# Prospects and Potentials of Rice Hybrids in Bangladesh

## A Special study


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**Funded by:**

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**June 2004**

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# Acknowledgement

The authors wish to duly acknowledge the service of all the individuals without whose assistance the entire study would have remained unaccomplished. Among them are Mr. Dev Kumar and Mrs Sabina, and Mr. Awal, as enumerators all of them were highly engaged in conducting field interviews, organizing focus group discussion and other relevant activities to gather necessary information for this study. We really appreciate their quality time and efforts.

Along with them we would like to acknowledge the assistance and support of all the farmers as well, who took part in individual interviews and focus group discussions and provided us needed information about the study. We are also grateful to all the seed companies, their dealers and agents for their guidance and assistant in conducting meeting with farmers and providing important information about hybrid seeds.

Our special thanks are to Mr. Nurun Nabi and Mr. Ibrahim for their sincere efforts to arrange all the logistics during the field activities and reporting period at AAS office.

Our deepest gratitude is for Dr. Noel Magor, Project Manager, PETRRA, IRRI Dhaka Office, for his personal inspiration and kind support to carryout this study as well as for all other experts and specialists of PETRRA, BRRI and IRRI Dhaka mission, for their special contributions in the planning workshop to determine appropriate design and overall methodology of the study.

## SUMMARY

The primary purpose of this study was to assess the actual performance of hybrid rice, particularly the scale of adoption of different varieties and their impacts towards the lives of rural communities in Bangaldesh. The study also served as a critical assessment of the achievement of the objectively verifiable indicators (OVIs) of purpose level 1 & 2 and output 3.1 of PETRRA funded hybrid rice sub-project. The study was conducted from middle of April to middle of May 2004 by a small group of experts with diversified experiences in agriculture in Southeast and South Asia. The study methodologies involved individual interviews, focus group discussions, and open interviews and discussions with different levels of stakeholders such as farmers, seed suppliers, dealers, and experts and specialists associated with hybrid rice. In addition, there was extensive field visit by the study team. The study was carried out in 12 different sites across the country where most of the hybrids are grown.

An important parameter to assess the performance of hybrid varieties was the average yields obtained by farmers as against those of non-hybrid modern varieties. The overall findings of the study in all the twelve sites indicate that the yields of hybrid varieties are tremendously higher than those of other modern varieties. Invariable to sites depending on the management practices and the skills of farmers the increases are noticed from at least **14 mounds to as high as 37 mounds per acre.** Considering this average yield increase, overall production per farm family, subsequent income and enhanced rice provision ability attained by a family and the comparative cost and return analysis between hybrids and non-hybrids, it is very obvious to note that the farmers are gradually **shifting from non-hybrids to hybrids**.

Although, at the initial stage there were some speculations that hybrid would perform better only in high fertile soils, but the overall findings of the study indicate that they are doing better also in moderately fertile soils both in single and double cropped areas. Throughout the country, ultimately, the demands for hybrids continue to enhance. In last year (2002/3) hybrids were grown in **67,300 acres** areas, while this year the area expanded to **122,700 acres**. In the coming years the expansion would be far more.

Hybrids have made significant changes towards the incomes and livings of farmers. With the introduction of hybrids farmer's average incomes have increased remarkably, which range from **1000** taka to as high as **42,065** taka per family based on the total areas of cultivation. The new incomes they spent to build new houses, buy additional lands, and expand the production areas as well as to meet varieties of necessities of the families. However, it is interesting to note than majority of the farmers who are practicing hybrids are medium to large farmers, only a very small percentage of them are resource poor. But they were able to make significant improvement towards their rice provision abilities. Many were able to sale rice as well.

The hybrids, however, require little more cost than the non-hybrids, which is needed to buy some additional amount of chemical fertilizers and insecticides. Because of more succulent plant the usual insect infestation is higher in hybrids, which is a common problem mentioned by all farmers. Though, farmers at this stage is not much concern about these problems since they are satisfied with the added yields but for long-term they could create more problems. Based on cost and return analysis the cost of production of unit volume of rice is, nevertheless, less with hybrids than non-hybrids.

