0.00 |
| | Spraying plant protection chemicals | 0.00 | 10.37 | 0.00 | 0.00 | 9.93 | 0.00 |
| | Irrigation | 2.49 | 14.61 | 17.02 | 0.00 | 13.78 | 0.00 |
| | Harvesting | 11.46 | 38.62 | 29.68 | 14.54 | 39.31 | 36.99 |
| | Post-harvesting | 4.53 | 46.10 | 9.82 | 5.25 | 46.29 | 11.34 |
| | All operations | 52.97 | 175.84 | 30.13 | 45.02 | 171.97 | 26.18 |

Data source: Primary data

[1] Madhya Pradesh additionally provided data on weeding

## Table 5.3-a: Comparison of Costs and Returns for Hybrid and Inbred Rice (2009-10)

(Rs./ha)

| States | Sl. No. | Particulars | Hybrid Adopters | | Non-adopters |
|---|---|---|---|---|---|
| | | | Hybrid | HYVs | HYVs |
| Andhra Pradesh | A. | Costs: | | | |
| | 1. | Seed (both farm produced and purchased) | 4200 | 1505 | 1706 |
| | 2. | Manure (owned and purchased) | 1500 | 1791 | 2725 |
| | 3. | Chemical fertilisers | 3333 | 3374 | 3208 |
| | 4. | Insecticides & Pesticides | 1698 | 1682 | 1240 |
| | 5. | Irrigation charges (both owned and hired) | 1400 | 1410 | 1440 |
| | 6. | Machinery charges | 3970 | 4093 | 4631 |
| | 7. | Hired human labour charges | 9662 | 11423 | 9418 |
| | 8. | Bullock labour (owned and hired) | 1143 | 1245 | 1186 |
| | 9. | Total cost (1 to 8) | 26906 | 26524 | 25555 |
| | 10. | Unit cost of production (Rs. Per Kg.) | 3.79 | 4.91 | 4.48 |
| | B. | Returns: | | | |
| | 1. | Yield of paddy (qtl/ha) | 71 | 54 | 57 |
| | 2. | Market price (Rs./qtl) | 1107 | 1186 | 1134 |
| | 3. | Value of grain yield (Rs./ha) | 69246 | 51046 | 51046 |
| | 4. | Value of straw yield (Rs./ha) | 2167 | 3305 | 3539 |
| | 5. | Total value of the produce (gross return) | 71413 | 54350 | 54350 |
| | 6. | Net return (5 – 9) | 44507 | 27826 | 28795 |
| | 7. | Benefit cost ratio: | 2.65 : 1 | 2.05 : 1 | 2.13 : 1 |
| Bihar | A. | Costs: | | | |
| | 1. | Seed (both farm produced and purchased) | 3264.96 | 813.15 | 821.37 |
| | 2. | Manure (owned and purchased) | 675.06 | 450.09 | 475.04 |
| | 3. | Chemical fertilisers | 2972.0 | 2640.16 | 2655.98 |
| | 4. | Insecticides & Pesticides | 350.12 | 225.18 | 296.29 |
| | 5. | Irrigation charges (both owned and hired) | 2785.05 | 2050.07 | 2060.14 |
| | 6. | Machinery charges | 5690.16 | 4685.06 | 4640.18 |
| | 7. | Hired human labour charges | 6465.19 | 6055.22 | 6050.29 |
| | 8. | Bullock labour (owned and hired) | 656.25 | 408.36 | 472.50 |
| | 9. | Total cost (1 to 8) | 22858.79 | 17327.29 | 17471.79 |
| | 10. | Unit cost of production (Rs. Per Kg.) | 3.63 | 4.38 | 4.40 |
| | B. | Returns: | | | |
| | 1. | Yield of paddy (qtl/ha) | 62.88 | 39.55 | 39.68 |
| | 2. | Market price (Rs./qtl) | 1240.00 | 1215.00 | 1213.00 |
| | 3. | Value of grain yield (Rs./ha) | 77971.20 | 48053.25 | 48131.84 |
| | 4. | Value of straw yield (Rs./ha) | 5026.58 | 8670.29 | 8316.35 |
| | 5. | Total value of the produce (gross return) | 82997.78 | 56723.54 | 56448.19 |
| | 6. | Net return (5 – 9) | 60138.94 | 39396.25 | 38976.40 |
| | 7. | Benefit cost ratio: | 3.63 : 1 | 3.27 : 1 | 3.23 : 1 |

*Table 5.3-a.....continued.....*

| States | Sl. No. | Particulars | Hybrid Adopters | | Non-adopters |
|---|---|---|---|---|---|
| | | | Hybrid | HYVs | HYVs |
| Madhya Pradesh | A. | Costs: | | | |
| | 1. | Seed (both farm produced and purchased) | 2818.12 | 1230.45 | 1310.05 |
| | 2. | Manure (owned and purchased) | 775.53 | 895.06 | 880.5 |
| | 3. | Chemical fertilisers | 2320.37 | 2055.24 | 1795.33 |
| | 4. | Insecticides & Pesticides | 715.59 | 602.77 | 579.6 |
| | 5. | Irrigation charges (both owned and hired) | 972.98 | 582.93 | 738.49 |
| | 6. | Machinery charges | 4680.99 | 4400.99 | 4205.88 |
| | 7. | Hired human labour charges | 5972.29 | 4695.01 | 4835.13 |
| | 8. | Bullock labour (owned and hired) | 83.33 | 74.01 | 170.42 |
| | 9. | Total cost (1 to 8) | 18339.2 | 14536.5 | 14515.4 |
| | 10. | Unit cost of production (Rs. Per Kg.) | 3.01 | 3.89 | 4.62 |
| | B. | Returns: | | | |
| | 1. | Yield of paddy (qtl/ha) | 49.8 | 28.35 | 23.7 |
| | 2. | Market price (Rs./qtl) | 1016.27 | 1038.27 | 1088.57 |
| | 3. | Value of grain yield (Rs./ha) | 50610.9 | 29436.7 | 25803.99 |
| | 4. | Value of straw yield (Rs./ha)[1] | 3360 | 3500 | 3570 |
| | 5. | Total value of the produce (gross return) | 53970.9 | 32936.7 | 29373.99 |
| | 6. | Net return (5 – 9) | 35631.6 | 18400.2 | 14858.59 |
| | 7. | Benefit cost ratio: | 2.94 : 1 | 2.27 : 1 | 2.02 : 1 |
| Uttar Pradesh | A. | Costs: | | | |
| | 1. | Seed (both farm produced and purchased) | 2063 | 810 | 871 |
| | 2. | Manure (owned and purchased) | 768 | 457 | 480 |
| | 3. | Chemical fertilisers | 2867 | 2730 | 2610 |
| | 4. | Insecticides & Pesticides | 0.00 | 0.00 | 0.00 |
| | 5. | Irrigation charges (both owned and hired) | 2690 | 2901 | 2713 |
| | 6. | Machinery charges | 5868 | 5486 | 5795 |
| | 7. | Hired human labour charges | 7295 | 7864 | 7351 |
| | 8. | Bullock labour (owned and hired) | 0.00 | 0.00 | 0.00 |
| | 9. | Total cost (1 to 8) | 21560 | 20205 | 19820 |
| | 10. | Unit cost of production (Rs. Per Kg.) | 3.33 | 4.04 | 4.75 |
| | B. | Returns: | | | |
| | 1. | Yield of paddy (qtl/ha) | 64.34 | 41.78 | 41.73 |
| | 2. | Market price (Rs./qtl) | 833 | 803 | 898 |
| | 3. | Value of grain yield (Rs./ha) | 38529 | 23965 | 33939 |
| | 4. | Value of straw yield (Rs./ha) | 8600 | 6400 | 6120 |
| | 5. | Total value of the produce (gross return) | 47129 | 30365 | 40059 |
| | 6. | Net return (5 – 9) | 25565 | 10160 | 20239 |
| | 7. | Benefit cost ratio: | 2.18 : 1 | 1.50 : 1 | 2.52: 1 |

*Table 5.3-a.....continued.....*

| States | Sl. No. | Particulars | Hybrid Adopters | | Non-adopters |
|---|---|---|---|---|---|
| | | | Hybrid | HYVs | HYVs |
| West Bengal | A. | Costs: | | | |
| | 1. | Seed (both farm produced and purchased) | 1766.33 | 1000.78 | 1013.60 |
| | 2. | Manure (owned and purchased) | 2950.13 | 1714.82 | 1411.01 |
| | 3. | Chemical fertilisers | 2924.54 | 2751.85 | 2875.94 |
| | 4. | Insecticides & Pesticides | 499.12 | 409.87 | 425.84 |
| | 5. | Irrigation charges (both owned and hired) | 5285.08 | 3052.34 | 3690.34 |
| | 6. | Machinery charges | 4315.98 | 3805.04 | 3795.22 |
| | 7. | Hired human labour charges | 10242.72 | 10161.97 | 9665.17 |
| | 8. | Bullock labour (owned and hired) | 789.06 | 596.53 | 616.85 |
| | 9. | Total cost (1 to 8) | 28772.9 | 23493.20 | 23493.98 |
| | 10. | Unit cost of production (Rs. Per Kg.) | 4.49 | 4.37 | 4.36 |
| | B. | Returns: | | | |
| | 1. | Yield of paddy (qtl/ha) | 64.09 | 53.78 | 53.90 |
| | 2. | Market price (Rs./qtl) | 912.10 | 941.23 | 932.56 |
| | 3. | Value of grain yield (Rs./ha) | 58452.18 | 50615.67 | 50261.18 |
| | 4. | Value of straw yield (Rs./ha) | 5862.07 | 11260.03 | 10855.04 |
| | 5. | Total value of the produce (gross return) | 64314.25 | 61875.70 | 61116.23 |
| | 6. | Net return (5 – 9) | 35549.76 | 38383.69 | 37618.73 |
| | 7. | Benefit cost ratio: | 2.24 : 1 | 2.63 : 1 | 2.60:1 |

Data source: Primary data

[1] Value of straw yield for Madhya Pradesh is derived by calculating sl.no. 5 less 3

