

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



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AGRO-ECONOMIC RESEARCH CENTRE  
VISVA-BHARATI  
SANTINIKETAN  
2013



**Study No. 177**

*Consolidated Report*

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and their Impact on the Overall Production  
and Productivity**

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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.*

Santiniketan  
November, 2013

Sd/-  
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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 bring 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
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	Bihar & Jharkhand: PSD 3, Ajay, CoRH 3, Indira Sona, JRH 8 Madhya Pradesh: JRH-4, JRH-5, JRH-8, and DRRH-3 Uttar Pradesh: PSD-1, NSD-2, Ganga, Narendra Usar SD-3 West Bengal: PSD 3, Ajay, CoRH 3, Indira Sona, JRH 8

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](http://www.agricoop.nic.in), [www.mpkrishi.org](http://www.mpkrishi.org), [www.dacnet.nic.in](http://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.

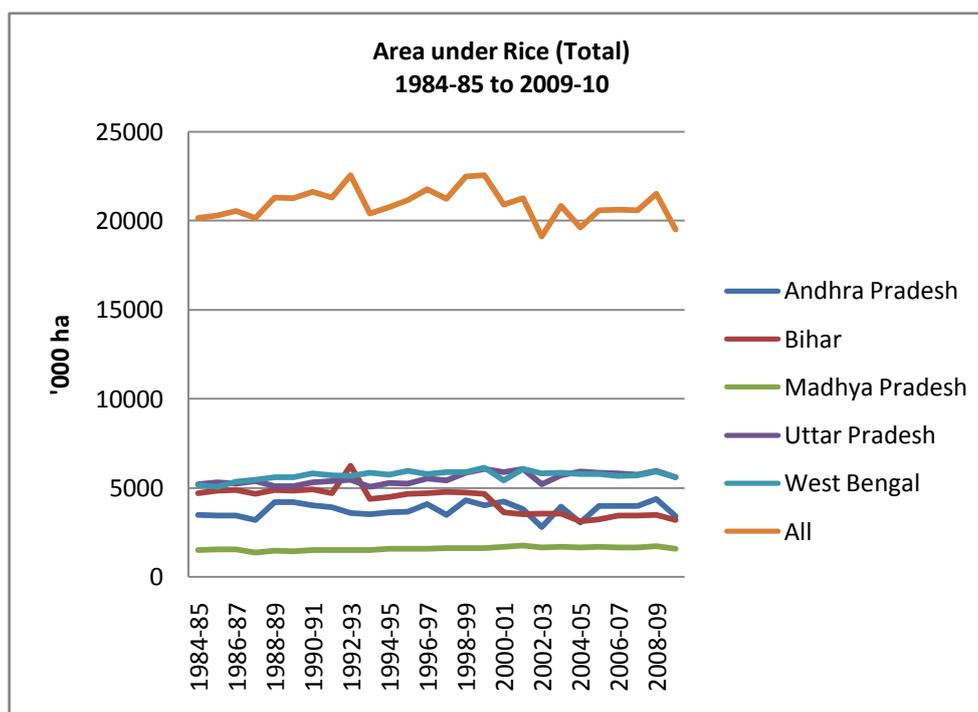
## CHAPTER-II

### Trends of Rice Production, Productivity and Area

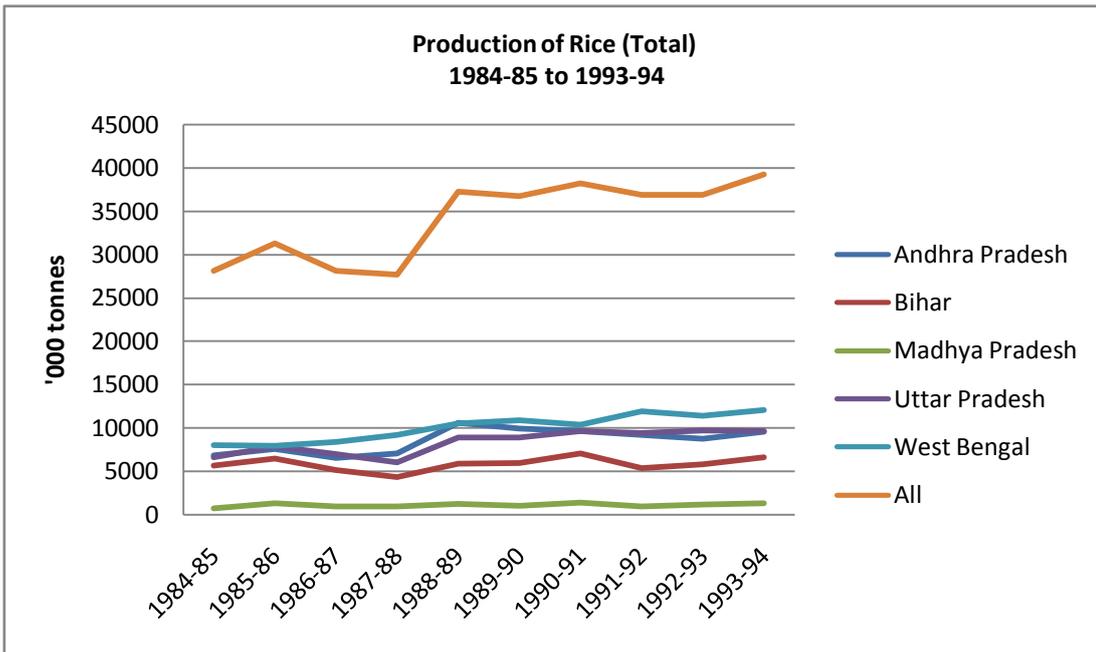
#### 2.1 Overall trends (1984 – 2010)

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.

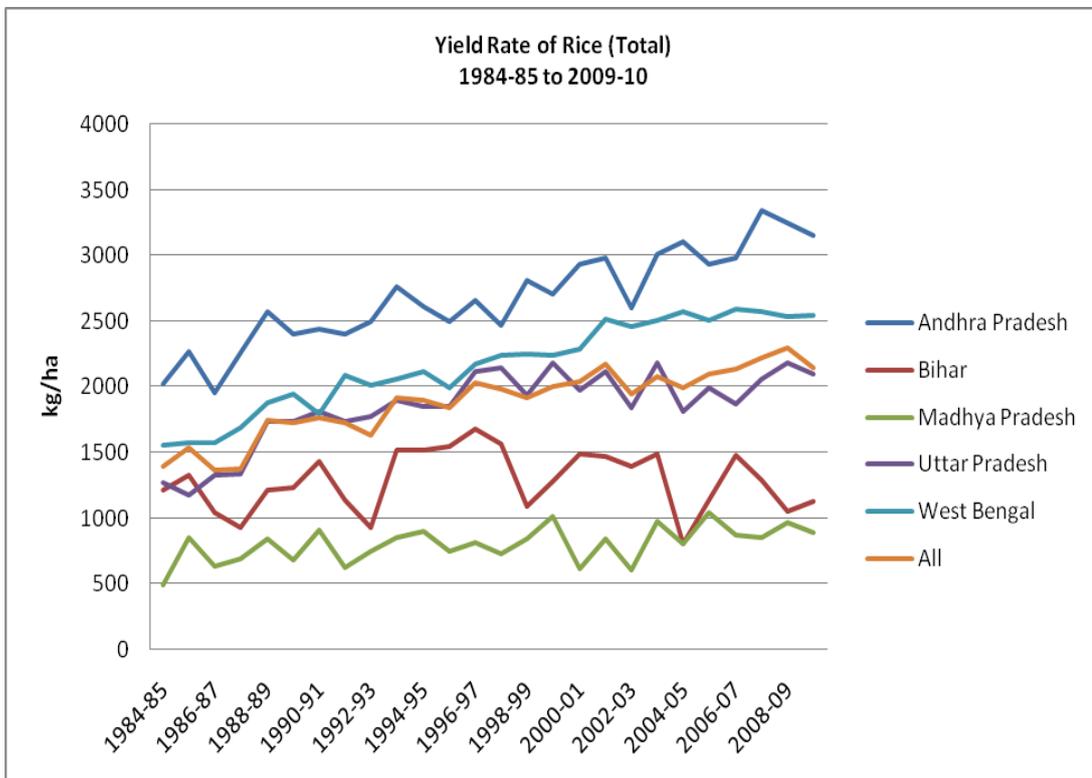
Figure 2.1



**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:  $CAGR(t_0, t_n) = (V(t_n)/V(t_0))^{\frac{1}{t_n-t_0}} - 1$  (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