Currently, there are five hybrid varieties widely grown by farmers. All these are of Chinese origin. Along with them in limited scale a BRRI released variety is also grown. The variety, however, needs further improvement. The supply and availability of most the seeds of these varieties are purely dominated by imports from China, except with Jagoroni. The total amount of Jagoroni seed is produced locally by BRAC. Similarly, BADC produces BRRI hybrid dhan-1 seed. At this stage, although, there has been no major problem seriously hindering the supply and availability of hybrid seeds but in future when the demands of hybrids would be gradually higher, serious problems can occur unless attempts are made now to handle those small problems that farmers have mentioned with the study team, specifically, about the seed quality and purity of some particular varieties.

The overall supply of seeds, nevertheless, was much lower than the actual demand. Limited supply of seed was a common complain of farmers. To make the supply steadier, there is a greater need to emphasize local production. Although, BRAC has made tremendous breakthrough on this for other companies, particularly, for the small suppliers limited financial capacities, lack of skilled expertise, and inadequate infrastructure facilities needed for seed production, processing, and storage would probably be some greater challenges.

# 1 Introduction

The challenge to maintain or enhance the production of rice to keep pace with the population growth is widely felt in most of the rice growing countries. The introduction of improved technologies, in this regard, of course, has eased the situation with multifold increase in the overall productivity of rice field. However, the limitations of the existing modern technologies to further enhance the growth at a desirable rate have largely introduced the hybrid technology in rice sector. The use of hybrid varieties now continues to dominate the rice sectors of major rice growing countries, notably in China, India, and Vietnam. Other countries have also been trying to join in the effort. Towards this is the introduction of hybrid rice in Bangladesh.

Nevertheless, since its introduction, due to some growing concerns over the sustainability and affordability of the technologies, the use of hybrid rice has remained a debated issue. Even then, the technologies continue to grow across the rice world. Today in China more than 70% of the rice area is covered by hybrid rice. India is growing fast with hybrid rice as well. This raises a big question whether the concerns that are mentioned are realistic and true.

Similarly, the experience of hybrid rice in Bangladesh has become largely contrasting. Success as well failure is now a debated issue. Researchers, extensionists and policy makers are divided over the performance of hybrid rice in the country. Although, at the initial stage, there was lot of misunderstanding, partly because of the limitation of actual information flow to the farmers, reports are now growing that in many parts of the county farmers are making remarkable progress with hybrid rice. Farmers, particularly in the low-lying high fertile soils where mostly Boro is cultivated as single crop, have made tremendous achievement, and there are huge demands for hybrid seeds.

# 2 Purpose and objectives

*The primary objectives of this study were to*:

1. Assess the performance and overall impacts of hybrid rice cultivated in different parts of the country, particularly, in high potential areas, with distinct comparisons among the hybrid and non hybrid varieties that have been cultivated so far by the farmers, and

2. Analyze the status of the availability of the hybrid rice seeds and their supply mechanisms at farmer levels in those potential areas where hybrid rice is making progress.

The study also served as a critical assessment of the achievement of the objectively verifiable indicators (OVIs) of purpose level 1 & 2 and output 3.1 of PETRRA funded hybrid rice sub-project. The study was conducted from 15 April -15 May 2004 by a small group of experts, which includes an independent consultant with diversified experience in sustainable agriculture in a large number of countries in Southeast and South Asia and an agronomist with strong technical background and long experience in research and extension, particularly, in rice sector in Bangladesh.

# 3 Study design, sites and methodology

## *3.1 Study design*

The study was designed appropriately to facilitate important interactions with the key groups of stakeholders, which involved farmers, seed suppliers, seed dealers, extension workers, NGO workers, researchers and others who are involved with hybrid rice at various stages to gather necessary information needed to asses the actual performance of hybrid rice in Bangladesh. The primary design and methodologies of the study was prepared by the study team, which were later shared with a key group of researchers, extensionists and seed suppliers in the country in an open workshop organized at the beginning of the study. Based on their important suggestions and feedback, the overall study design and methodologies were finalized.