## Table 5.3-b: Comparison of Costs and Returns for Hybrid and Inbred Rice (2010-11)

(Rs./ha)

| States | Sl. No. | Particulars | Hybrid Adopters | | Non-adopters |
|---|---|---|---|---|---|
| | | | Hybrid | HYVs | HYVs |
| Andhra Pradesh | A. | Costs: | | | |
| | 1. | Seed (both farm produced and purchased) | 4200 | 1571 | 1836 |
| | 2. | Manure (owned and purchased) | 1350 | 1650 | 2725 |
| | 3. | Chemical fertilisers | 3801 | 3608 | 3643 |
| | 4. | Insecticides & Pesticides | 1789 | 1761 | 1559 |
| | 5. | Irrigation charges (both owned and hired) | 1744 | 1746 | 1621 |
| | 6. | Machinery charges | 4758 | 4466 | 5044 |
| | 7. | Hired human labour charges | 11137 | 11658 | 11206 |
| | 8. | Bullock labour (owned and hired) | 1209 | 1289 | 1372 |
| | 9. | Total cost (1 to 8) | 29988 | 27750 | 29006 |
| | 10. | Unit cost of production (Rs. Per Kg.) | 4.28 | 5.20 | 4.88 |
| | B. | Returns: | | | |
| | 1. | Yield of paddy (qtl/ha) | 70 | 53 | 59 |
| | 2. | Market price (Rs./qtl) | 1140 | 1188 | 1174 |
| | 3. | Value of grain yield (Rs./ha) | 70429 | 50162 | 54737 |
| | 4. | Value of straw yield (Rs./ha) | 2197 | 2705 | 3603 |
| | 5. | Total value of the produce (gross return) | 72626 | 52866 | 58341 |
| | 6. | Net return (5 – 9) | 42638 | 25117 | 29335 |
| | 7. | Benefit cost ratio: | 2.42 : 1 | 1.91 : 1 | 2.01 : 1 |
| Bihar | A. | Costs: | | | |
| | 1. | Seed (both farm produced and purchased) | 3365.20 | 895.47 | 908.06 |
| | 2. | Manure (owned and purchased) | 725.35 | 466.65 | 465.98 |
| | 3. | Chemical fertilisers | 3050.55 | 2450.05 | 2455.38 |
| | 4. | Insecticides & Pesticides | 365.15 | 280.24 | 285.18 |
| | 5. | Irrigation charges (both owned and hired) | 2890.26 | 2352.08 | 2360.17 |
| | 6. | Machinery charges | 6050.08 | 5460.12 | 5465.08 |
| | 7. | Hired human labour charges | 6560.16 | 6270.19 | 6275.24 |
| | 8. | Bullock labour (owned and hired) | 745.50 | 465.76 | 536.76 |
| | 9. | Total cost (1 to 8) | 23752.25 | 18640.56 | 18751.85 |
| | 10. | Unit cost of production (Rs. Per Kg.) | 3.76 | 4.61 | 4.64 |
| | B. | Returns: | | | |
| | 1. | Yield of paddy (qtl/ha) | 63.11 | 40.51 | 40.43 |
| | 2. | Market price (Rs./qtl) | 1245.08 | 1218.06 | 1216.42 |
| | 3. | Value of grain yield (Rs./ha) | 78576.99 | 49343.61 | 49179.86 |
| | 4. | Value of straw yield (Rs./ha) | 5142.19 | 4835.05 | 4793.02 |
| | 5. | Total value of the produce (gross return) | 83719.18 | 54178.66 | 53972.88 |
| | 6. | Net return (5 – 9) | 59966.93 | 35538.10 | 35221.03 |
| | 7. | Benefit cost ratio: | 3.52 : 1 | 2.91 : 1 | 2.88 : 1 |

*Table 5.3-b....continued.....*

| States | Sl. No. | Particulars | Hybrid Adopters | | Non-adopters |
|---|---|---|---|---|---|
| | | | Hybrid | HYVs | HYVs |
| Madhya Pradesh | A. | Costs: | | | |
| | 1. | Seed (both farm produced and purchased) | 2884.14 | 1506.91 | 1548.55 |
| | 2. | Manure (owned and purchased) | 516.31 | 1008.71 | 842.33 |
| | 3. | Chemical fertilisers | 311.5 | 278.68 | 271.25 |
| | 4. | Insecticides & Pesticides | 739.41 | 694.12 | 687.82 |
| | 5. | Irrigation charges (both owned and hired) | 934.42 | 753.95 | 785.19 |
| | 6. | Machinery charges | 5048.39 | 4475.67 | 4316.46 |
| | 7. | Hired human labour charges | 6043.9 | 4710.96 | 5294.81 |
| | 8. | Bullock labour (owned and hired) | 91.11 | 49.97 | 100.77 |
| | 9. | Total cost (1 to 8) | 16569.2 | 13479 | 13847.19 |
| | 10. | Unit cost of production (Rs. Per Kg.) | 2.5 | 3.22 | 3.96 |
| | B. | Returns: | | | |
| | 1. | Yield of paddy (qtl/ha) | 51.18 | 29.18 | 25.24 |
| | 2. | Market price (Rs./qtl) | 1102.21 | 1120.11 | 1165.71 |
| | 3. | Value of grain yield (Rs./ha) | 56414.3 | 32682.8 | 29426.03 |
| | 4. | Value of straw yield (Rs./ha)[1] | 3760 | 4080 | 3840 |
| | 5. | Total value of the produce (gross return) | 60174.3 | 36762.8 | 33266.03 |
| | 6. | Net return (5 – 9) | 43605.1 | 23283.9 | 19418.84 |
| | 7. | Benefit cost ratio: | 3.63 : 1 | 2.73 : 1 | 2.4 : 1 |
| Uttar Pradesh | A. | Costs: | | | |
| | 1. | Seed (both farm produced and purchased) | 2230 | 857 | 935 |
| | 2. | Manure (owned and purchased) | 778 | 484 | 570 |
| | 3. | Chemical fertilisers | 3165 | 3293 | 2915 |
| | 4. | Insecticides & Pesticides | 0.00 | 0.00 | 0.00 |
| | 5. | Irrigation charges (both owned and hired) | 2515 | 2844 | 2670 |
| | 6. | Machinery charges | 6765 | 6312 | 6457 |
| | 7. | Hired human labour charges | 9137 | 8894 | 8583 |
| | 8. | Bullock labour (owned and hired) | 0.00 | 0.00 | 0.00 |
| | 9. | Total cost (1 to 8) | 24590 | 22685 | 22130 |
| | 10. | Unit cost of production (Rs. Per Kg.) | 3.66 | 4.55 | 5.14 |
| | B. | Returns: | | | |
| | 1. | Yield of paddy (qtl/ha) | 67.25 | 42.60 | 43.04 |
| | 2. | Market price (Rs./qtl) | 905 | 961 | 960 |
| | 3. | Value of grain yield (Rs./ha) | 44182 | 27133 | 37913 |
| | 4. | Value of straw yield (Rs./ha) | 9200 | 7100 | 6850 |
| | 5. | Total value of the produce (gross return) | 53382 | 34333 | 44763 |
| | 6. | Net return (5 – 9) | 28792 | 11648 | 22633 |
| | 7. | Benefit cost ratio: | 2.17 : 1 | 1.51 : 1 | 2.02 : 1 |

*Table 5.3-b.....continued.....*

| States | Sl. No. | Particulars | Hybrid Adopters | | Non-adopters |
|---|---|---|---|---|---|
| | | | Hybrid | HYVs | HYVs |
| West Bengal | A. | Costs: | | | |
| | 1. | Seed (both farm produced and purchased) | 2073.24 | 1389.99 | 1367.73 |
| | 2. | Manure (owned and purchased) | 1866.67 | 835.10 | 757.71 |
| | 3. | Chemical fertilisers | 3795.90 | 3148.61 | 3186.18 |
| | 4. | Insecticides & Pesticides | 591.99 | 252.18 | 282.33 |
| | 5. | Irrigation charges (both owned and hired) | 3608.33 | 2198.05 | 2672.00 |
| | 6. | Machinery charges | 4727.56 | 4163.95 | 4128.11 |
| | 7. | Hired human labour charges | 11378.21 | 11025.53 | 10419.93 |
| | 8. | Bullock labour (owned and hired) | 845.51 | 536.23 | 640.57 |
| | 9. | Total cost (1 to 8) | 28887.40 | 23549.66 | 23454.57 |
| | 10. | Unit cost of production (Rs. Per Kg.) | 4.41 | 4.41 | 4.38 |
| | B. | Returns: | | | |
| | 1. | Yield of paddy (qtl/ha) | 65.51 | 53.41 | 53.55 |
| | 2. | Market price (Rs./qtl) | 931.01 | 939.46 | 936.39 |
| | 3. | Value of grain yield (Rs./ha) | 60993.24 | 50175.30 | 50139.94 |
| | 4. | Value of straw yield (Rs./ha) | 6590.27 | 11152.02 | 10930.50 |
| | 5. | Total value of the produce (gross return) | 67583.51 | 61327.32 | 61070.45 |
| | 6. | Net return (5 – 9) | 38696.10 | 37776.32 | 37621.44 |
| | 7. | Benefit cost ratio: | 2.34 : 1 | 2.60 : 1 | 2.60 : 1 |

Data source: Primary data

[1] Value of straw yield for Madhya Pradesh is derived by calculating sl.no. 5 less 3

*Annexure to Chapter VI*

**Table 6.1-a: Grain quality traits of Hybrid rice vis-a-vis HYVs 2009-2010**

| States | Grain quality traits | Adopters | | Non-Adopters |
|---|---|---|---|---|
| | | Hybrid | HYVs | HYVs |
| Andhra Pradesh | Hulling ratio | 60.00 | 60.00 | 60.00 |
| | Milling ratio | 62.00 | 63.00 | 63.00 |
| | Head rice recovery ratio | 55.00 | 58.00 | 58.00 |
| Bihar | Hulling ratio | 66.67 | 70.58 | 71.43 |
| | Milling ratio | 63.16 | 65.22 | 66.66 |
| | Head rice recovery ratio | 60.00 | 61.86 | 65.21 |
| Madhya Pradesh | Hulling ratio | 71.87 | 75.83 | 75.60 |
| | Milling ratio | 64.13 | 65.17 | 65.40 |
| | Head rice recovery ratio | 56.54 | 56.80 | 57.05 |
| Uttar Pradesh | Hulling ratio | 45.00 | - | - |
| | Milling ratio | 52.00 | - | - |
| | Head rice recovery ratio | 49.00 | - | - |
| West Bengal | Hulling ratio | - | - | - |
| | Milling ratio | 60.71 | 61.36 | 61.55 |
| | Head rice recovery ratio | 54.57 | 55.41 | 56.00 |