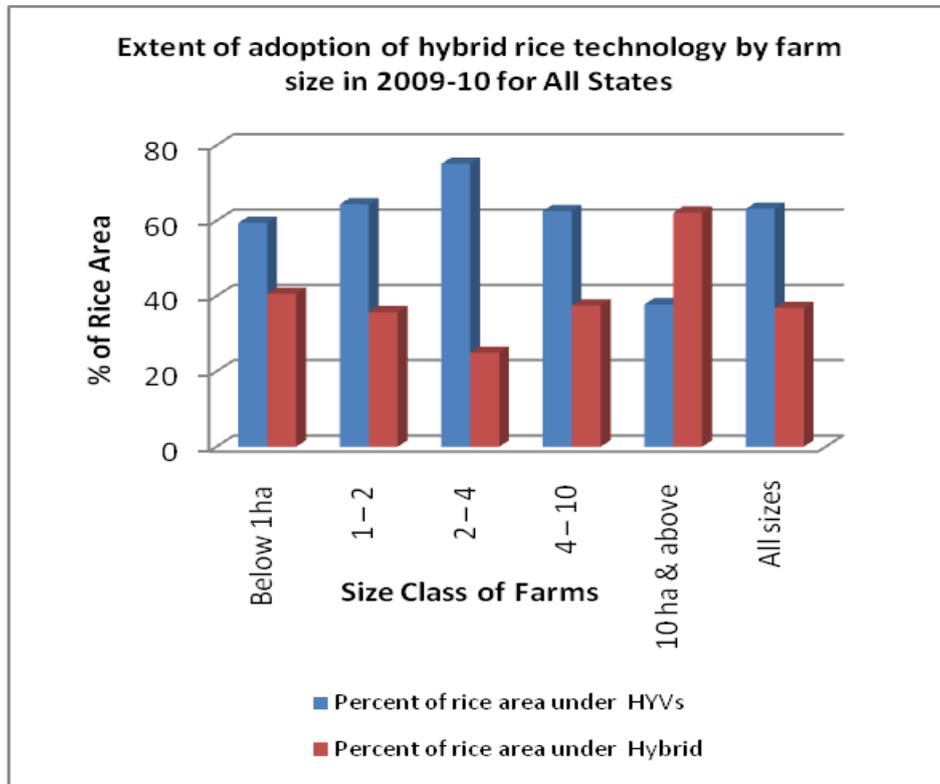
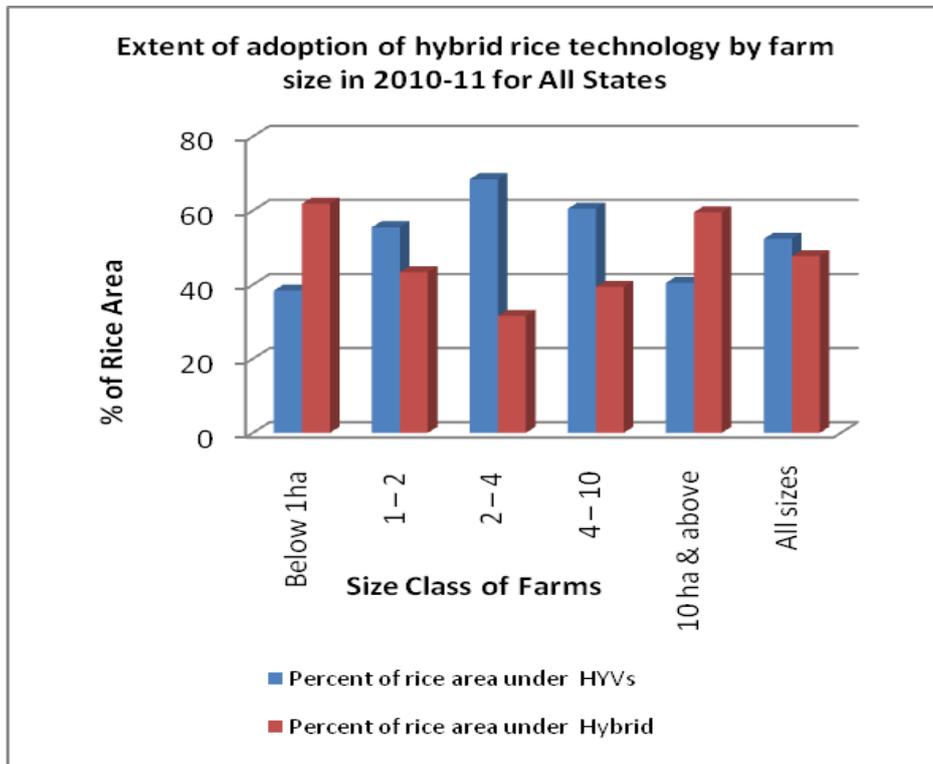


Figure 3.2-b



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 be 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 aggregate 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 too 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
<b>Kharif</b>	<b>784.83</b>	<b>52.76</b>	<b>793.42</b>	<b>53.05</b>	<b>168.07</b>	<b>53.83</b>	<b>168.81</b>	<b>53.56</b>
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
<b>Rabi</b>	<b>665.51</b>	<b>44.74</b>	<b>665.38</b>	<b>44.49</b>	<b>135.91</b>	<b>43.53</b>	<b>138.09</b>	<b>43.81</b>
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
Seasumum	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
<b>Summer</b>	<b>37.26</b>	<b>2.50</b>	<b>36.94</b>	<b>2.47</b>	<b>8.26</b>	<b>2.65</b>	<b>8.27</b>	<b>2.62</b>
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
<b>GCA</b>	<b>1487.60</b>	<b>100.00</b>	<b>1495.74</b>	<b>100.00</b>	<b>312.24</b>	<b>100.00</b>	<b>315.17</b>	<b>100.00</b>

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\***

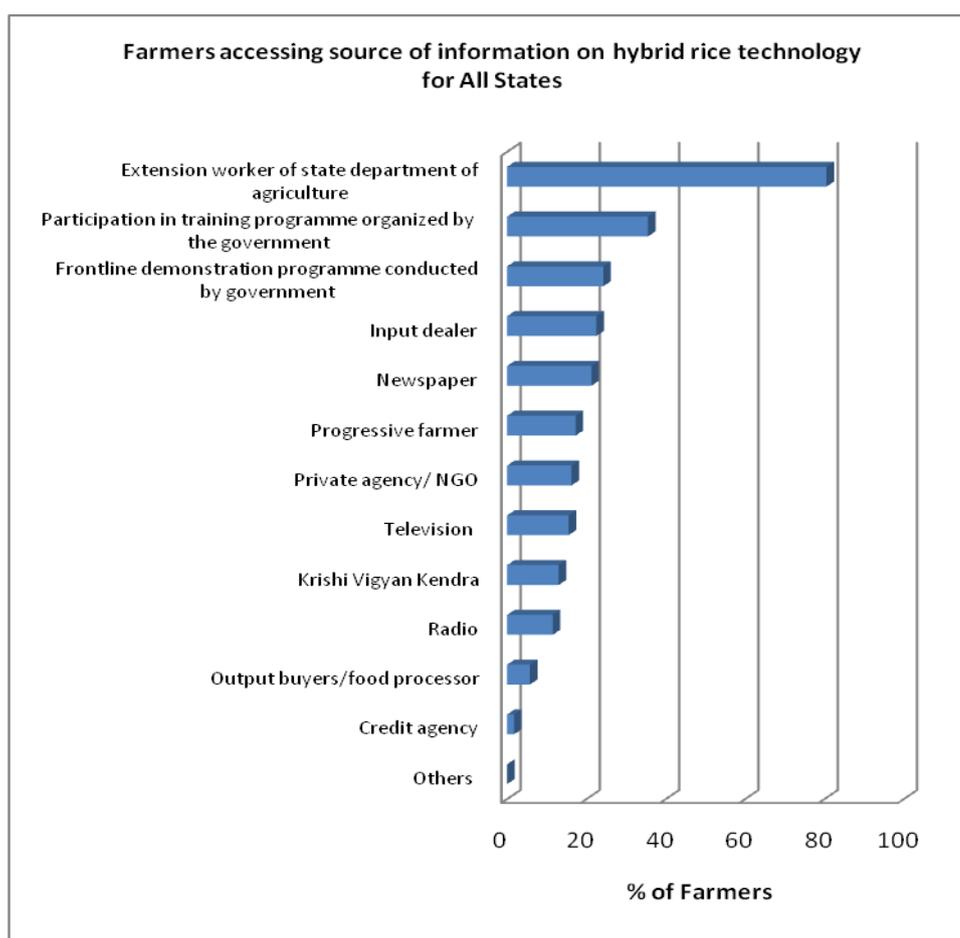
(For Hybrid adopters only)

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)

	<b>Sources of seeds</b>	<b>2009-2010</b>	<b>2010-2011</b>
<b>All States</b>	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 2010-2011 for 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)

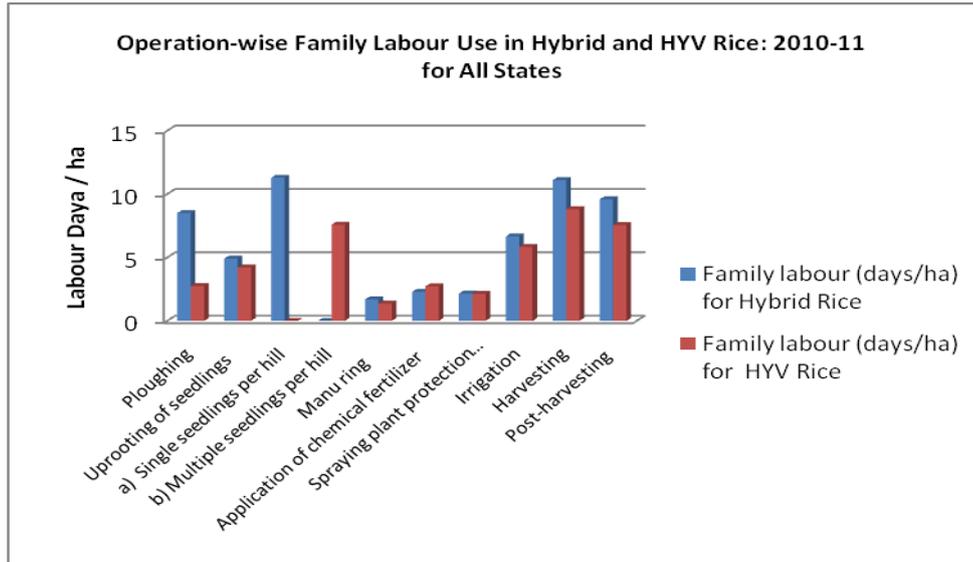


Figure 5.2-a(2)