The design employed a number of methodologies to assess and evaluate three important issues such as ***overall performance, general impacts and availability of seeds*** to understand the prospects and potentials of hybrid rice towards improving the lives of rural communities including resource poor farmers in the country. To assess the progress of each factor the following parameters were determined.

| Performance | Impacts | Seed availability |
|---|---|---|
| ❒ Yield | ❒ Average area cultivated by individual farmers | ❑ Seed source |
| ❒ Varieties | ❒ Total land holdings | ❑ Seed quality |
| ❒ Cost and return | ❒ Total number of farmers | ❑ Seed production |
| ❒ Agronomic practices | ❒ Total area cultivated in the country | ❑ Seed delivery |
| ❒ Crop duration | ❒ Production per household (past and present) | ❑ Price |
| ❒ Seed rate | ❒ Income per household (past and present) | ❑ Quantity sold |
| | ❒ Rice provision ability (past and present) | ❑ Seed policy |
| | ❒ Livelihood changes | |

## *3.2 Study sites*

The study was conducted in 12 different sites across the country where most of the hybrid rice is grown. The sites were selected based on the recommendations of different seed companies, BADC, and BRAC as they know where most of their seeds were sold as well as the experts and specialists associated with hybrid rice. A number of criteria and factors have been considered in selecting those sites, which include soil quality, cropping system, farmer's number of years with hybrid rice, geographical location, and scale of production. The sites are:

| SL no. | Sites | Location | Soil types | Cropping system | Year with hybrid rice |
|---|---|---|---|---|---|
| 1 | Natore-1 | Chalanbeel, Grudashpur | High fertile | Single crop | 3 years |
| 2 | Natore-2 | Beel Halti, Patul | High fertile | Single crop | 3 years |
| 3 | Natore-3 | Beel Halti, Kholabaria | High fertile | Single crop | 2 years |
| 4 | Sirajganj | Chalanbeel, Tarash | High fertile | Single crop | 3 years |
| 5 | Naogaon | Beel Halti, Gopalbati | High fertile | Single crop | 2 years |
| 6 | Gopalganj | Vedgram beel, Silona | High fertile | Single crop | 3 years |
| 7 | Jessore | Salua | Moderate fertile | Double crop | 2 years |
| 8 | Jhenaidah | Ghorshal | Moderate fertile | Double crop | 3 years |
| 9 | Gaibandha | Dariapur, Kholahati | Moderate fertile | Double crop | 2 year |
| 10 | Jamalpur | Melandah | Moderate soil | Double crop | 4 years |
| 11 | Moulvibazar | Hailhaor, Srimangal | High fertile | Single crop | 1 year |
| 12 | Habiganj | Madhabpur | Moderate fertile | Double crop | 1 year |

### *3.3 Study Methodology*

***Individual interviews*** were organized with a representative number of farmers in each selected site. In each site 10 farmers were interviewed with a complete set of questionnaire. The questionnaire includes farmer's total landholdings, family size, lands cultivated under hybrid and other modern varieties, productions and yields of different varieties, incomes and livelihood changes before and after hybrid rice cultivation etc.

***Focus group discussions*** provided wider opportunities to discuss with a large number of farmers in each selected site. On an average in each site 30 farmers participated in the discussion meeting. Farmers were asked a set of questions primarily to assess the scales of productions and lands under hybrid rice cultivation by individually and all farmers together in the community. They were asked specific advantages and disadvantages of hybrid rice cultivation. In the discussions special attention was made about the particular challenges of hybrid rice cultivations. In addition, the group was encouraged to identify their particular benefits from hybrid rice cultivation. They also made comparative analysis among different varieties used under hybrid rice. Focus group discussion was also important to validate the information collected during interviews with individual farmers.

***Field visits:*** The study team during individual interviews and focus group discussions in each site visited a number of farmer's fields grown with different hybrid and modern varieties. As the study was conducted during the ripening stage of most of the rice, it gave the team an important

opportunity to assess and witness the actual performance of different hybrid varieties compared with most popular modern varieties grown by many farmers. The field visit was also important to see problems of different hybrid varieties that farmers mentioned during the focus group discussions.

***Cost and return analysis:*** To assess and compare the economic details of hybrid and non-hybrid varieties, the study team in each site made particular cost and return analysis with selected number of farmers. The cost and return analysis provided particular idea about the pattern of costs and net incomes from hybrid and non-hybrid rice.

***Discussions with seed dealers*** were an important part of the study, particularly to assess the availability of hybrid seeds, their supply and marketing systems, more importantly the availability and distribution mechanisms to the farmers. In each selected site the study team discussed with a number of seed dealers selling seeds of different companies. The discussions gave important idea about the price, volume, network and which parts of the sites where most of the hybrid seeds were sold. The discussions were also important to assess the particular demands of different hybrid varieties for the coming years.