Data source: Primary data

**Table 6.1-b: Grain quality traits of Hybrid rice vis-a-vis HYVs 2010-11**

| States | Grain quality traits | Adopters | | Non-Adopters |
|---|---|---|---|---|
| | | Hybrid | HYVs | HYVs |
| Andhra Pradesh | Hulling ratio | 60.00 | 60.00 | 60.00 |
| | Milling ratio | 62.00 | 63.00 | 63.00 |
| | Head rice recovery ratio | 54.00 | 58.00 | 58.00 |
| Bihar | Hulling ratio | 65.22 | 68.18 | 69.76 |
| | Milling ratio | 61.85 | 63.82 | 64.52 |
| | Head rice recovery ratio | 58.25 | 57.14 | 63.83 |
| Madhya Pradesh | Hulling ratio | 72.73 | 76.67 | 76.80 |
| | Milling ratio | 64.27 | 65.33 | 65.20 |
| | Head rice recovery ratio | 56.54 | 56.80 | 57.05 |
| Uttar Pradesh | Hulling ratio | 45.00 | - | - |
| | Milling ratio | 52.00 | - | - |
| | Head rice recovery ratio | 49.00 | - | - |
| West Bengal | Hulling ratio | - | - | - |
| | Milling ratio | 60.56 | 61.20 | 61.65 |
| | Head rice recovery ratio | 54.26 | 55.51 | 55.85 |

Data source: Primary data

**Table 6.2-a(1): Output and sale of paddy (un husked) by size groups of land holdings (2009-10) for Hybrid Adopters**

| Size group (Ha) | Crop | Andhra Pradesh | | | | Bihar | | | | Madhya Pradesh | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | 108 (16) | 91 (16) | 84.40 | 1100 | 2.45 ( 37 ) | 1.48 ( 37 ) | 80.50 | 1230.20 | 14.40 (10) | 11.90 (9) | 82.64 | 988.00 |
| | HYVs | 39 (16) | 27 (16) | 67.73 | 1129 | 10.51 ( 37 ) | 4.23 ( 37) | 40.25 | 1210.15 | 20.75 (4) | 12.25 (4) | 59.04 | 1022.50 |
| 1 – 2 | Hybrid | 123 (12) | 112 (12) | 90.85 | 1122 | 5.63 ( 25 ) | 3.47 ( 25 ) | 61.75 | 1230.38 | 43.50 (14) | 35.14 (14) | 80.79 | 996.43 |
| | HYVs | 97 (17) | 84 (17) | 86.93 | 1109 | 21.15 ( 25 ) | 8.98 ( 25 ) | 42.50 | 1215.08 | 20.36 (11) | 14.91 (11) | 73.21 | 1004.55 |
| 2 – 4 | Hybrid | 209 (5) | 194 (5) | 92.91 | 1070 | 11.43 ( 12 ) | 7.12 ( 12 ) | 62.30 | 1250.03 | 50.92 (12) | 46.58 (12) | 91.49 | 1066.25 |
| | HYVs | 144 (12) | 130 (12) | 90.19 | 1079 | 47.34 ( 12 ) | 20.47 ( 12 ) | 43.25 | 1230.20 | 29.92 (11) | 18.64 (11) | 62.29 | 1081.82 |
| 4 – 10 | Hybrid | 340 (2) | 315 (2) | 92.65 | 1100 | 30.63 ( 6 ) | 19.76 (6 ) | 64.50 | 1250.52 | 105.62 (13) | 89.23 (13) | 84.49 | 996.15 |
| | HYVs | 150 (4) | 134 (4) | 89.17 | 1150 | 126.02 ( 6 ) | 57.40 ( 6 ) | 45.55 | 1230.68 | 75.64 (11) | 58.64 (11) | 77.52 | 1101.36 |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - | 219.60 (15) | 185.20 (15) | 84.34 | 1024.00 |
| | HYVs | - | - | - | - | - | - | - | - | 88.31 (13) | 72.31 (13) | 81.88 | 1130.77 |
| All Sizes | Hybrid | 141 (35) | 126 (35) | 89.27 | 1103 | 6.92 ( 80 ) | 4.31 ( 80 ) | 62.26 | 1240.28 | 86.81 (64) | 73.61 (63) | 84.80 | 1014.17 |
| | HYVs | 94 (49) | 81 (49) | 85.83 | 1112 | 28.08 ( 80 ) | 12.04 (80 ) | 42.89 | 1221.53 | 46.99 (50) | 35.35 (50) | 75.22 | 1068.20 |

*table 6.2-a(1)...continued.....*

| Size group (Ha) | Crop | Uttar Pradesh | | | | West Bengal | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | 33.15 (45) | 27.73 (45) | 83.65 | 827 | 6.95 (60) | 4.94 (60) | 71.14 | 890.46 |
| | HYVs | 22.94 (17) | 17.59 (17) | 76.68 | 884 | 25.71 (60) | 14.48 (60) | 56.33 | 873.60 |
| 1 – 2 | Hybrid | 44.70 (15) | 40.73 (15) | 91.12 | 847 | 12.45 (16) | 9.75 (16) | 78.31 | 855.26 |
| | HYVs | 37.40 (11) | 29.64 (11) | 79.25 | 879 | 77.04 (16) | 59.99 (16) | 77.87 | 880.90 |
| 2 – 4 | Hybrid | 50.14 (14) | 37.36 (11) | 75.51 | 830 | 27.58 (04) | 23.50 (04) | 85.22 | 846.81 |
| | HYVs | 85.14 (14) | 60.73 (11) | 71.33 | 913 | 188.58 (04) | 159.65 (04) | 84.66 | 893.65 |
| 4 – 10 | Hybrid | 97.92 (6) | 52.50 (4) | 53.62 | 850 | - | - | - | - |
| | HYVs | 142.70 (6) | 122.50 (4) | 85.84 | 950 | - | - | - | - |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | 43.15 (80) | 30.07 (75) | 69.69 | 838 | 9.08 (80) | 6.83 (80) | 75.24 | 872.90 |
| | HYVs | 59.37 (48) | 41.47 (43) | 69.85 | 906 | 44.12 (80) | 30.84 (80) | 69.91 | 881.63 |

Data source: Primary data
Note: Figures in brackets indicate number of farms

**Table 6.2-a(2): Output and sale of paddy (un husked) by size groups of land holdings (2009-10) for Hybrid Non-Adopters**

| Size group (Ha) | Crop | Andhra Pradesh | | | | Bihar | | | | Madhya Pradesh | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | 56 (8) | 43 (8) | 75.39 | 1069 | 15.11 (8 ) | 6.07 ( 8 ) | 40.17 | 1205.18 | 24.50 (2) | 13.50 (2) | 55.10 | 1040 |
| 1 – 2 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | 114 (6) | 99 (6) | 87.24 | 1080 | 41.36 ( 6 ) | 17.55 ( 6 ) | 42.46 | 1205.26 | 38.33 (3) | 22.33 (3) | 58.26 | 1103.33 |
| 2 – 4 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | 146 (4) | 125 (4) | 85.47 | 1075 | 79.70 ( 4 ) | 34.67 ( 4 ) | 43.50 | 1215.54 | 50.00 (3) | 32.33 (3) | 64.67 | 1143.33 |
| 4 – 10 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | 174 (2) | 158 (2) | 90.52 | 950 | 161.81 ( 2 ) | 75.65 ( 2 ) | 46.75 | 1215.68 | 102.00 (2) | 70.50 (2) | 69.12 | 1135 |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - | 115.75 (4) | 86.75 (4) | 74.95 | 1072.5 |
| All Sizes | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | 95 (20) | 80 (20) | 84.17 | 1061 | 32.72 ( 20) | 14.14 ( 20 ) | 43.22 | 1210.42 | 66.12 (14) | 45.08 (14) | 68.19 | 1098.83 |

*table 6.2-a(2)...continued.....*

| Size group (Ha) | Crop | Uttar Pradesh | | | | West Bengal | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | 36.45 (12) | 31.09 (11) | 78.19 | 897 | 35.88 (16) | 22.43 (16) | 62.53 | 860.77 |
| 1 – 2 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | 54.67 (6) | 33.50 (6) | 66.76 | 901 | 70.73 (03) | 54.89 (03) | 77.61 | 883.17 |
| 2 – 4 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | 80.00 (1) | 75.00 (1) | 93.75 | 900 | 173.00 (01) | 162.44 (01) | 93.90 | 920.00 |
| 4 – 10 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | 150.00 (1) | 100.00 (1) | 66.67 | 900 | - | - | - | - |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | 49.77 (20) | 37.78 (19) | 72.13 | 898 | 47.96 (20) | 34.30 (20) | 71.52 | 880.17 |