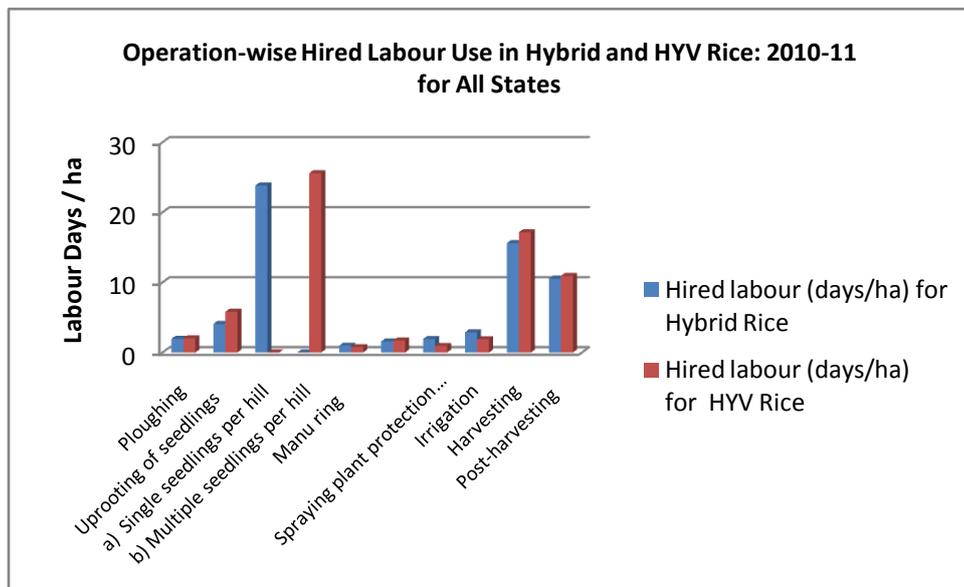
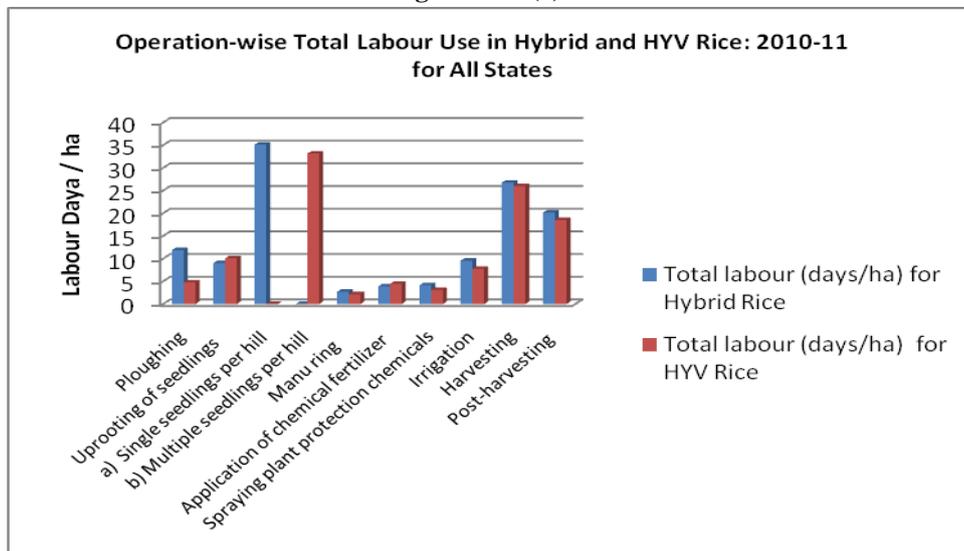


Figure 5.2-a(3)



**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 inbreds (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)

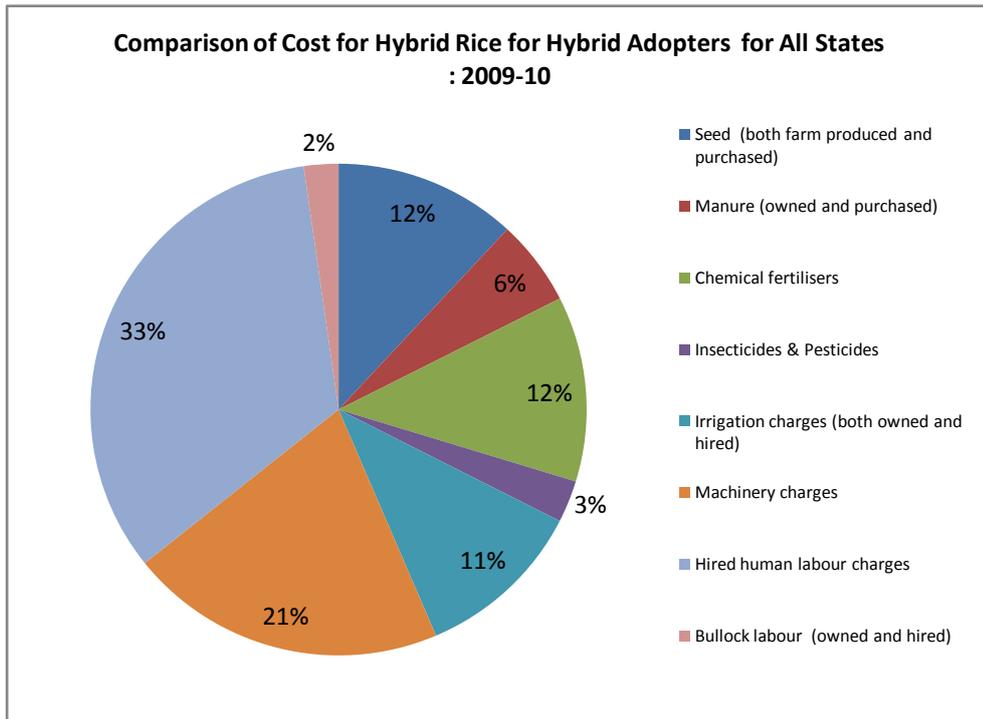
Sl. No.	Particulars	2009-10			2010-11		
		Hybrid Adopters		Non-adopters	Hybrid Adopters		Non-adopters
		Hybrid	HYVs	HYVs	Hybrid	HYVs	HYVs
A.	Costs:						
1.	Seed (both farm produced and purchased)	2822.48	1071.88	1144.40	2950.52	1244.07	1319.07
2.	Manure (owned and purchased)	1333.74	1061.59	1194.31	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 <sup>1</sup>	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

<sup>1</sup> rate of return on working capital

**Figure 5.3-a(1)**



**Figure 5.3-a(2)**

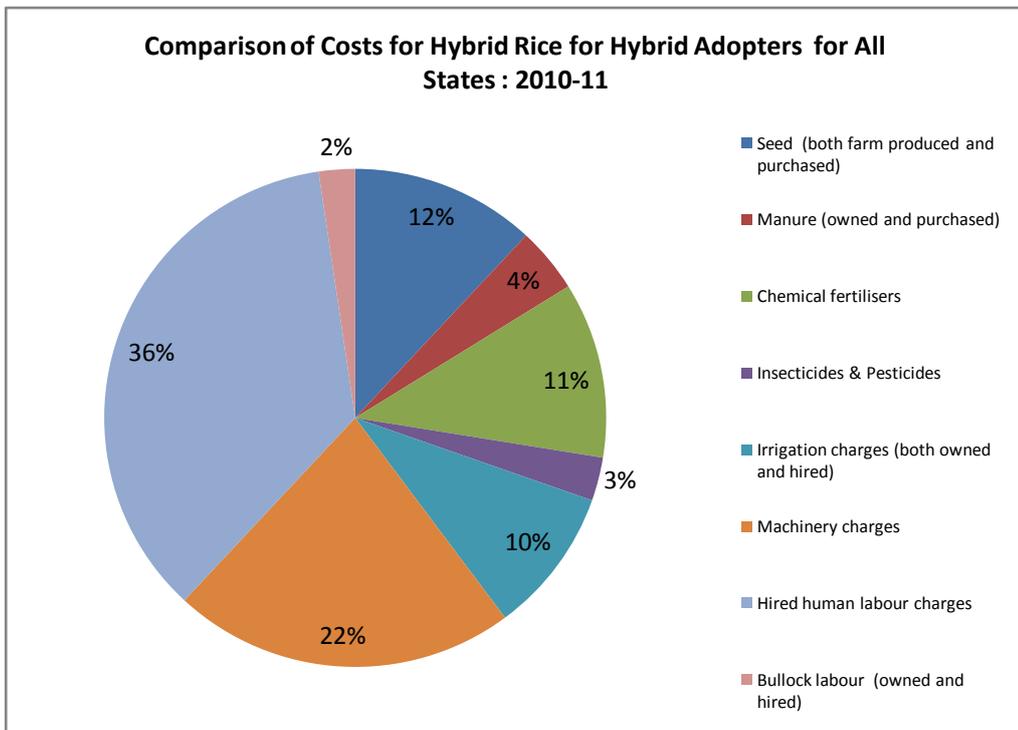


Figure 5.3-b(1)

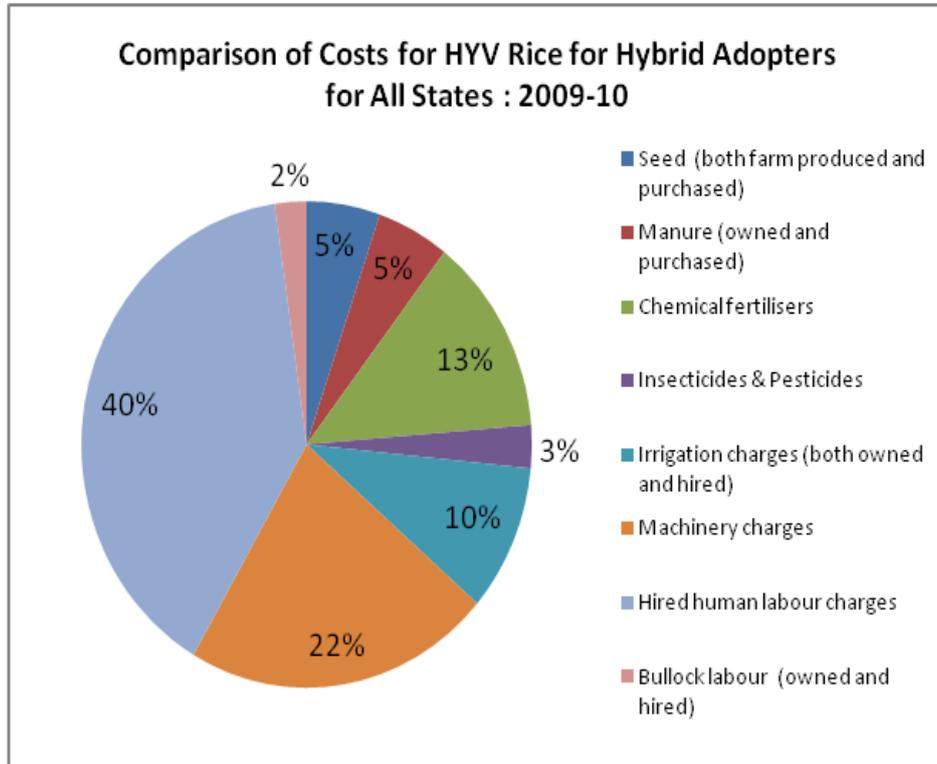


Figure 5.3-b(2)