***Open discussions and interviews with different seed companies and seed suppliers:*** As part of the study, the study team met with key representatives of important seed companies and organizations who are engaged in hybrid seed trading in Bangladesh. They include Aftab Bahumukhi Farm, Mallika Seed company, Kustia Seed Store, Supreme Seed Company, BRAC and Bangladesh Agricultural Development Corporation (BADC). An important set of questions, particularly, about the variety that they are registered to sell, their volume of imports, and local productions, marketing channels, storage facilities, and their overall capacity in hybrid seed production and trading in the country was discussed with all of them. The companies also shared the potentials and challenges of hybrid seed trading in Bangladesh.

# 4 Findings of the study

## *4.1 Performance of the hybrid varieties*

### 4.1.1 Rice yields and productions

An important parameter to assess the performance of hybrid varieties was the average yields obtained by farmers as against those of non-hybrid modern varieties. In all the twelve sites the yields of hybrid varieties were found significantly higher than those of other modern varieties. Invariably in all the sites the increases could be noticed from at least 14 mounds[2] to as high as 37 mounds per acre depending on the soil qualities and other management practices applied to the fields.

Higher yield is the most important reason why, all the farmers mentioned, they are cultivating hybrid rice in their lands. For such increase most farmers are found growing hybrid varieties in major part of their fields, non-hybrid varieties cover only a very little fraction. During individual interviews, 10-12 farmers in each site were asked about the details of their rice productions, particularly the yields and total productions of hybrid and non-hybrid varieties grown in different portions of their fields. In site wise, the following tables provide the production details of those farmers.

[1] 1 mound is equal to 40 Kg.

Site: 1, **Natore-1**
Village: Raoshanpur, Upazila: Gurudaspur, Dist: Natore

Raosanpur is part of the Chalan beel. Majority of the farmers in this village have been growing hybrid rice for around 3 years. The soils are highly fertile. Hybrid variety Sonarbangla, and Jagoroni have been cultivated for more than one year. Hira, Richer and Aftab LP-50 have been introduced this year. BRRI dhan-28 and BR-16 are the most common non-hybrid varieties grown along with hybrids.

| ***Sl Nr*** | ***Farmers Name*** | ***Area of rice in Boro 2004 season (acre)*** | | ***Production 2003 (mounds)*** | | ***Average Yield mds/acre*** | |
|---|---|---|---|---|---|---|---|
| | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Md. Nazmul Hossin | 1.32 | - | 116 | - | 88 | - |
| **2** | Md. Mofizuddin Pramanik | 1.00 | - | 93 | - | 93 | - |
| **3** | Khodabox Maula | 0.33 | 0.14 | 30 | 10 | 90 | 72 |
| **4** | Md. Mokbul Hossain | 0.43 | 0.08 | 34 | 5 | 79 | 63 |
| **5** | Md. Shahinur Islam | 0.50 | - | 27 | 8 | 82 | 47 |
| **6** | Md. Majid | 2.80 | 0.80 | 240 | 40 | 90 | 70 |
| **7** | Md. Alauddin | 5.70 | - | 510 | - | 95 | - |
| **8** | Md. Nausher Ali | 2.33 | - | 210 | - | 90 | - |
| **9** | Md. Amirul Islam | 1.00 | 1.00 | 85 | 78 | 85 | 78 |
| **10** | Abdul Razzak | 0.16 | - | 28 | - | 85 | - |

1 mound = 40 kg

Site-2, **Natore-2**
Village - Patul, Upazila - Natore Sadar, Dist - Natore

Patul belongs to beel halti, one of the largest parts of Chalan beel. The site is very near from Natore town, 6-7 Kilometers to the northwest of the town. Patul is in the southern part of beel. Rice is the single most important crop in the beel. The soils are very fertile. Hybrid varieties are grown in large scale. Almost all of the hybrid varieties such as Aftab LP-50, Jagoron, Hira, Richer and Sonarbangla have been grown by majority of the farmers. Among the non-hybrid BR -10 and BRRI Dhan 28 are most common.