Data source: Primary data

Note: Figures in brackets indicate number of farms

**Table 6.2-b(1): Output and sale of paddy (un husked) by size groups of land holdings (2010-11) for Hybrid Adopters**

| Size group (Ha) | Crop | Andhra Pradesh | | | | Bihar | | | | Madhya Pradesh | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | 63 (32) | 54 (32) | 86.28 | 1104 | 3.70 ( 37) | 2.27 ( 37 ) | 61.25 | 1240.05 | 21.10 (10) | 16.80 (8) | 79.62 | 1036.50 |
| | HYVs | 28 (16) | 18 (16) | 64.55 | 1138 | 10.60 (37 ) | 4.40 ( 37) | 41.50 | 1225.07 | 13.20 (5) | 9.00 (5) | 68.18 | 1153.33 |
| 1 – 2 | Hybrid | 76 (24) | 70 (24) | 92.68 | 1101 | 7.53 (25 ) | 4.71 ( 25 ) | 62.50 | 1240.09 | 43.07 (12) | 32.07 (11) | 74.46 | 1066.43 |
| | HYVs | 85 (16) | 73 (16) | 85.59 | 1116 | 21.98 ( 25 ) | 9.40 (25 ) | 42.75 | 1225.15 | 26.33 (9) | 21.36 (9) | 81.13 | 1103.18 |
| 2 – 4 | Hybrid | 104 (16) | 97 (16) | 93.91 | 1106 | 12.77 ( 12 ) | 8.15 (12 ) | 63.80 | 1240.15 | 63.25 (12) | 51.08 (12) | 80.76 | 1094.17 |
| | HYVs | 127 (9) | 113 (9) | 89.01 | 1106 | 47.44 (12 ) | 21.11 (12) | 44.50 | 1225.19 | 30.42 (12) | 23.80 (12) | 78.25 | 1180.00 |
| 4 – 10 | Hybrid | 131 (8) | 122 (8) | 93.31 | 1100 | 33.31 ( 6 ) | 21.48 ( 6) | 64.50 | 1250.25 | 154.92 (13) | 141.15 (13) | 91.11 | 1082.31 |
| | HYVs | 130 (4) | 114 (4) | 87.50 | 1150 | 130.08 ( 6 ) | 60.09 ( 6 ) | 46.20 | 1235.28 | 64.27 (11) | 48.36 (11) | 75.25 | 1127.27 |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - | 221.87 (15) | 201.13 (15) | 90.66 | 1098.00 |
| | HYVs | - | - | - | - | - | - | - | - | 109.38 (13) | 81.62 (13) | 74.61 | 1145.77 |
| All Sizes | Hybrid | 82 (80) | 74 (80) | 91.13 | 1103 | 9.92 ( 80) | 6.25 ( 80 ) | 63.01 | 1242.63 | 100.84 (62) | 88.45 (59) | 87.71 | 1075.48 |
| | HYVs | 77 (45) | 65 (45) | 84.34 | 1124 | 28.36 ( 80 ) | 12.40 ( 80) | 43.74 | 1227.67 | 48.72 (50) | 36.83 (50) | 75.59 | 1141.91 |

*table 6.2-b(1)...continued.....*

| Size group (Ha) | Crop | Uttar Pradesh | | | | West Bengal | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | 35.98 (45) | 30.42 (45) | 84.54 | 905 | 10.13 (60) | 7.59 (60) | 74.93 | 887.84 |
| | HYVs | 23.24 (17) | 18.06 (17) | 77.71 | 895 | 23.63 (60) | 12.43 (60) | 52.61 | 857.98 |
| 1 – 2 | Hybrid | 45.95 (15) | 42.00 (15) | 91.40 | 944 | 17.65 (16) | 14.19 (16) | 80.38 | 839.07 |
| | HYVs | 41.46 (11) | 32.82 (11) | 79.16 | 954 | 65.14 (16) | 48.76 (16) | 74.86 | 846.14 |
| 2 – 4 | Hybrid | 50.79 (14) | 37.91 (11) | 74.64 | 859 | 32.95 (04) | 31.13 (04) | 94.46 | 820.36 |
| | HYVs | 91.09 (14) | 65.45 (11) | 71.85 | 970 | 164.25 (04) | 133.08 (04) | 81.02 | 867.87 |
| 4 – 10 | Hybrid | 102.12 (6) | 53.00 (4) | 51.90 | 888 | - | - | - | - |
| | HYVs | 146.62 (6) | 140.00 (4) | 95.48 | 1000 | - | - | - | - |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | 45.40 (80) | 35.04 (75) | 77.18 | 899 | 12.78 (80) | 10.09 (80) | 78.95 | 863.71 |
| | HYVs | 63.50 (48) | 45.30 (43) | 71.34 | 955 | 38.97 (80) | 25.73 (80) | 66.04 | 856.05 |

Data source: Primary data

Note: Figures in brackets indicate number of farms

**Table 6.2-b(2): Output and sale of paddy (un husked) by size groups of land holdings (2010-11) for Hybrid Non-Adopters**

| Size group (Ha) | Crop | Andhra Pradesh | | | | Bihar | | | | Madhya Pradesh | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | 60 (8) | 48 (8) | 79.88 | 1119 | 13.67 ( 8 ) | 5.37 ( 8 ) | 39.28 | 1210.28 | 23.25 (4) | 11.75 (3) | 50.54 | 1051.25 |
| 1 – 2 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | 115 (6) | 99 (6) | 86.48 | 1092 | 40.20 ( 6 ) | 16.60 (6 ) | 41.29 | 1210.36 | 30.33 (3) | 14.33 (3) | 47.25 | 1086.67 |
| 2 – 4 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | 151 (4) | 128 (4) | 84.30 | 1088 | 81.10 ( 4) | 35.30 ( 4 ) | 43.53 | 1225.42 | 68.50 (3) | 43.50 (3) | 63.50 | 1132.5 |
| 4 – 10 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | 187 (2) | 165 (2) | 88.47 | 1175 | 164.21 ( 2) | 75.94 (2 ) | 46.25 | 1225.48 | 101.00 (3) | 77.50 (3) | 76.73 | 1167.5 |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - | 125.75 (4) | 93.50 (4) | 74.35 | 1191.25 |
| All Sizes | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | 98 (20) | 83 (20) | 84.37 | 1113 | 31.99 ( 20 ) | 13.58 ( 20 ) | 42.44 | 1217.88 | 69.77 (17) | 48.12 (16) | 68.97 | 1125.83 |

*table 6.2-b(2)...continued.....*

| Size group (Ha) | Crop | Uttar Pradesh | | | | West Bengal | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | 33.21 (12) | 32.91 (11) | 86.12 | 955 | 34.69 (16) | 20.78 (16) | 59.89 | 865.34 |
| 1 – 2 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | 52.85 (6) | 34.83 (6) | 65.90 | 967 | 66.33 (03) | 50.49 (03) | 76.12 | 875.71 |
| 2 – 4 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | 84 (1) | 80 (1) | 95.24 | 950 | 149.00 (01) | 138.44 (01) | 92.91 | 910.00 |
| 4 – 10 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | 157.20 (1) | 100 (1) | 63.61 | 980 | - | - | - | - |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | 50.90 (20) | 39.53 (19) | 77.66 | 960 | 45.15 (20) | 31.12 (20) | 68.92 | 877.80 |

Data source: Primary data

Note: Figures in brackets indicate number of farms

**Table 6.2-c(1): Output and sale of paddy (husked) by size groups of land holdings (2009-10) for Hybrid Adopters**

| Size group (Ha) | Crop | Andhra Pradesh | | | | Bihar | | | | Madhya Pradesh | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | 0.73 ( 37 ) | 0.47 ( 25 ) | 64.38 | 1812.10 | 14.20 (6) | 4.89 (4) | 34.44 | 1298.00 |
| | HYVs | - | - | - | - | 4.71 ( 37 ) | 0.38 ( 25 ) | 8.07 | 1915.25 | 4.75 (2) | 1.23 (2) | 25.89 | 1400.00 |
| 1 – 2 | Hybrid | - | - | - | - | 1.62 ( 25 ) | 0.48 (18 ) | 29.63 | 1813.40 | 14.50 (2) | 6.12 (2) | 42.21 | 1257.50 |
| | HYVs | - | - | - | - | 9.13 ( 25 ) | 2.01 ( 18 ) | 22.02 | 1918.50 | - | - | - | - |
| 2 – 4 | Hybrid | - | - | - | - | 3.23 ( 12 ) | 1.45 ( 12) | 44.89 | 1816.50 | 26.25 (4) | 20.11 (4) | 76.61 | 1346.25 |
| | HYVs | - | - | - | - | 20.15 ( 12 ) | 7.25 (12) | 35.98 | 2012.32 | 11.25 (2) | 5.13 (2) | 45.60 | 1550.00 |
| 4 – 10 | Hybrid | - | - | - | - | 8.15 ( 6 ) | 4.40 ( 6 ) | 53.99 | 1825.20 | 32.33 (3) | 25.34 (3) | 78.37 | 1333.33 |
| | HYVs | - | - | - | - | 51.46 ( 6 ) | 37.05 ( 6 ) | 71.99 | 2015.25 | 10.00 (3) | 4.67 (3) | 46.70 | 1600.00 |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - | 41.50 (1) | 35.60 (1) | 85.78 | 1300.00 |
| | HYVs | - | - | - | - | - | - | - | - | 15.50 (1) | 7.90 (1) | 50.97 | 1450.00 |
| All Sizes | Hybrid | - | - | - | - | 1.96 ( 80 ) | 0.84 ( 61 ) | 42.83 | 1816.80 | 25.76 (16) | 18.41 (14) | 71.48 | 1307.02 |
| | HYVs | - | - | - | - | 12.03 ( 80) | 5.21 ( 61) | 43.33 | 1965.33 | 8.30 (8) | 3.79 (8) | 45.61 | 1500.00 |

*table 6.2-c(1)...continued.....*

| Size group (Ha) | Crop | Uttar Pradesh | | | | West Bengal | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | 4.22 (60) | 0.19 (60) | 4.49 | 1473.92 |
| | HYVs | - | - | - | - | 15.71 (60) | 0.70 (60) | 4.46 | 1520.95 |
| 1 – 2 | Hybrid | - | - | - | - | 7.54 (16) | 0.16 (16) | 2.07 | 1350.00 |
| | HYVs | - | - | - | - | 47.27 (16) | 0.13 (16) | 0.26 | 1520.00 |
| 2 – 4 | Hybrid | 34.67 (3) | 34.67 (3) | 100 | 1517 | 16.64 (04) | 1.00 (04) | 6.01 | 1400.00 |
| | HYVs | - | - | - | - | 117.87 (04) | 0.00 (04) | 0.00 | 0.00 |
| 4 – 10 | Hybrid | 20 (2) | 20 (2) | 100 | 1625 | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | 28.80 (5) | 28.80 (5) | 100 | 1560 | 5.50 (80) | 0.22 (80) | 4.06 | 1440.00 |
| | HYVs | - | - | - | - | 27.13 (80) | 0.55 (80) | 2.03 | 1520.91 |