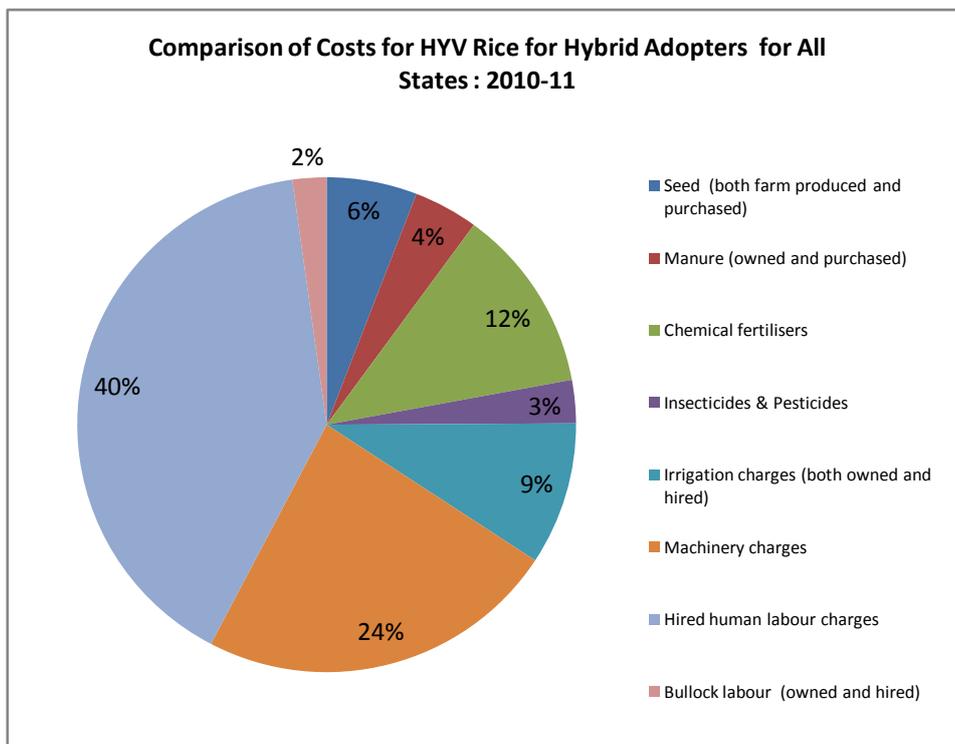


Figure 5.3-c(1)

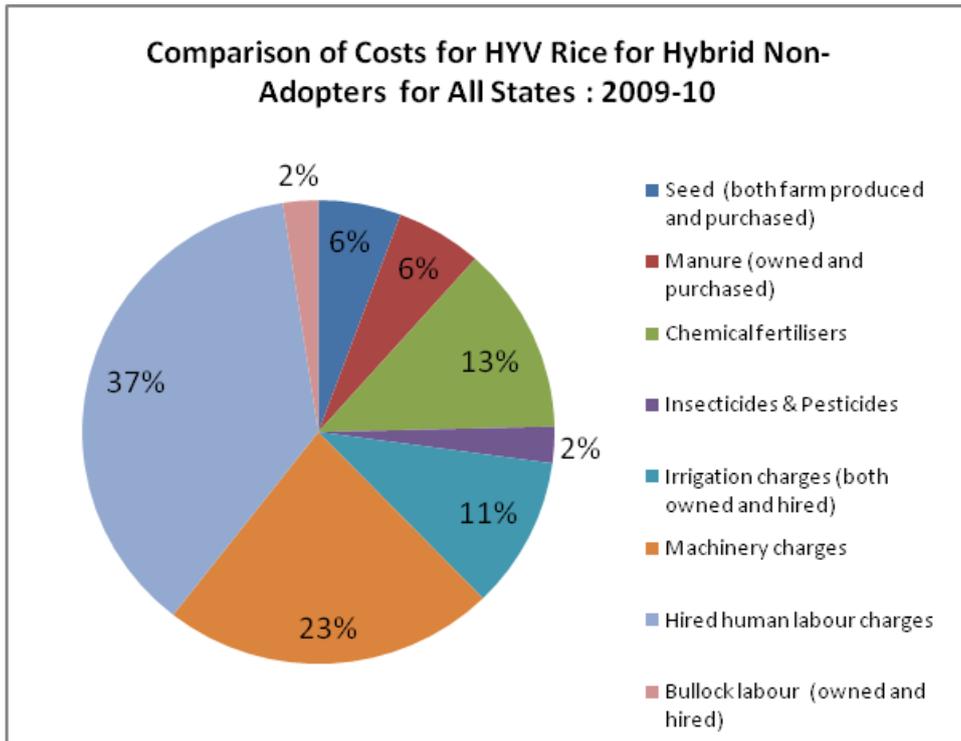
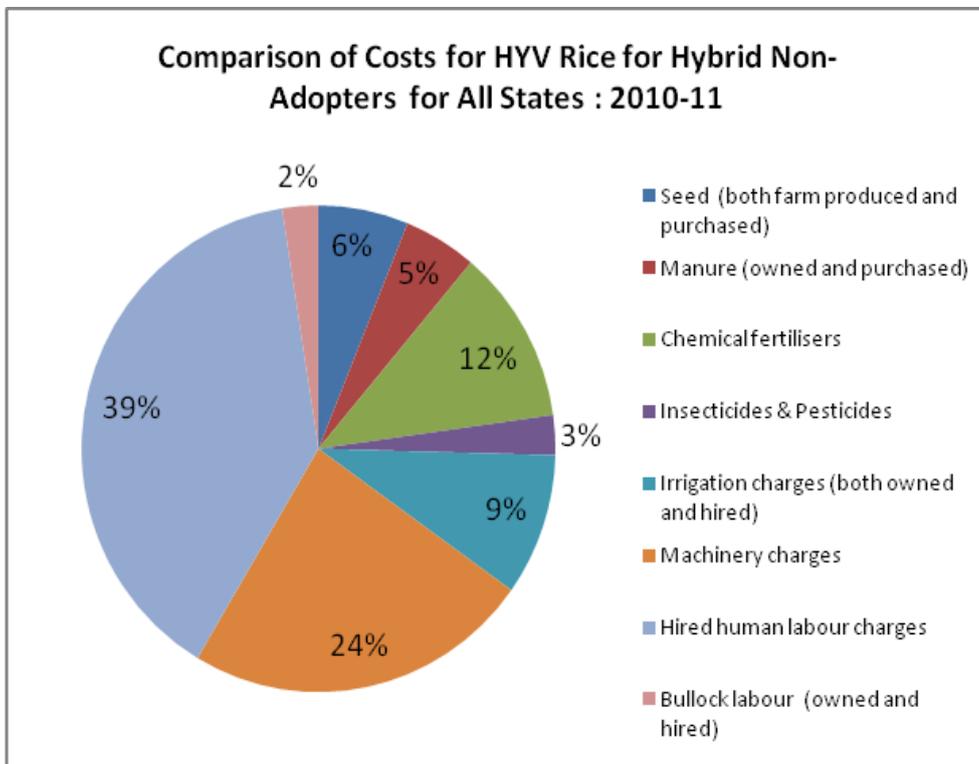
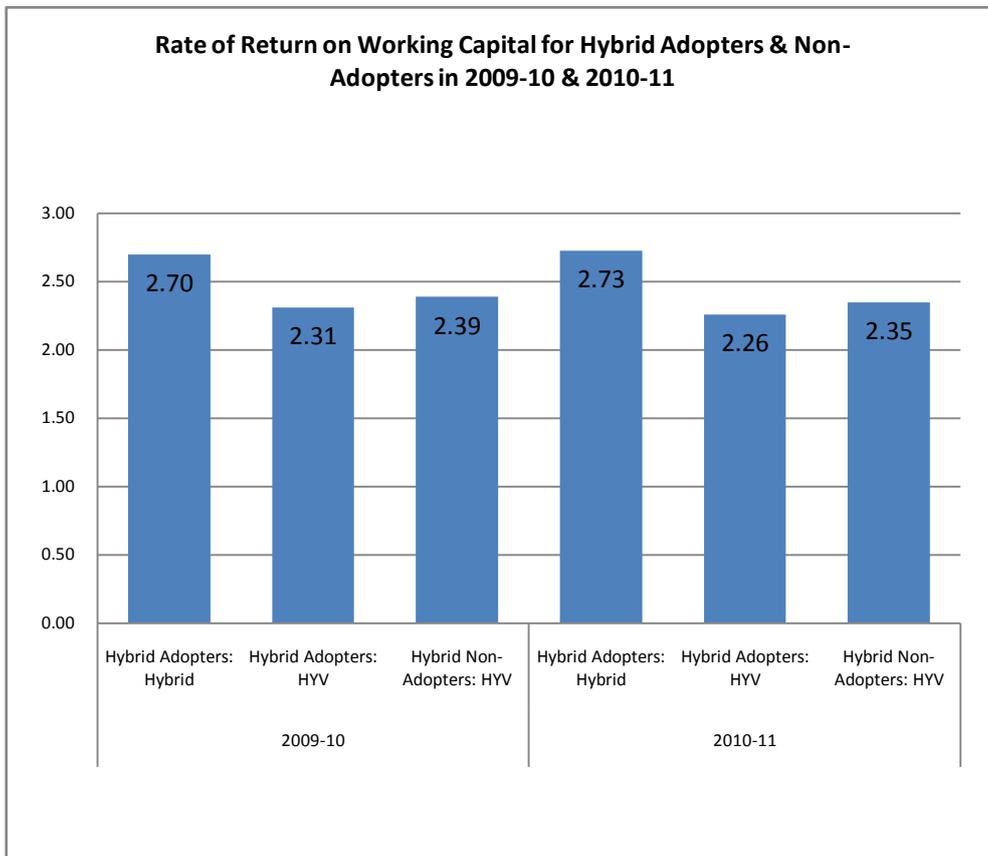


Figure 5.3-c(2)



**Figure 5.3-d**



## **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 6.1 for 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.