| ***Sl Nr*** | ***Farmers Name*** | ***Area of rice in Boro 2004 season (acre)*** | | ***Production in 2003 (mounds)*** | | ***Average Yield mds/acre*** | |
|---|---|---|---|---|---|---|---|
| | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Md. Asaduzzam | 0.99 | 0.66 | 60 | 20 | 90 | 60 |
| **2** | Md. Mansur Fakir | 3.30 | 0.99 | 230 | 126 | 90 | 57 |
| **3** | Md. Hakim | 15.84 | 3.96 | 1344 | 280 | 84 | 60 |
| **4** | Md. Ali | 8.25 | 3.30 | 700 | 220 | 84 | 66 |
| **5** | Md. Masud | 0.66 | 0.33 | 70 | 20 | 105 | 60 |
| **6** | Md. Afjal | 1.73 | 9.32 | 145 | 5 | 84 | 60 |
| **7** | Md. Faruk Hossain | 1.32 | 0.99 | 113 | 53 | 90 | 54 |
| **8** | Md. Mofijur Rahman | 1.82 | 0.99 | 163 | 53 | 90 | 54 |
| **9** | Md. Anisur Rahman | 4.29 | 0.33 | 360 | 60 | 84 | 60 |

Site-3, **Natore-3**
Village - Kholabaria, Upazila - Natore Sadar, Dist - Natore

This site is also in beel halti. The village Kholabaria is next to Patul village (site-2). The area is very lowland, which is very fertile. It is a large village almost all of the farmers grow hybrid, many in large scale. Farmers in the village are mad about hybrid varieties. They grow all the hybrid varieties depending on the availabilities of seeds. Rice is the only crop for majority of the farmers. The common non-hybrids are BRRI dhan-28 and BR-10

| ***Sl*** | ***Farmers Name*** | ***Area of rice Boro 2004 season (acre)*** | | ***Production 2003 (mounds)*** | | ***Average Yield mds/acre*** | |
|---|---|---|---|---|---|---|---|
| ***Nr*** | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Md. Abdul Hakim | 3.30 | 1.67 | 270 | 100 | 81 | 60 |
| **2** | Abu Taher | 6.00 | 1.33 | 396 | 64 | 66 | 48 |
| **3** | Md. Humayun Kabir | 10.56 | - | 480 | 416 | 73 | 48 |
| **4** | Md. Jahangir | 5.61 | 1.98 | 142 | 182 | 71 | 39 |
| **5** | Abu Jiyad | 1.65 | 1.33 | 60 | 22 | 73 | 66 |
| **6** | Md. Salim Uddin | 4.29 | - | 240 | 80 | 73 | 60 |
| **7** | Md. Abdul Aziz | 4.95 | - | 250 | 90 | 75 | 54 |
| **8** | Md. Abdul Motin | 1.65 | - | 128 | 215 | 77 | 56 |
| **9** | Tayabur Rahman | 16.00 | - | 600 | - | 75 | - |
| **10** | Md. Shaiful Islam | 3.30 | - | 250 | - | 99 | - |
| **11** | Md. Rafiqul Islam | 13.33 | - | 1200 | - | 90 | - |

Site-4, **Sirajganj**
Village - Kundail, Upazila - Tarash, Dist - Sirajganj

The site is located in the central part of Chalan beel. Farmers here grow hybrid in large scale. The soils are highly fertile. Most of the villages around Kundail also grow hybrids. Hira, Sonarbangla1and Richer 101 are the more common hybrid varieties as against BRRI Dhan 29 the other modern non-hybrid variety.

| ***Sl*** | ***Farmers Name*** | ***Area of rice Boro 2004 season (acre)*** | | ***Production 2003 (mounds)*** | | ***Average Yield mds/acre*** | |
|---|---|---|---|---|---|---|---|
| ***Nr*** | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Monju | 2.31 | 1.65 | 164 | 99 | 73 | 60 |
| **2** | Shamimur Rahman | 2.00 | 4.95 | 138 | 525 | 69 | 51 |
| **3** | Momin | 1.98 | 3.30 | 162 | 198 | 82 | 60 |
| **4** | Md. Akkas Ali | 0.16 | 2.31 | 10 | 140 | 60 | 60 |
| **5** | Md. Saidur | 1.98 | 1.00 | 156 | 42 | 78 | 42 |
| **6** | Sultan Mahmud | 3.30 | 2.31 | 207 | 124 | 63 | 54 |
| **7** | Md. Shariful Islam | 3.96 | 9.24 | 289 | 554 | 73 | 60 |
| **8** | Md. Nazrul Islam | 2.14 | - | 181 | - | 85 | - |
| **9** | Bakul | 1.32 | - | 103 | - | 78 | - |
| **10** | Azgar Ali | 3.30 | 1.65 | 260 | 85 | 78 | 51 |