Data source: Primary data

Note: Figures in brackets indicate number of farms

**Table 6.2-c(2): Output and sale of paddy (husked) by size groups of land holdings (2009-10) for Hybrid Non-Adopters**

| Size group (Ha) | Crop | Andhra Pradesh | | | | Bihar | | | | Madhya Pradesh | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 6.78 ( 8 ) | 1.31 ( 6 ) | 19.32 | 1914.80 | 3.12 (2) | 0.00 (2) | 0.00 | 0.00 |
| 1 – 2 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 17.86 ( 6 ) | 8.74 ( 5 ) | 48.93 | 1920.15 | 9.50 (1) | 2.11 (1) | 22.21 | 1450 |
| 2 – 4 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 23.77 ( 4 ) | 12.36 ( 4 ) | 51.99 | 2010.25 | 23.50 (1) | 11.50 (1) | 48.94 | 1400 |
| 4 – 10 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 64.62 ( 2 ) | 36.19 ( 2 ) | 56.01 | 2013.40 | 25.50 (2) | 14.89 (2) | 58.39 | 1500 |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 13.93 (20) | 6.13 ( 17 ) | 44.06 | 1964.52 | 12.32 (6) | 5.70 (6) | 46.25 | 1450.00 |

*table 6.2-c(2)...continued.....*

| Size group (Ha) | Crop | Uttar Pradesh | | | | West Bengal | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 22.06 (16) | 1.19 (16) | 5.38 | 1510.00 |
| 1 – 2 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 43.63 (03) | 0.00 (03) | 0.00 | 0.00 |
| 2 – 4 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 110.72 (01) | 0.00 (01) | 0.00 | 0.00 |
| 4 – 10 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 29.73 (20) | 0.95 (20) | 3.20 | 1510.00 |

Data source: Primary data

Note: Figures in brackets indicate number of farms

**Table 6.2-d(1): Output and sale of paddy (husked) by size groups of land holdings (2010-11) for Hybrid Adopters**

| Size group (Ha) | Crop | Andhra Pradesh | | | | Bihar | | | | Madhya Pradesh | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | 1.07 ( 37 ) | 0.69 ( 37 ) | 64.49 | 1815.21 | 10.20 (5) | 4.40 (4) | 43.14 | 1360.00 |
| | HYVs | - | - | - | - | 4.65 (37 ) | 0.42 ( 37 ) | 9.03 | 1918.05 | 4.25 (2) | 0.89 (2) | 20.94 | 1500.00 |
| 1 – 2 | Hybrid | - | - | - | - | 2.11 ( 25 ) | 1.60 ( 25 ) | 75.83 | 1819.08 | 24.50 (2) | 9.20 (2) | 37.55 | 1317.50 |
| | HYVs | - | - | - | - | 9.44 ( 25 ) | 4.83 ( 25 ) | 51.17 | 1920.22 | - | - | - | - |
| 2 – 4 | Hybrid | - | - | - | - | 3.46 ( 12 ) | 2.70 ( 12 ) | 78.03 | 1825.07 | 32.50 (4) | 20.32 (4) | 62.52 | 1462.50 |
| | HYVs | - | - | - | - | 19.75 ( 12 ) | 11.48 ( 12 ) | 58.13 | 2014.01 | 19.00 (1) | 8.90 (1) | 46.84 | 1500.00 |
| 4 – 10 | Hybrid | - | - | - | - | 8.87 ( 6 ) | 5.51 ( 6 ) | 62.12 | 1828.11 | 45.50 (2) | 33.43 (2) | 73.47 | 1415.00 |
| | HYVs | - | - | - | - | 52.49 ( 6 ) | 34.73 ( 6 ) | 66.17 | 2018.06 | 22.67 (3) | 13.44 (3) | 59.29 | 1516.67 |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - | 87.50 (2) | 71.30 (2) | 81.49 | 1500.00 |
| | HYVs | - | - | - | - | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | - | - | - | - | 2.75 ( 80 ) | 1.92 ( 80 ) | 70.12 | 1821.87 | 40.04 (15) | 27.73 (14) | 69.26 | 1411.00 |
| | HYVs | - | - | - | - | 11.97 ( 80 ) | 5.29 ( 80 ) | 46.12 | 1967.53 | 9.18 (6) | 4.65 (6) | 50.59 | 1505.56 |

*table 6.2-d(1)...continued.....*

| Size group (Ha) | Crop | Uttar Pradesh | | | | West Bengal | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | 6.11 (60) | 0.35 (60) | 5.73 | 1587.38 |
| | HYVs | - | - | - | - | 14.42 (60) | 0.79 (60) | 5.49 | 1590.00 |
| 1 – 2 | Hybrid | - | - | - | - | 10.73 (16) | 0.50 (16) | 4.66 | 1568.75 |
| | HYVs | - | - | - | - | 40.14 (16) | 0.38 (16) | 0.93 | 1650.00 |
| 2 – 4 | Hybrid | 35.67 (3) | 35.67 (3) | 100 | 1617 | 20.31 (04) | 0.00 (04) | 0.00 | 0.00 |
| | HYVs | - | - | - | - | 100.43 (04) | 0.00 (04) | 0.00 | 0.00 |
| 4 – 10 | Hybrid | 20.50 (2) | 20.50 (2) | 100 | 1720 | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | 29.60 (5) | 29.60 (5) | 100 | 1658 | 7.74 (80) | 0.36 (80) | 4.68 | 1582.24 |
| | HYVs | - | - | - | - | 23.87 (80) | 0.67 (80) | 2.80 | 1596.73 |

Data source: Primary data

Note: Figures in brackets indicate number of farms

**Table 6.2-d(2): Output and sale of paddy (husked) by size groups of land holdings (2010-11) for Hybrid Non-Adopters**

| Size group (Ha) | Crop | Andhra Pradesh | | | | Bihar | | | | Madhya Pradesh | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 6.23 ( 8 ) | 1.13 ( 6 ) | 18.14 | 1915.25 | 5.50 (2) | 0.00 (0) | 0.00 | 0.00 |
| 1 – 2 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 17.70 ( 6 ) | 10.29 ( 6 ) | 58.14 | 1920.18 | 11.00 (1) | 2.00 (1) | 18.18 | 1500 |
| 2 – 4 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 34.35 ( 4 ) | 23.41 ( 4 ) | 68.15 | 2012.05 | 24.50 (2) | 11.46 (2) | 46.78 | 1450 |
| 4 – 10 | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 66.20 ( 2 ) | 46.43 ( 2 ) | 70.14 | 2015.11 | 41.50 (2) | 23.98 (2) | 57.78 | 1650 |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | - | - | - | - | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 13.81 ( 20 ) | 7.41 ( 18 ) | 53.64 | 1965.64 | 16.50 (7) | 7.49 (5) | 45.38 | 1533.33 |

*table 6.2-d(2)...continued.....*

| Size group (Ha) | Crop | Uttar Pradesh | | | | West Bengal | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received | Output quantity (qtl) per farm | Sale quantity (qtl) per farm | % of Output sold | Average price received |
| Below 1ha | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 21.51 (16) | 1.44 (16) | 6.68 | 1664.13 |
| 1 – 2 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 40.64 (03) | 0.00 (03) | 0.00 | 0.00 |
| 2 – 4 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 93.87 (01) | 0.00 (01) | 0.00 | 0.00 |
| 4 – 10 | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| 10 ha and above | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | - | - | - | - |
| All Sizes | Hybrid | - | - | - | - | - | - | - | - |
| | HYVs | - | - | - | - | 27.99 (20) | 1.15 (20) | 4.11 | 1664.13 |

Data source: Primary data

Note: Figures in brackets indicate number of farms

**Table 6.3-a(1): Seasonal flow of marketing (sales) of paddy (un husked) (2009-10) of Hybrid Adopters**

(Sales quantity in qtl.)

| Month | Andhra Pradesh | | Bihar | | Madhya Pradesh | | Uttar Pradesh | | West Bengal | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hybrid | HYVs | Hybrid | HYVs | Hybrid | HYVs | Hybrid | HYVs | Hybrid | HYVs |
| January | 37.67 (30.00) | 24.3 (30.00) | 66.15 ( 19.15) | 68.35 ( 7.04 ) | 8.01 (10.04) | 5.78 (14.14) | - | - | 231.32 (9.38) | 44.26 (6.45) |
| February | 12.56 (10.00) | 8.10 (10.00) | 55.73 ( 16.13) | 48.08 ( 4.95 ) | - | 3.21 (7.85) | - | - | 231.32 (9.38) | 33.19 (4.84) |
| March | 6.28 (5.00) | 4.05 (5.00) | 38.25 ( 11.07) | 35.09 ( 3.61) | - | 2.6 (6.36) | - | - | 33.05 (1.34) | 11.06 (1.61) |
| April | 31.40 ( 25.00) | 20.30 (25.00) | - | 28.05 ( 2.89) | - | 1.97 (4.82) | - | - | 66.09 (2.68) | 11.06 (1.61) |
| May | 12.56 (10.00) | 8.10 (10.00) | - | 18.29 ( 1.88 ) | - | 3.1 (7.58) | - | - | 198.27 (8.04) | 55.32 (8.06) |
| June | - | - | - | 16.55 ( 1.71) | - | 2.6 (6.36) | - | - | 231.32 (9.38) | 77.45 (11.29) |
| July | - | - | - | 7.84 ( 0.81) | 3 (3.76) | 1.67 (4.09) | - | - | 253.35 (10.27) | 88.52 (12.90) |
| August | - | - | - | 38.25 (3.94) | - | 1.54 (3.77) | - | - | 55.08 (2.23) | 22.13 (3.23) |
| September | - | - | - | 42.30 ( 4.36 ) | - | 0.8 (1.96) | - | - | 220.30 (8.93) | 55.32 (8.06) |
| October | - | - | - | 72.65 ( 7.48 ) | - | 1.12 (2.74) | - | - | 319.44 (12.95) | 99.58 (14.52) |
| November | 12.56 (10.00) | 8.10 (10.00) | 88.05 ( 25.48 ) | 255.50 ( 26.31) | 16.39 (20.54) | 6.7 (16.39) | - | - | 473.65 (19.20) | 143.84 (20.97) |
| December | 12.56 (10.00) | 8.10 (10.00) | 97.33 ( 28.17) | 340.10 ( 35.02) | 52.41 (65.67) | 9.78 (23.93) | 33.07 (100) | 41.47 (100) | 154.21 (6.25) | 44.26 (6.45) |

Data source: Primary data

Note: Figures in brackets indicate percentages of total sales

**Table 6.3-a(2): Seasonal flow of marketing (sales) of paddy (un husked) (2009-10) of Hybrid Non-Adopters**

(Sales quantity in qtl.)