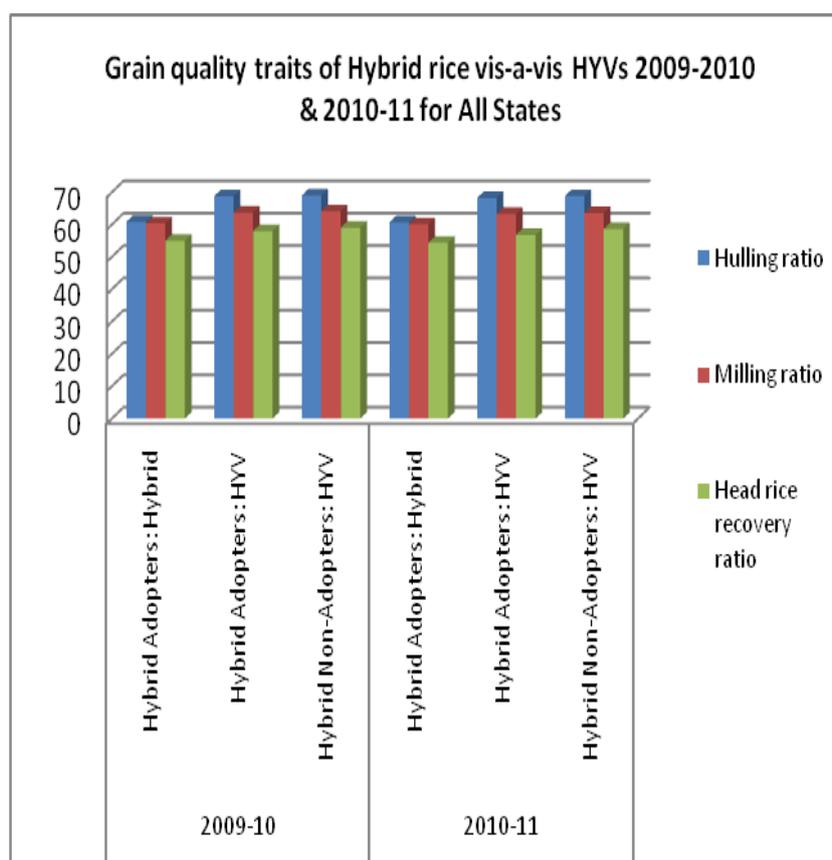
**Table 6.1: Grain quality traits of Hybrid rice vis-a-vis HYVs 2009-2010 & 2010-11 for All States\***

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)

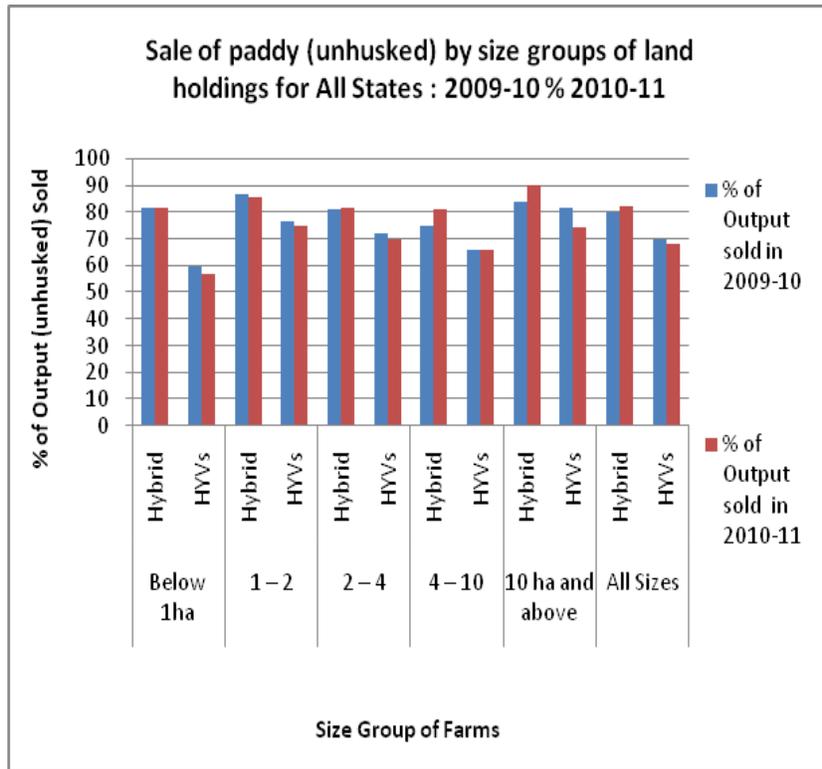
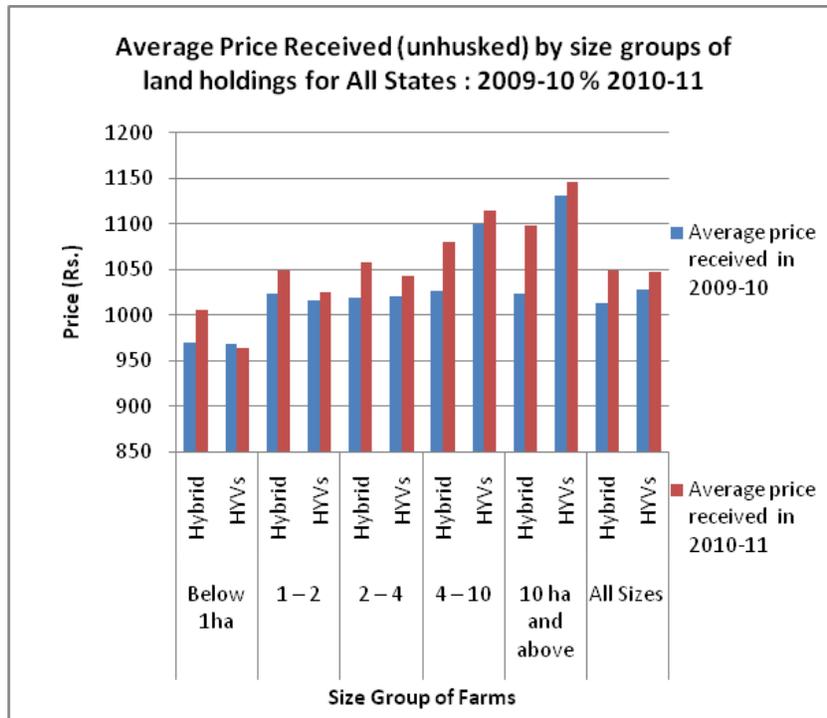
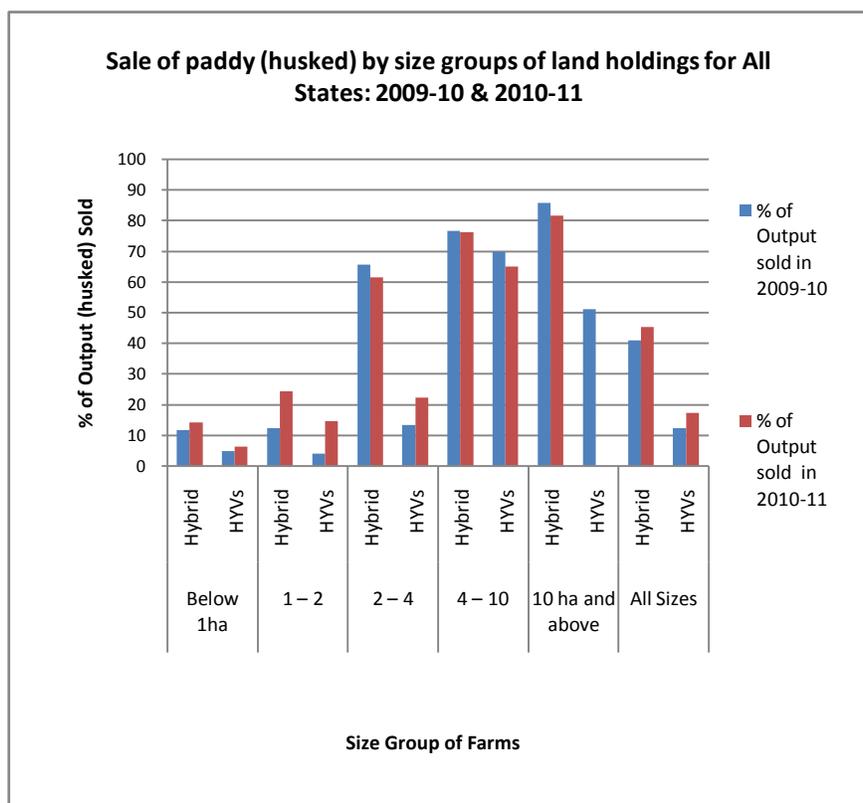


Figure 6.2-a(2)