Site-5, **Naogaon**
Village - Gopalbati, Upazila - Atrai, Dist - Naogaon

This is the third site in beel halti, situated to the north of previous site (site-3). This part of the site is located in the Naogaon district. Lands and crops are very similar to those of Kholabaria site. Farmers have been growing all the hybrid varieties for two years. The village is pretty large. Farmers in all other nearby villages also grow hybrids. Among the non-hybrids BRRI Dhan 28 and BRRI dhan-36 are very common.

| ***Sl Nr*** | ***Farmers Name*** | ***Area of rice Boro 2004 season (acre)*** | | ***Production 2003 (mounds)*** | | ***Average Yield mds/acre*** | |
|---|---|---|---|---|---|---|---|
| | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Abdul Malek | 1.65 | 1.32 | 168 | 79 | 102 | 60 |
| **2** | Abdul Salam | 0.36 | 0.99 | 32 | 74 | 90 | 75 |
| **3** | Shahidul Islam | 17.16 | 24.75 | 1458 | 1633 | 85 | 66 |
| **4** | Nazrul Islam | 3.30 | 1.66 | 140 | 85 | 84 | 51 |
| **5** | Md. Hashem | 0.66 | 1.32 | 73 | 79 | 110 | 60 |
| **6** | Muktadul Rahman | 5.94 | 0.50 | 594 | 33 | 100 | 66 |
| **7** | Pear Ali | 1.32 | - | 127 | - | 96 | - |
| **8** | Solaiman | 0.66 | 0.99 | 63 | 65 | 96 | 66 |
| **9** | Bakul | 2.14 | 0.50 | 171 | 34 | 80 | 64 |
| **10** | Andajur Rahman | 1.32 | 0.99 | 120 | 66 | 90 | 66 |

Site-6, **Gopalganj**
Village: Silona, Upazila - Gopalgonj Sadar, Dist - Gopalgonj

Shilona is a small village in the central part of a large beel in Gopalganj, known as Vedgram beel. The village is around 15 Kilometers east of Gopalganj town. Around 30 farmers took part in the focus group discussions. The farmers those appear in the table below were randomly selected ones who took part in the individual interviews. Among the hybrids, Hira, Aftab LP-50, Gagorani, Sonarbangla are common. The non-hybrids are Bhojan and BRRI Dhan-32.

| ***Sl Nr*** | ***Farmer's Name*** | ***Area of rice in Boro 2004 season (acre)*** | | ***Production in Boro 2003 (mounds)*** | | ***Average Yields mds/acre*** | |
|---|---|---|---|---|---|---|---|
| | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Nirmal Kumar Adhikari | 3.50 | 0.50 | 301 | 35 | 86 | 70 |
| **2** | Shudeb Basu | 1.28 | 1.72 | 64 | 68 | 50 | 40 |
| **3** | Parimal Adhikari | 0.25 | 0.40 | 21 | 16 | 84 | 40 |
| **4** | Prodip Kumar Biswas | 4.00 | - | 306 | - | 90 | - |
| **5** | Shantu Ranjan Biswas | 0.50 | 1.50 | 43 | 78 | 86 | 52 |
| **6** | Palash Kumar | 1.00 | - | 55 | - | 55 | - |
| **7** | Tapash Kumar | 0.64 | 1.00 | 64 | 50 | 100 | 50 |
| **8** | Dukhir Mondal | 1.00 | 1.00 | 100 | 70 | 100 | 70 |
| **9** | Uzzal Kumar Basu | 2.55 | 0.45 | 255 | 33 | 100 | 75 |
| **10** | Shyamal Krishna | 1.28 | 0.64 | 121 | 38 | 95 | 60 |

Site-7, **Jessore**
Village - Salua, Upazila - Bagharpara, Dist - Jessore

Salua is comparatively a new area for hybrid varieties. It is situated in the borders of Jessore, Jhenaidah and Magura district. In this site large numbers of trials have been organized with BRRI Hybrid-1. Farmers have grown other hybrids too. They are Jagoroni and Aftab LP-50. The most common non-hybrids are Ratna, Minicat, BRRI Dhan-28. The soils are moderately fertile. It is a double cropped area.