| Month | Andhra Pradesh | Bihar | Madhya Pradesh | Uttar Pradesh | West Bengal |
|---|---|---|---|---|---|
| | HYVs | HYVs | HYVs | HYVs | HYVs |
| January | 20.5 (25.00) | 98.32 (22.16 ) | 7.61 (15.69) | - | 44.26 (6.45) |
| February | 12.30 (15.00) | 60.25 (13.58) | 3.9 (8.04) | - | 33.19 (4.84) |
| March | 4.10 (5.00) | 13.60 ( 3.06 ) | 1.99 (4.10) | - | 11.06 (1.61) |
| April | 12.3 (15.00) | 10.09 ( 2.27) | 2.8 (5.77) | - | 11.06 (1.61) |
| May | 12.3 (15.00) | 6.28 ( 1.42) | 2.6 (5.36) | - | 55.32 (8.06) |
| June | 4.1 (5.00) | 5.35 ( 1.21) | 3.1 (6.39) | - | 77.45 (11.29) |
| July | - | 8.55 ( 11.93) | 2.2 (4.54) | - | 88.52 (12.90) |
| August | - | 9.25 ( 2.08 ) | 1.29 (2.66) | - | 22.13 (3.23) |
| September | - | 10.75 ( 2.42) | 1.01 (2.08) | - | 55.32 (8.06) |
| October | - | 17.13 (3.86 ) | 2.08 (4.29) | - | 99.58 (14.52) |
| November | 8.2 (10.00) | 98.50 (22.20) | 8.9 (18.35) | - | 143.84 (20.97) |
| December | 8.2 (10.00) | 105.65 ( 23.81) | 11.02 (22.72) | 37.78 (100) | 44.26 (6.45) |

Data source: Primary data

Note: Figures in brackets indicate percentages of total sales

**Table 6.3-b(1): Seasonal flow of marketing (sales) of paddy (un husked) (2010-11) of Hybrid Adopters**

(Sales quantity in qtl.)

| Month | Andhra Pradesh | | Bihar | | Madhya Pradesh | | Uttar Pradesh | | West Bengal | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hybrid | HYVs | Hybrid | HYVs | Hybrid | HYVs | Hybrid | HYVs | Hybrid | HYVs |
| January | 21.9 (30.00) | 19.5 (30.00) | 68.25 (15.93) | 110.50 ( 10.92 ) | 8.01 (10.04) | 5.78 (14.14) | - | - | 80.52 (9.98) | 218.53 (10.61) |
| February | 7.3 (10.00) | 6.5 (10.00) | 56.58 (13.21 ) | 95.35 ( 9.43 ) | - | 3.21 (7.85) | - | - | 87.84 (10.88) | 242.81 (11.79) |
| March | 3.65 (5.00) | 3.25 (5.00) | 42.05 ( 9.82) | 64.08 ( 6.32 ) | - | 2.6 (6.36) | - | - | 3.66 (0.45) | 9.71 (0.47) |
| April | 18.25 (25.00) | 16.25 (25.00) | 35.62 ( 18.31) | 35.15 ( 3.47 ) | - | 1.97 (4.82) | - | - | 5.49 (0.68) | 24.28 (1.18) |
| May | 7.3 (10.00) | 6.5 (10.00) | - | 28.85 ( 2.85 ) | - | 3.1 (7.58) | - | - | 76.86 (9.52) | 184.53 (8.96) |
| June | - | - | - | 19.30 ( 1.91 ) | - | 2.6 (6.36) | - | - | 38.43 (4.76) | 106.83 (5.19) |
| July | - | - | - | 8.25 (0.82 ) | 3 (3.76) | 1.67 (4.09) | - | - | 87.84 (10.88) | 218.53 (10.61) |
| August | - | - | - | 6.13 ( 0.61 ) | - | 1.54 (3.77) | - | - | 9.15 (1.13) | 14.57 (0.71) |
| September | - | - | - | 4.05 ( 0.41 ) | - | 0.8 (1.96) | - | - | 75.03 (9.30) | 174.82 (8.49) |
| October | - | - | 32.47 ( 7.58) | 15.95 ( 1.58 ) | - | 1.12 (2.74) | - | - | 113.46 (14.06) | 291.37 (14.15) |
| November | 7.3 (10.00) | 6.5 (10.00) | 90.80 ( 21.19 ) | 268.35 ( 26.53 ) | 16.39 (20.54) | 6.7 (16.39) | - | - | 151.88 (18.82) | 378.78 (18.40) |
| December | 7.3 (10.00) | 6.5 (10.00) | 102.65 ( 23.96 ) | 355.70 ( 35.16 ) | 52.41 (65.67) | 9.78 (23.93) | 35.04 (100) | 46.38 (100) | 76.86 (9.52) | 194.25 (9.43) |

Data source: Primary data

Note: Figures in brackets indicate percentages of total sales

**Table 6.3-b(2): Seasonal flow of marketing (sales) of paddy (un husked) (2010-11) of Hybrid Non-Adopters**

(Sales quantity in qtl.)

| Month | Andhra Pradesh | Bihar | Madhya Pradesh | Uttar Pradesh | West Bengal |
|---|---|---|---|---|---|
| | HYVs | HYVs | HYVs | HYVs | HYVs |
| January | 21.25 (25.00) | 94.08 ( 21.58 ) | 7.61 (15.69) | - | 53.62 (8.62) |
| February | 12.75 (15.00) | 55.45 ( 12.72 ) | 3.9 (8.04) | - | 32.17 (5.17) |
| March | 4.25 (5.00) | 14.72 ( 3.38 ) | 1.99 (4.10) | - | 10.72 (1.72) |
| April | 12.75 (15.00) | 12.09 ( 2.77 ) | 2.8 (5.77) | - | 21.45 (3.45) |
| May | 12.75 (15.00) | 6.30 ( 1.45 ) | 2.6 (5.36) | - | 42.90 (6.90) |
| June | 4.25 (5.00) | 8.60 ( 1.97 ) | 3.1 (6.39) | - | 10.72 (1.72) |
| July | - | 5.35 ( 1.23 ) | 2.2 (4.54) | - | 107.24 (17.24) |
| August | - | 4.80 ( 1.10 ) | 1.29 (2.66) | - | 10.72 (1.72) |
| September | - | 4.55 ( 1.04 ) | 1.01 (2.08) | - | 64.34 (10.34) |
| October | - | 16.40 ( 3.76 ) | 2.08 (4.29) | - | 96.52 (15.52) |
| November | 8.5 (10.00) | 98.40 ( 22.57 ) | 8.9 (18.35) | - | 96.52 (15.52) |
| December | 8.5 (10.00) | 115.25 ( 26.43 ) | 11.02 (22.72) | 39.53 (100) | 75.07 (12.07) |

Data source: Primary data

Note: Figures in brackets indicate percentages of total sales

*Annexure to Chapter VII*

**Table 7.1: Questions related to Hybrid Adopters' Awareness about Hybrid Rice Technology**

| Sl. No. | Particulars | Answers | % of farmers reporting | | | | |
|---|---|---|---|---|---|---|---|
| | | | Andhra Pradesh | Bihar | Madhya Pradesh | Uttar Pradesh | West Bengal |
| 1. | How has he become aware about hybrid rice technology? | Govt. Ext. Worker | - | 73.50 | - | - | 71.25 |
| | | News paper | - | 12.25 | - | - | 10.00 |
| | | Other cultivators | - | - | - | - | 18.75 |
| | | Relatives & Friends | 27.50 | - | - | - | - |
| | | Local People | 41.25 | - | - | - | - |
| | | Progressive Farmer | 31.25 | - | - | - | - |
| | | Other | - | 14.25 | - | - | - |
| 2. | If yes have you participated in the programme? | Yes | 81.25 | 72.00 | 33.75 | - | 70.00 |
| | | No | 18.75 | 28.00 | 66.25 | 100.00 | 30.00 |
| 3. | Whether front line demonstration programme is organized in your area by the Government to create awareness about the hybrid rice technology? | Yes | 91.25 | 74.00 | 72.50 | | 65.00 |
| | | No | 8.75 | 26.00 | 27.50 | 100.00 | 35.00 |
| 4. | Name the hybrids demonstrated and indicate the extent of yield advantage as demonstrated. | Hybrid –1 KRH-II,Yield advantage over HYV(80%) | - | - | - | - | 44.00 |
| | | Hybrid –2 DRRS-II,Yield advantage over HYV(70%) | - | - | - | - | 38.00 |
| | | Hybrid –3PAC – 835, Yield advantage over HYV(65%) | - | - | - | - | 14.00 |
| | | Hybrid – 1 ARIZE-6444 GOLD Yield advantage (%) (70) | 56.25 | - | - | - | - |
| | | Hybrid – 2 RASI Yield advantage (%) (68) | 43.75 | - | - | - | - |
| | | PHB - 71 Yield advantage (%) (72) | - | 42.00 | - | - | - |
| | | US- 312 Yield advantage (%) (65) | - | 35.00 | - | - | - |
| | | 3 PAC – 835 (58%) | - | 28.00 | - | - | - |
| 5. | Whether the government organised training programmes for farmers? | Yes | 65.00 | 78.00 | 42.50 | - | 100.00 |
| | | No | 35.00 | 22.00 | 57.50 | 100.00 | 0.00 |
| 6. | If yes, had he participated? | Yes | 66.25 | 72.00 | 67.60 | - | 73.75 |
| | | No | 33.75 | 28.00 | 32.40 | - | 26.25 |
| 7. | If participated mention the number of training programmes participated and their duration. | Trainings participated | - | - | - | - | - |
| | | Duration : one day | - | 81.50 | 71.25 | - | 83.00 |
| | | : two days | - | 18.50 | 28.75 | - | 17.00 |