**Figure 6.2-b(1)**



**Figure 6.2-b(2)**

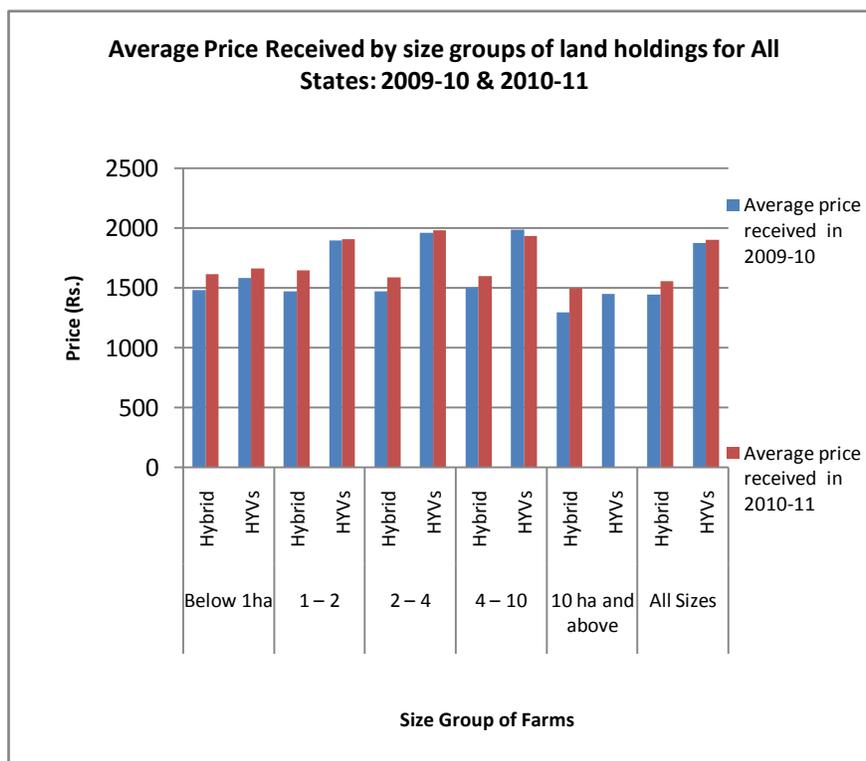


Figure 6.3-a

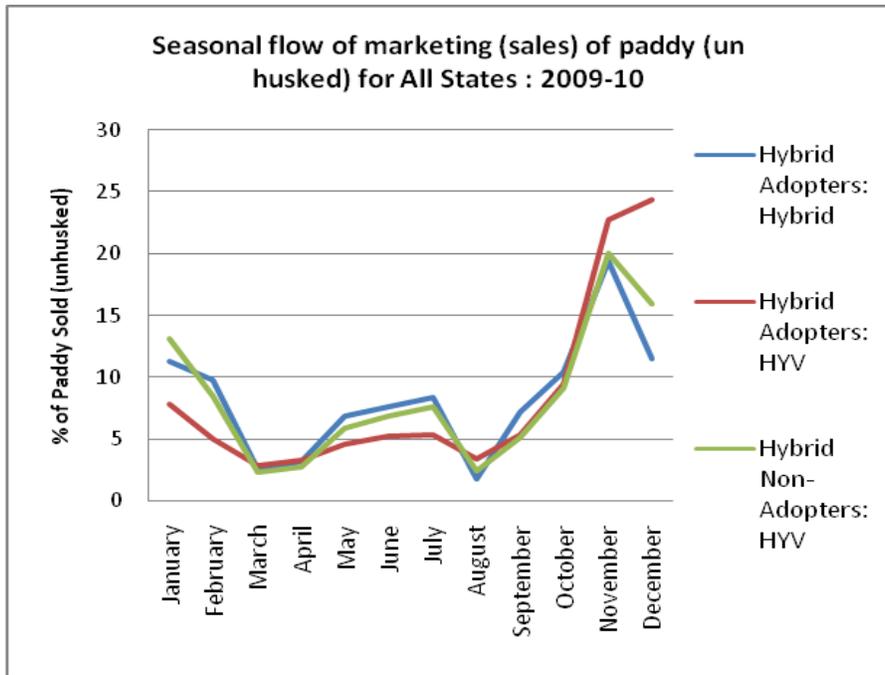


Figure 6.3-b

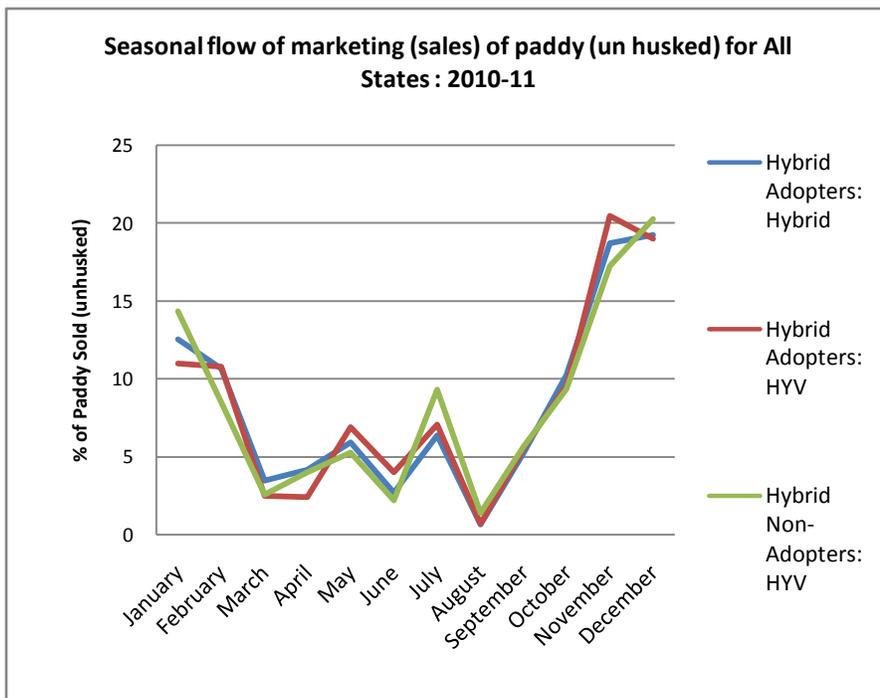


Table **6.2 a** gives statistics of the output of the unhusked hybrid and inbred (HYVs) rice crop and the quantity sold in the market across size classes of operational land holdings during the years 2009-10 and 2010-11.

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 millers 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?	<b>Hybrids inferior in respect of</b>	-
		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.	If 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	<b>Reasons for continuing hybrid rice cultivation</b>	-
		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*

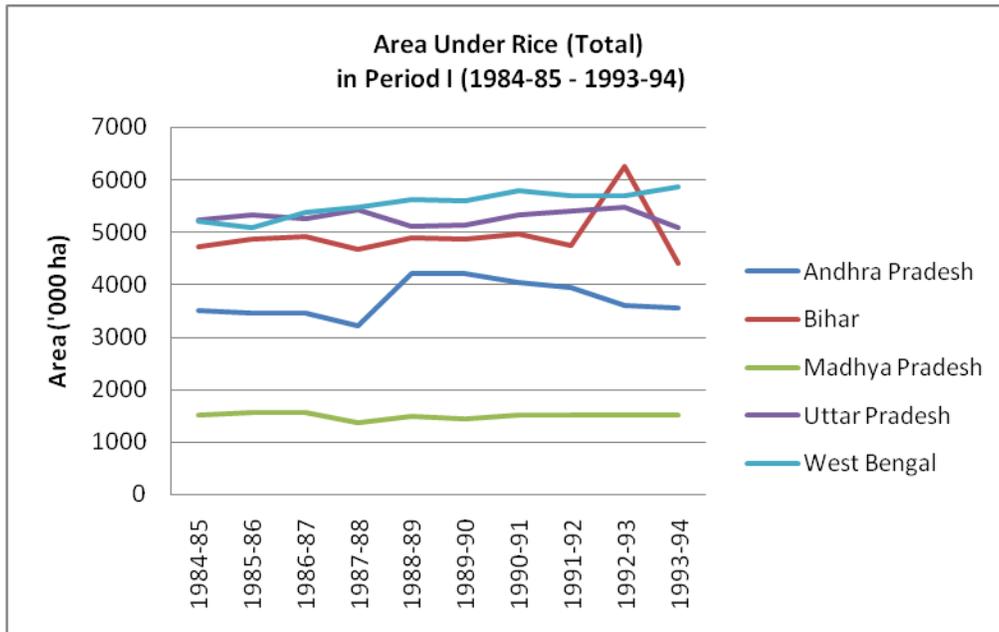
**Annexure Table 2.1: Trend and Composition of Rice (Total) across States**

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

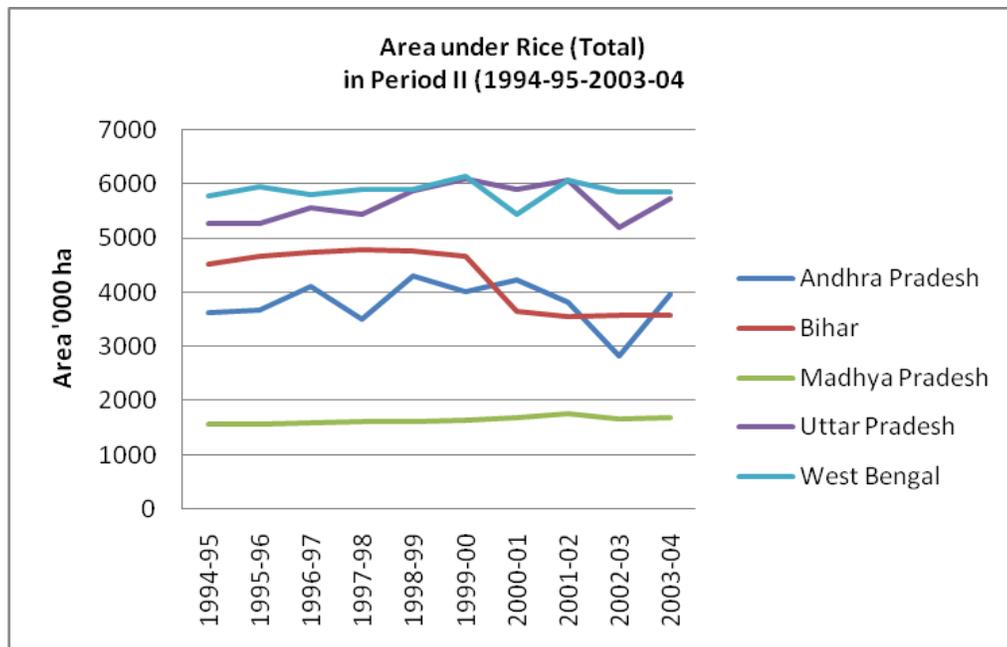
A = Area in thousand hectare, P = Production in thousand tonnes, Y = Yield in Kg/ Hectare.