Data source: Primary data

## Table 7.2-a: Questions related to Hybrid Adopting Farmers' access to Hybrid Seed input

| Sl. No. | Particulars | Answers | % of farmers reporting | | | | |
|---|---|---|---|---|---|---|---|
| | | | Andhra Pradesh | Bihar | Madhya Pradesh | Uttar Pradesh | West Bengal |
| 1. | Have you used hybrid seed? | Yes | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| | | No | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2. | If yes, why used - | Higher yield | 47.50 | 82.00 | - | 100.00 | 100.00 |
| | | Free supply of hybrid seed | 0.00 | 90.00 | - | 0.00 | 100.00 |
| | | Interested | 0.00 | 0.00 | - | 0.00 | 0.00 |
| | | Easy Available | 0.00 | 0.00 | - | 0.00 | 0.00 |
| | | Demonstration | 31.25 | 0.00 | - | 0.00 | 0.00 |
| 3. | Is the hybrid seed easily available? | Yes | 91.25 | 32.00 | 78.75 | 100.00 | 36.25 |
| | | No | 8.75 | 68.00 | 21.25 | 0.00 | 63.75 |
| 4. | What is the usual source of your seeds? | Govt. supply | 0.00 | 75.80 | - | 71.25 | 77.50 |
| | | Pvt. supply | 100.00 | 24.20 | - | 28.75 | 22.50 |
| 5. | Is the quality hybrid seeds available in your area? | Yes | 86.25 | 40.00 | 61.25 | 100.00 | 45.00 |
| | | No | 13.75 | 60.00 | 38.75 | 0.00 | 55.00 |
| 6. | If yes, do you get seeds (a) during planting time and (b) at a reasonable price | Available during planting time | 97.50 | 39.00 | 61.25 | 88.75 | 41.25 |
| | | Available at reasonable price | 57.50 | 10.50 | 0.00 | 0.00 | 8.75 |
| 7. | Are you satisfied with quality of seed? | Yes | 86.25 | 54.25 | 63.75 | 100.00 | 48.75 |
| | | No | 13.75 | 45.75 | 36.25 | 0.00 | 51.25 |
| 8. | If no, reasons there for (poor germination etc.) | Poor germination | 13.75 | 100.00 | - | - | 100.00 |
| | | Other | 86.25 | 0.00 | - | - | 0.00 |
| 9. | Are you convinced that hybrid seed yield better results than the inbred seeds? | Yes | 86.25 | 100.00 | 100.00 | 100.00 | 100.00 |
| | | No | 13.75 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10. | If yes, indicate the percentage of yield increase. | 5-10% | 0.00 | 8.25 | 42.50 | 0.00 | 0.00 |
| | | 10-15% | 0.00 | 15.50 | 32.50 | 3.75 | 11.25 |
| | | 15-20% | 100.00 | 32.75 | 25.00 | 96.25 | 43.75 |
| | | 20% & Above | 0.00 | 43.50 | 0.00 | 0.00 | 45.00 |
| 11. | If Hybrid seeds bring lesser yields, indicate the percentage of yield loss due to hybrid rice. | 5-10% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 10-15% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 15-20% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12. | Do you purchase new seeds of hybrid varieties every crop season/year? | Yes | 48.75 | 80.00 | 100.00 | 100.00 | 100.00 |
| | | No | 51.25 | 20.00 | 0.00 | 0.00 | 0.00 |
| 13. | Do you feel that adoption of hybrid seeds prevented traditional practice of saving and exchanging of seeds? | Yes | 21.25 | 100.00 | 100.00 | 100.00 | 100.00 |
| | | No | 78.25 | 0.00 | 0.00 | 0.00 | 0.00 |
| 14. | How often do you replace hybrid seed varieties? | replacing every year | 41.25 | 65.00 | 1.25 | 100.00 | 80.00 |
| | | replacing every alternative year | 27.50 | 25.00 | 8.75 | 0.00 | 20.00 |
| | | replacing every 3 years | 31.25 | 10.00 | 22.50 | 0.00 | 0.00 |
| | | replacing after 3 years or more | 0.00 | 0.00 | 67.50 | 0.00 | 0.00 |

Data source: Primary data

**Table 7.2-b: Questions related to Hybrid Adopting Farmers access to Fertiliser input and its use**

| Sl. No. | Particulars | Answers | % of farmers reporting | | | | |
|---|---|---|---|---|---|---|---|
| | | | Andhra Pradesh | Bihar | Madhya Pradesh | Uttar Pradesh | West Bengal |
| 1. | Have you used chemical fertilizer? | Yes | 86.25 | 100.00 | 100.00 | 100.00 | 100.00 |
| | | No | 13.75 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2. | Whether received information from any source regarding what to use and the required doses? | Yes | 81.25 | 82.00 | 41.25 | 100.00 | 87.50 |
| | | No | 18.75 | 18.00 | 58.75 | 0.00 | 12.50 |
| 3. | If yes, have you applied recommended doses of fertilizer? | Yes | 81.25 | 85.50 | 31.25 | 0.00 | 84.15 |
| | | No | 18.75 | 14.50 | 68.75 | 100.00 | 15.85 |
| 4. | If not, state reasons there for | Reason 1 Financial constrain | - | 44.25 | - | 56.25 | 46.43 |
| | | Reason 2 Lack of knowledge | - | 55.75 | - | 43.75 | 53.57 |
| 5. | If fertilizer not used at all what are the reasons | Reason 1 | - | - | - | - | 0.00 |
| | | Reason 2 | - | - | - | - | 0.00 |
| 6. | Is fertiliser easily available? | Yes | 82.50 | 80.00 | 47.50 | 0.00 | 100.00 |
| | | No | 17.50 | 20.00 | 52.50 | 100.00 | 0.00 |
| 7. | If yes, the source where it is available | Source : Pvt. Outlet at market | 100 | 100.00 | - | - | 100.00 |
| 8. | Do you feel that hybrid seeds require more fertilizer than inbred seeds | Yes | 33.75 | 100.00 | 77.50 | 56.25 | 100.00 |
| | | No | 66.25 | 0.00 | 22.50 | 43.75 | 0.00 |

Data source: Primary data

**Table 7.2-c: Questions related to Hybrid Adopting Farmers access to Pesticide input and its use**

| Sl. No. | Particulars | Answers | % of farmers reporting | | | | |
|---|---|---|---|---|---|---|---|
| | | | Andhra Pradesh | Bihar | Madhya Pradesh | Uttar Pradesh | West Bengal |
| 1. | Whether hybrid rice crop or any other variety of rice crops was attacked with pests and diseases? | Yes | 37.50 | 90.00 | 36.25 | 0.00 | 100.00 |
| | | No | 62.50 | 10.00 | 63.75 | 100.00 | 0.00 |
| 2. | If yes, which variety (Hybrid/ Hyvs) with area | Hybrid (area) | - | 85.00 | - | - | 100.00 |
| | | HYVs (area) | - | 15.00 | - | - | 100.00 |
| 3. | Have you applied pesticides? | Yes | 82.50 | 83.00 | 31.25 | 0.00 | 86.00 |
| | | No | 17.50 | 17.00 | 68.75 | 100.00 | 14.00 |
| 4. | If not, why not used? | Lack of money | 0.00 | 34.75 | - | 0.00 | 100.00 |
| | | Costly | 11.00 | 0.00 | - | 60.00 | 0.00 |
| | | Not needed | 6.50 | 0.00 | - | 40.00 | 0.00 |
| | | Lack of knowledge | 0.00 | 65.25 | - | 0.00 | 0.00 |
| 5. | Is the pesticide easily available? | Yes | 86.25 | 100.00 | 100.00 | 0.00 | 100.00 |
| | | No | 13.75 | 0.00 | 0.00 | 100.00 | 0.00 |
| 6. | Do you know the correct way of using and doses of plant protection pesticides? | Yes | 87.50 | 84.50 | 22.50 | 0.00 | 88.75 |
| | | No | 12.50 | 15.50 | 77.50 | 100.00 | 11.25 |
| 7. | Do you feel that hybrid rice varieties are more susceptible to pests and diseases? | Yes | 92.50 | 88.25 | 36.25 | 0.00 | 86.25 |
| | | No | 7.50 | 11.75 | 63.75 | 100.00 | 13.75 |
| 8. | Do you know the correct does of pesticides for hybrid seed varieties ? | Yes | 96.25 | 79.50 | 23.75 | 0.00 | 81.25 |
| | | No | 3.75 | 20.50 | 76.25 | 100.00 | 18.75 |
| 9. | Do you feel that hybrid rice cultivation is highly sensitive to crop management practices - use of key inputs and time bound operations? | Yes | 90.00 | 78.00 | 78.75 | 0.00 | 81.25 |
| | | No | 10.00 | 22.00 | 21.25 | 100.00 | 18.75 |
| 10. | Do you feel that the extent of yield loss due to pests and diseases for inbred variety is lower as compared to hybrids | Yes | 36.25 | 100.00 | 90.00 | 0.00 | 100.00 |
| | | No | 63.75 | 0.00 | 10.00 | 100.00 | 0.00 |

Data source: Primary data

**Table 7.2-d: Questions related to Hybrid Adopting Farmers' access to credit**

| Sl. No. | Particulars | Answers | % of farmers reporting | | | | |
|---|---|---|---|---|---|---|---|
| | | | Andhra Pradesh | Bihar | Madhya Pradesh | Uttar Pradesh | West Bengal |
| 1. | Do you require more credit for using hybrid seed? | Yes-1 | 76.25 | 28.50 | 83.75 | 100.00 | 26.25 |
| | | No-2 | 23.75 | 71.50 | 16.25 | 0.00 | 73.75 |
| 2. | Do you get required credit from the Co. Credit Society or any other institutional sources? | Yes-1 | 70.00 | 38.00 | 86.25 | 0.00 | 54.17 |
| | | No-2 | 30.00 | 62.00 | 13.75 | 100.00 | 45.83 |
| 3. | If yes, which source | Bank | 100.00 | 100.00 | - | - | 66.67 |
| | | Co-operative | 0.00 | 0.00 | - | - | 33.33 |
| 4. | If not, what are the problems in getting credit | Security | - | 25.50 | - | 52.50 | 23.61 |
| | | Other | - | 74.50 | - | 47.50 | 76.39 |