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

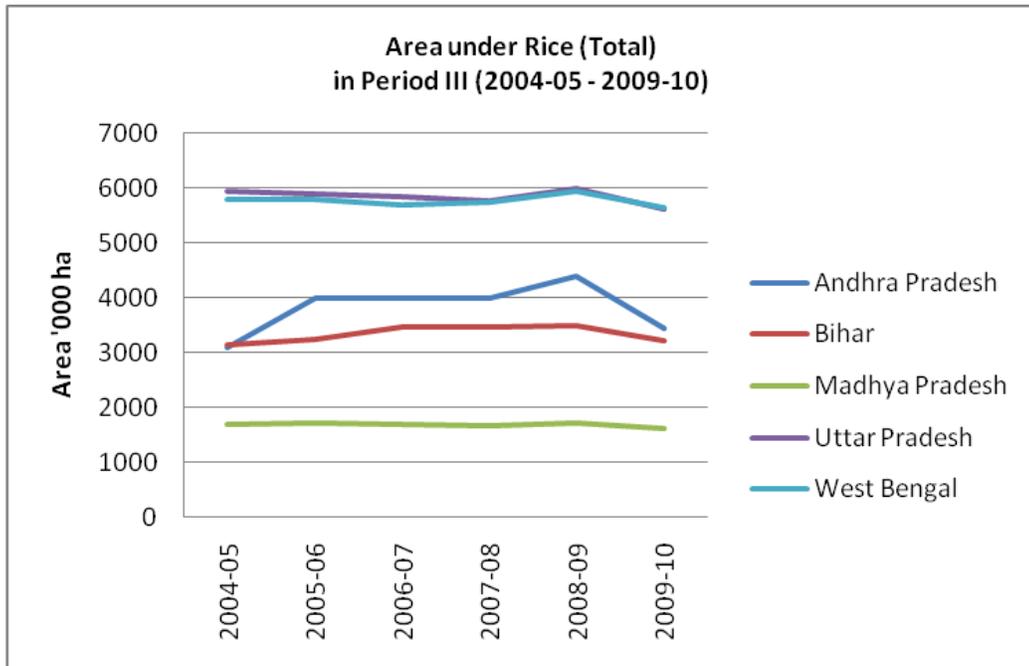
**Annexure Figure: 2.1**



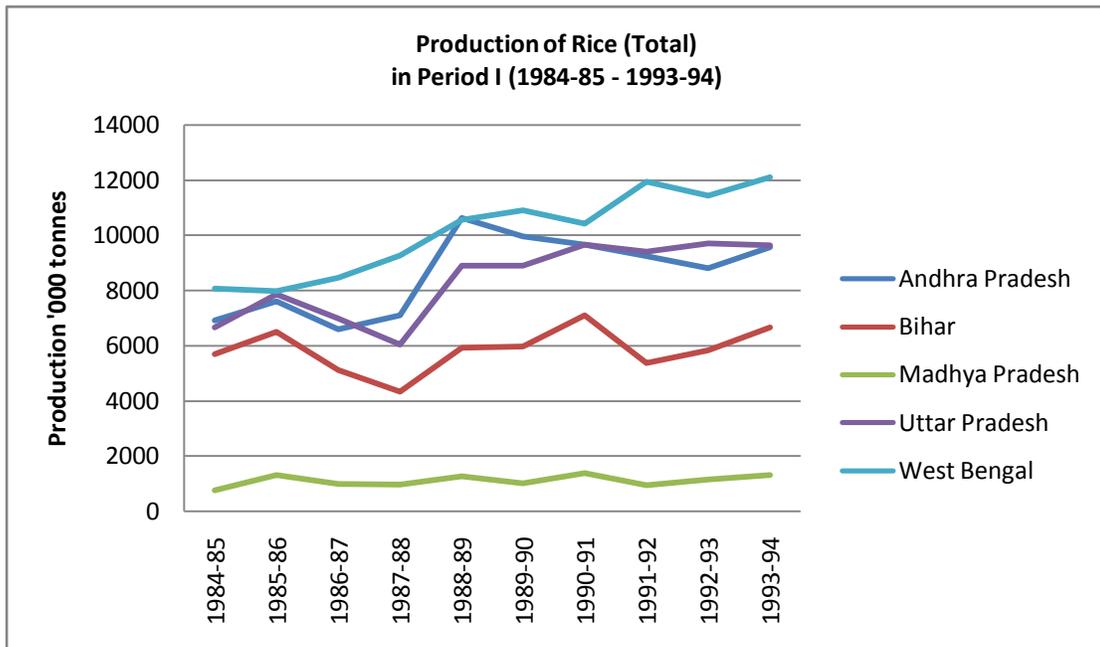
**Annexure Figure: 2.2**



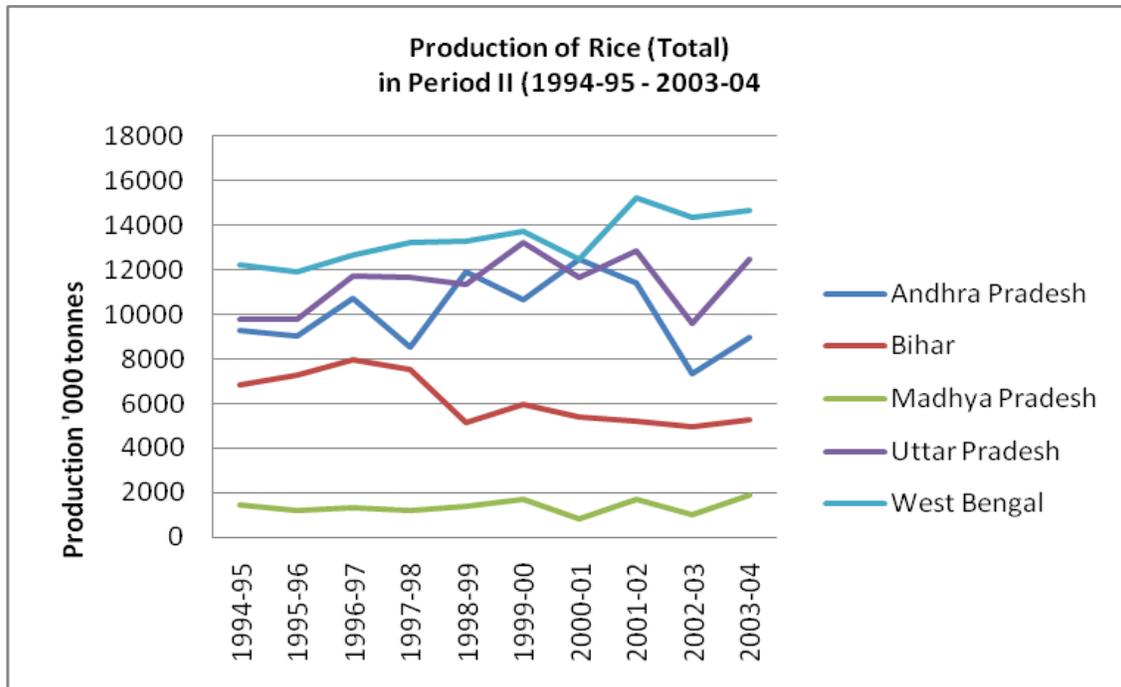
**Annexure Figure: 2.3**



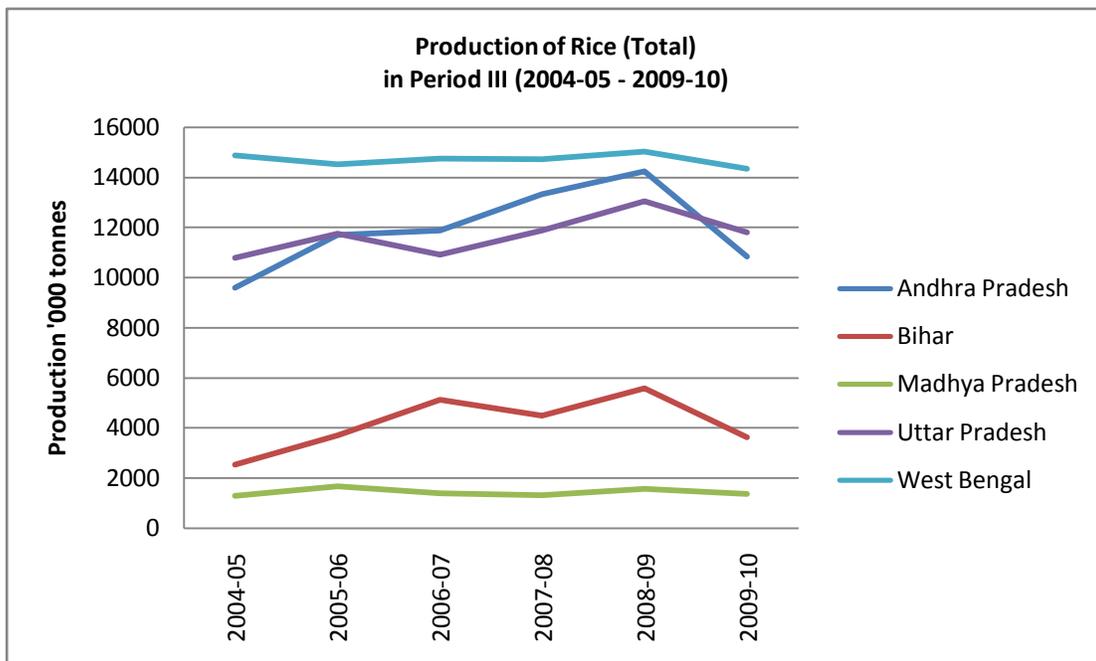
**Annexure Figure: 2.4**



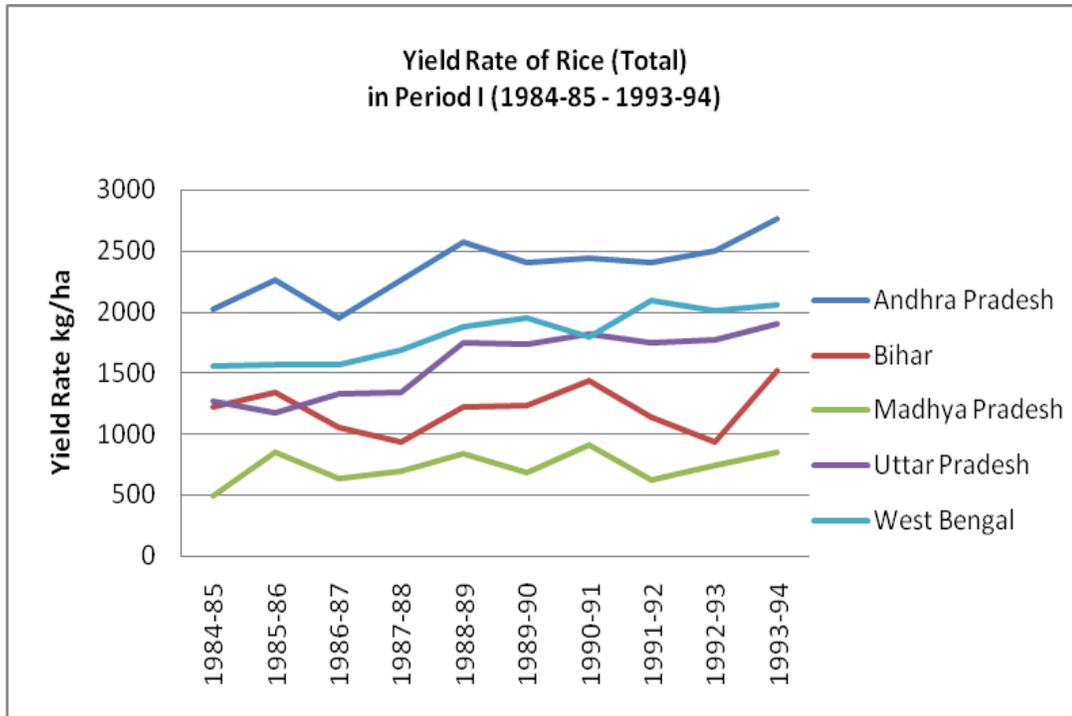
Annexure Figure: 2.5



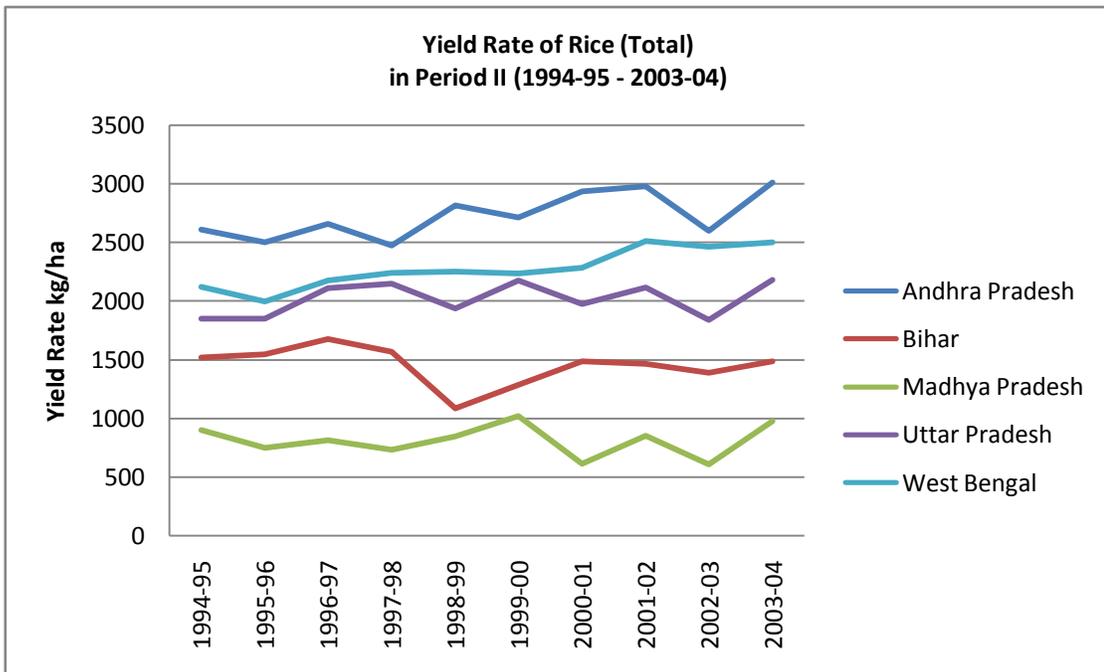
Annexure Figure: 2.6



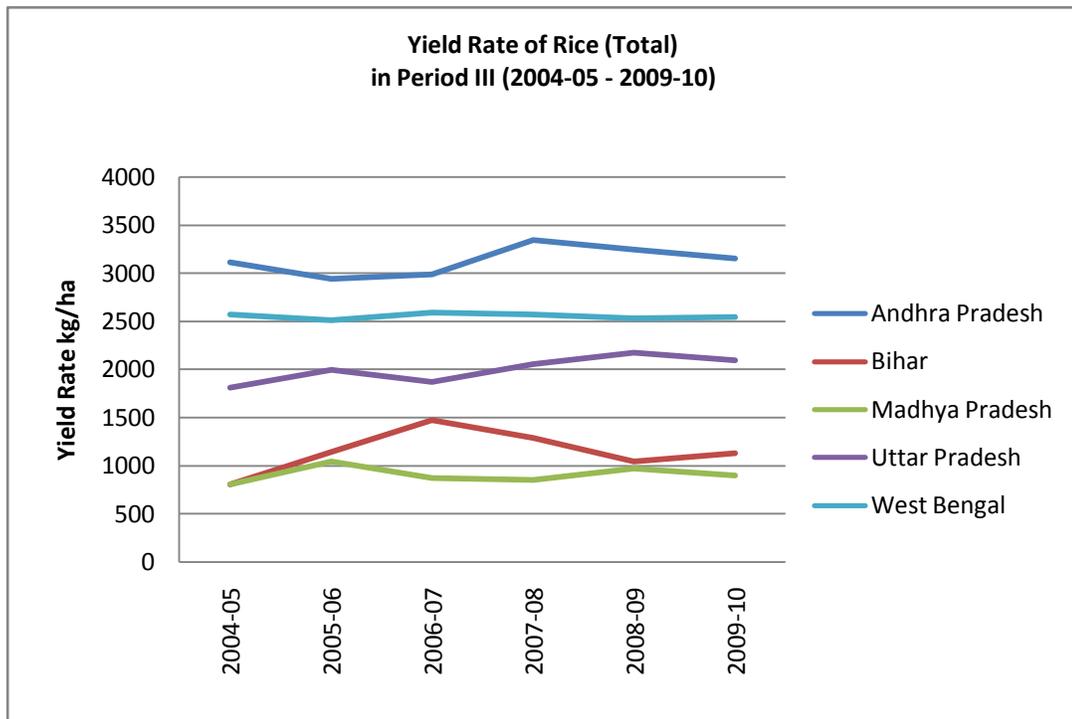
**Annexure Figure: 2.7**



**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 <sup>#</sup>	Male <sup>1</sup>	2.43	2.15	2.37
	% <sup>2</sup>	52.72	51.19	52.43
	Female <sup>3</sup>	2.18	2.05	2.15
	% <sup>4</sup>	47.28	48.81	47.57
	Total <sup>5</sup>	4.60	4.20	4.52
	% <sup>6</sup>	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

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

<sup>1</sup> Average no. of male members per household

<sup>2</sup> Percentage of male members to total population

<sup>3</sup> Average no. of female members per household

<sup>4</sup> Percentage of female members to total population

<sup>5</sup> Average no. of male & female members per household

<sup>6</sup> 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 <sup>#</sup>	Male <sup>1</sup>	1.48	1.55	1.49
	% <sup>2</sup>	53.39	52.54	53.21
	Female <sup>3</sup>	1.29	1.40	1.31
	% <sup>4</sup>	46.61	47.46	46.79
	Total <sup>5</sup>	2.76	2.95	2.80
	% <sup>6</sup>	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

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

<sup>1</sup> Average no. of male workers per household

<sup>2</sup> Percentage of male workers to total no. of workers

<sup>3</sup> Average no. of female workers per household

<sup>4</sup> Percentage of female workers to total no. of workers

<sup>5</sup> Average no. of male & female worker per household

<sup>6</sup> 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
	%	16.25	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**

<b>States</b>	<b>Nature of Landholding</b>	<b>Hybrid adopters</b>	<b>Non-adopters</b>	<b>Aggregate</b>
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
<b>Kharif</b>	<b>142.59</b>	<b>60.14</b>	<b>99.25</b>	<b>71.66</b>	<b>354.40</b>	<b>49.11</b>	<b>142.30</b>	<b>50.00</b>	<b>46.29</b>	<b>43.74</b>
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				
<b>Rabi</b>	<b>94.49</b>	<b>39.86</b>	<b>39.25</b>	<b>28.34</b>	<b>367.20</b>	<b>50.89</b>	<b>142.30</b>	<b>50.00</b>	<b>22.27</b>	<b>21.05</b>
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				
<b>Summer</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>37.26</b>	<b>35.21</b>
Hybrid Rice									10.13	9.57
Inbred Rice									26.20	24.76
Maize									0.93	0.88
<b>GCA</b>	<b>237.08</b>	<b>100.00</b>	<b>138.50</b>	<b>100.00</b>	<b>721.60</b>	<b>100.00</b>	<b>284.60</b>	<b>100.00</b>	<b>105.82</b>	<b>100.00</b>

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
<b>Kharif</b>	<b>145.01</b>	<b>62.07</b>	<b>100.42</b>	<b>73.48</b>	<b>360.80</b>	<b>49.02</b>	<b>142.30</b>	<b>50.00</b>	<b>44.89</b>	<b>42.82</b>
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				
<b>Rabi</b>	<b>88.63</b>	<b>37.93</b>	<b>36.25</b>	<b>26.52</b>	<b>375.20</b>	<b>50.98</b>	<b>142.30</b>	<b>50.00</b>	<b>23.00</b>	<b>21.94</b>
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				
<b>Summer</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>36.94</b>	<b>35.24</b>
Hybrid Rice									12.87	12.28
Inbred Rice									20.87	19.91
Maize									3.20	3.05
<b>GCA</b>	<b>233.64</b>	<b>100.00</b>	<b>136.67</b>	<b>100.00</b>	<b>736.00</b>	<b>100.00</b>	<b>284.60</b>	<b>100.00</b>	<b>104.83</b>	<b>100.00</b>

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
<b>Kharif</b>	<b>30.25</b>	<b>62.81</b>	<b>24.80</b>	<b>73.48</b>	<b>75.60</b>	<b>48.90</b>	<b>27.18</b>	<b>50.00</b>	<b>10.24</b>	<b>47.92</b>
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				
<b>Rabi</b>	<b>17.91</b>	<b>37.19</b>	<b>8.95</b>	<b>26.52</b>	<b>79.00</b>	<b>51.10</b>	<b>27.18</b>	<b>50.00</b>	<b>2.87</b>	<b>13.43</b>
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				
<b>Summer</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>8.26</b>	<b>38.65</b>
Hybrid Rice										
Inbred Rice									8.13	38.04
Maize									0.13	0.61
<b>GCA</b>	<b>48.16</b>	<b>100.00</b>	<b>33.75</b>	<b>100.00</b>	<b>154.60</b>	<b>100.00</b>	<b>54.36</b>	<b>100.00</b>	<b>21.37</b>	<b>100.00</b>

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
<b>Kharif</b>	<b>30.25</b>	<b>62.81</b>	<b>24.14</b>	<b>73.42</b>	<b>77.00</b>	<b>48.61</b>	<b>27.18</b>	<b>50.00</b>	<b>10.24</b>	<b>47.92</b>
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				
<b>Rabi</b>	<b>17.91</b>	<b>37.19</b>	<b>8.74</b>	<b>26.58</b>	<b>81.40</b>	<b>51.39</b>	<b>27.18</b>	<b>50.00</b>	<b>2.86</b>	<b>13.38</b>
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				
<b>Summer</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>8.27</b>	<b>38.70</b>
Hybrid Rice										
Inbred Rice									7.2	33.69
Maize									1.07	5.01
<b>GCA</b>	<b>48.16</b>	<b>100.00</b>	<b>32.88</b>	<b>100.00</b>	<b>158.40</b>	<b>100.00</b>	<b>54.36</b>	<b>100.00</b>	<b>21.37</b>	<b>100.00</b>

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	50.00
	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
	<i>Irrigation (charges in Rs/ha)</i>	<i>1400.00</i>	<i>1410.00</i>	<i>1440.00</i>
	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	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

<sup>1</sup> 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	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

<sup>1</sup> 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) <sup>1</sup>	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

<sup>1</sup> 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) <sup>1</sup>	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

<sup>1</sup> 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?	<b>Hybrids inferior in respect of</b>	-	-	-	-	-
		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	<b>Reasons for continuing hybrid rice cultivation</b>	-	-	-	-	-
		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.*