Data source: Primary data

**Table 7.2-e: Questions related to Hybrid Adopters' Perception about Marketing of Hybrid Rice**

| Sl. No. | Particulars | Answers | % of farmers reporting | | | | |
|---|---|---|---|---|---|---|---|
| | | | Andhra Pradesh | Bihar | Madhya Pradesh | Uttar Pradesh | West Bengal |
| 1. | Do you face problems in marketing of hybrid rice produce? | Yes | 67.50 | 84.50 | 0.00 | 100.00 | 100.00 |
| | | No | 32.50 | 15.50 | 100.00 | 0.00 | 0.00 |
| 2. | If yes, state the nature of the problem faced | Lower market price | 63.75 | 96.00 | 0.00 | 58.75 | 100.00 |
| | | Poor cooking and keeping quality | 56.25 | 78.00 | 0.00 | 36.25 | 83.75 |
| | | Lower head – rice recovery (percentage of clean rice after milling) | 11.25 | 100.00 | 0.00 | 100.00 | 100.00 |
| | | More broken rice after milling | 22.50 | 52.00 | 0.00 | 100.00 | 56.25 |
| | | Lack of consumer demand for hybrid rice grain | 52.50 | 92.00 | 0.00 | 67.50 | 100.00 |
| | | Poor grain quality and as a result lack of market acceptance | 21.25 | 88.00 | 0.00 | 82.50 | 86.25 |
| | | Traders not accepting hybrid rice grain lack of demand from millers and consumers | 8.75 | 81.50 | 0.00 | 95.00 | 83.75 |

Data source: Primary data

**Table 7.3: Hybrid Adopting Farmers' overall Perception about Hybrid Rice Cultivation**

| Sl. No. | Particulars | Answers | % of farmers reporting | | | | |
|---|---|---|---|---|---|---|---|
| | | | Andhra Pradesh | Bihar | Madhya Pradesh | Uttar Pradesh | West Bengal |
| 1. | Is there any yield gain from cultivation of hybrids over the best popular inbred rice varieties? | Yes | 77.50 | 100.00 | 100.00 | 100.00 | 100.00 |
| | | No | 22.50 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2. | Is hybrid rice production profitable? | Yes | 97.50 | 74.50 | 100.00 | 100.00 | 78.75 |
| | | No | 2.50 | 25.50 | 0.00 | 0.00 | 21.25 |
| 3. | Do consumers perceive hybrid as inferior to inbred in respect of grain quality? | **Hybrids inferior in respect of** | - | - | - | - | - |
| | | Poor grain quality | 41.25 | 88.50 | 70.00 | 100.00 | 96.25 |
| | | No taste | 33.75 | 56.25 | 3.75 | 35.00 | 63.75 |
| | | Poor cooking quality | 58.75 | 78.50 | 15.00 | 80.00 | 81.25 |
| | | Stickiness of cooked rice | 23.75 | 80.00 | 11.25 | 81.25 | 85.00 |
| 4. | Is hybrid rice grain acceptable to traders and millers? | Yes | 95.00 | 24.00 | 88.75 | 51.25 | 20.00 |
| | | No | 5.00 | 76.00 | 11.25 | 48.75 | 80.00 |
| 5. | Is he convinced with the economic viability of hybrid rice cultivation? | Yes | 95.00 | 72.50 | 83.75 | 100.00 | 75.00 |
| | | No | 5.00 | 27.50 | 16.25 | 0.00 | 25.00 |
| 6. | It no, reasons therefore | Reason – 1: Less/non availability of seeds, higher cost of cultivation, | - | 22.00 | - | 0.00 | 25.00 |
| | | Reason – 2: More susceptible to pest and diseases, | - | 13.00 | - | 0.00 | 15.00 |
| | | Reason – 3:Poor quality of grain, | - | 32.00 | - | 0.00 | 35.00 |
| | | Reason – 4:Poor knowledge about hybrid cultivation, technology and management | - | 21.00 | - | 0.00 | 25.00 |
| | | Reason – 5: Poor marketing of hybrid rice | - | 12.00 | - | 0.00 | - |
| 7. | Do you like to continue cultivating of hybrid rice? | Yes | 91.25 | 85.00 | 97.50 | 100.00 | 92.50 |
| | | No | 8.75 | 15.00 | 2.50 | 0.00 | 7.50 |
| 8. | If yes, reasons for continuing hybrid rice production | **Reasons for continuing hybrid rice cultivation** | - | - | - | - | - |
| | | Expecting to get new hybrids with better quality in the near future | 100.00 | 28.50 | 41.00 | 100.00 | 31.25 |
| | | Higher yield of hybrid rice | 100.00 | 71.50 | 59.00 | 0.00 | 92.50 |

Data source: Primary data

## Table7.4: Questions related to Reasons for non-adoption of hybrid rice (reaction of non-participants)

| Sl. No. | Particulars | Answers | % of farmers reporting | | | | |
|---|---|---|---|---|---|---|---|
| | | | Andhra Pradesh | Bihar | Madhya Pradesh | Uttar Pradesh | West Bengal |
| 1. | Have you heard of any of the new hybrid varieties of rice? | Yes-1 | 95.00 | 62.00 | 75.00 | 40.00 | 65.00 |
| | | No-2 | 5.00 | 38.00 | 0.00 | 60.00 | 35.00 |
| 2. | If yes, what are they? | KRH-II | 0.00 | - | - | 0.00 | 67.86 |
| | | DRRS-II | 0.00 | - | - | 0.00 | 53.57 |
| | | PAC - 835 | 0.00 | - | - | 0.00 | 44.05 |
| | | ARIZE-6444- GOLD | 15.00 | - | - | 0.00 | 0.00 |
| | | RASI | 45.00 | - | - | 0.00 | 0.00 |
| | | SRI | 35.00 | - | - | 0.00 | 0.00 |
| | | 6444 & PHB-71 | 0.00 | - | - | 40.00 | 0.00 |
| 3. | Have you heard of the Govts. Hybrid rice promotion programme? | Yes-1 | 95.00 | 52.00 | 80.00 | 0.00 | 55.00 |
| | | No-2 | 5.00 | 48.00 | 20.00 | 100.00 | 45.00 |
| 4. | Have you seen any standing rice crop of hybrid variety in your area? | Yes-1 | 95.00 | 43.00 | 75.00 | 40.00 | 45.00 |
| | | No-2 | 5.00 | 57.00 | 25.00 | 60.00 | 55.00 |
| 5. | Did anybody suggest you to grow this variety? | Yes-1 | 90.00 | 61.00 | 55.00 | 0.00 | 65.00 |
| | | No-2 | 10.00 | 39.00 | 45.00 | 100.00 | 35.00 |
| 6. | If yes, state who suggested? | V.L.W | 0.00 | 42.18 | 0.00 | - | 39.29 |
| | | BDO | 0.00 | 4.20 | 0.00 | - | 7.15 |
| | | AEO | 0.00 | 60.50 | 63.64 | - | 54.77 |
| | | Relative | 60.00 | 0.00 | 27.27 | - | 15.48 |
| | | Other cultivators | 60.00 | 10.45 | 9.09 | - | 15.48 |
| | | Known from government demonstration | 60.00 | 25.25 | 45.45 | - | 7.14 |
| | | Others (Media) | 50.00 | 15.75 | 0.00 | - | 30.95 |
| 7. | Will you be growing this variety next year? | Yes | 55.00 | 68.00 | 35.00 | 95.00 | 70.00 |
| | | No | 45.00 | 32.00 | 65.00 | 5.00 | 30.00 |

*table-7.4.....continued.....*

*table-7.4.....continued.....*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8. | What are the reasons for your not using this year? | Not heard of the variety | 10.00 | 8.35 | 25.00 | 40.00 | 35.00 |
| | | Not heard of the Govt. assistance for expansion of hybrid rice seeds. | 30.00 | 30.00 | 20.00 | 100.00 | 35.00 |
| | | Non-availability of seed | - | - | - | - | - |
| | | a. Not at all | 5.00 | 0.00 | 0.00 | 100.00 | 15.00 |
| | | b. Not in time | 5.00 | 0.00 | 66.67 | 0.00 | 0.00 |
| | | c. Pure hybrid seed not available | 85.00 | 0.00 | 33.33 | 0.00 | 0.00 |
| | | Seed is too costly | 45.00 | 42.00 | 20.00 | 100.00 | 20.00 |
| | | Seed available, but at too far a distance | 20.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | Pre-treatment of seed is necessary and have never done it before. | 90.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | Govt. Seed germination rate too low | 10.00 | 26.00 | 30.00 | 100.00 | 0.00 |
| | | Not convinced that the seed is of high quality | 40.00 | 0.00 | 20.00 | 100.00 | 10.00 |
| | | Not convinced that its yield is sufficiently high | 30.00 | 0.00 | 25.00 | 100.00 | 20.00 |
| | | Lower yield for hybrid than for inbred | 15.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | Yield gain but lower profitability of Hybrid rice | 45.00 | 66.50 | 10.00 | 0.00 | 10.00 |
| | | Variety too coarse | 25.00 | 0.00 | 20.00 | 100.00 | 0.00 |
| | | Higher risks | 15.00 | 0.00 | 25.00 | 0.00 | 25.00 |
| | | Will fetch lower price as compared to inbred variety | 15.00 | 0.00 | 5.00 | 100.00 | 75.00 |
| | | Needs too much of fertilizers | 85.00 | 18.25 | 35.00 | 0.00 | 0.00 |
| | | Soil type not suitable | 25.00 | 0.00 | 0.00 | 100.00 | 0.00 |
| | | Not insects pests and disease resistant. | 85.00 | 0.00 | 35.00 | 0.00 | 25.00 |
| | | The extent of yield loss due to pests and diseases is | 15.00 | 20.45 | 30.00 | 0.00 | 30.00 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | higher for hybrids. | | | | | |
| | | Needs more water | 30.00 | 0.00 | 15.00 | 0.00 | 0.00 |
| | | Fodder quality not good | 15.00 | 0.00 | 0.00 | 100.00 | 0.00 |
| | | Credit – not available in time | 30.00 | 0.00 | 5.00 | 0.00 | 0.00 |
| | | Credit not at all available | 0.00 | 14.30 | 15.00 | 0.00 | 0.00 |
| | | Restrictions on disposal i.e. should be sold to a particular agency | 35.00 | 0.00 | 0.00 | 100.00 | 0.00 |
| | | Any other (Specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 9. | Are you ready to accept new hybrid rice varieties in future considering superior grain quality and higher yield potential? | Yes | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| | | No | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10. | If no, reasons therefore. | Reasons – 1 | - | - | - | - | - |
| | | Reasons – 2 | - | - | - | - | - |

Data source: Primary data *table-7.4.....concluded.*