| ***Sl*** | ***Farmers' Name*** | ***Area of rice in Boro 2004 season (acre)*** | | ***Production 2003 (mounds)*** | | ***Average Yield mds/acre*** | |
|---|---|---|---|---|---|---|---|
| ***Nr*** | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Harashit | 0.33 | 7.00 | 23 | 455 | 70 | 60 |
| **2** | Mijanur Rahaman | 3.00 | 2.00 | 216 | 120 | 72 | 60 |
| **3** | Sree Ranjan | 1.00 | 0.50 | 72 | 28 | 72 | 57 |
| **4** | Md. Ayub Hossain | 1.00 | 4.00 | 80 | 280 | 80 | 60 |
| **5** | Tapan Babu | 1.65 | 5.61 | 115 | 310 | 70 | 60 |
| **6** | Md. Nazrul Islam | 0.37 | 0.33 | 28 | 20 | 70 | 60 |
| **7** | Anamul Hossain | 0.33 | 1.67 | 80 | 100 | 80 | 60 |
| **8** | Md. Nurul Hossain | 0.50 | 3.50 | 42 | 210 | 85 | 60 |
| **9** | Md. Golam Maula | 4.00 | 29.00 | 340 | 1740 | 85 | 60 |
| **10** | Md. Jahiruddin | 3.00 | 0.50 | 70 | 280 | 84 | 75 |

Site-8, **Jhenaidah**
Village - Ghorshal, Upazila - Jhenaidah, Dist - Jhenaidah

Ghorshal is comparatively an older site. Hybrids have been grown here for around three years. The common hybrids are Sonarbangla-1, Jagoroni, Aftab LP-50, Hira and Richer. In addition, in the area, AAS has organized a number of variety performance trials with all the hybrid varieties, which includes BRRI hybrid-1 too. The common non-hybrids are Ratna, and BRRI Dhan-28.

| ***Sl*** | ***Farmers Name*** | ***Area of rice in Boro 2004 season (acre)*** | | ***Production in 2003 (mounds)*** | | ***Average Yield mds/acre*** | |
|---|---|---|---|---|---|---|---|
| ***Nr*** | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Chand Ali Biswas | 1.00 | 8.00 | 34 | 376 | 66.0 | 60 |
| **2** | Md. Eunus Ali | 0.30 | 0.92 | - | 50 | - | 50 |
| **3** | Mofazzal Hossain | 8.00 | 3.00 | - | 400 | 80.0 | 36 |
| **4** | Md.Jahangir Alam | 1.50 | 3.00 | 115 | 180 | 77.0 | 60 |
| **5** | Md. Hasem Ali | 4.60 | 1.00 | 391 | 55 | 84.8 | 55 |
| **6** | Md. Motiyar Rahman | 1.84 | 0.92 | 167 | 120 | 95.0 | 50 |
| **7** | Md. Jakir Hossain | 6.44 | 3.68 | 590 | 175 | 95.0 | 50 |
| **8** | Md. Foysal Ali | 0.80 | 5.00 | 70 | 250 | 87.5 | 50 |
| **9** | Ratan Kumar Biswas | 1.50 | 0.90 | 96 | 62 | 96.0 | 65 |
| **10** | Md. Abdul Hamid | 0.50 | 0.26 | 45 | 15 | 90.0 | 58 |

Site-9, **Gaibandha**
Village - Uttar Anelertari, Upazila - Gaibandha Sadar, Dist - Gaibandha

Dariapur is about 9 Kilometer north of Gaibandha town on the way to Sundarganj. Although hybrids have been started in the site since two years ago, majority of the farmers in Anelertari and nearby villages have started to grow hybrids from this year. Jagoroni, Sonarbangla-1, Aftab LP-50 are the more common hybrid varieties. The reported yields of hybrids cover both year 2003 and 2004. Many farmers have already harvested this year's crop. The common non-hybrids in the area are BRRI dhan-28, BRRI dhan-29, Chandina (BR-1), and BR-3.

| ***Sl Nr*** | ***Farmers Name*** | ***Area of rice in Boro 2004 season (acre)*** | | ***Production 2003/4 (mounds)*** | | ***Average Yield mds/acre*** | |
|---|---|---|---|---|---|---|---|
| | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Bhabesh Chandra Madak | 1.85 | 2.31 | 140 | 126 | 76 | 56 |
| **2** | Md. Golam Mostafa | 1.00 | 0.66 | 78 | 40 | 78 | 60 |
| **3** | Md. Zillur Rahman | 0.66 | 0.33 | 90 | 60 | 90 | 60 |
| **4** | Khadem Hossain | 1.00 | 0.66 | 78 | 100 | 78 | 60 |
| **5** | Md. Nurunnabi Sarker | 4.00 | 0.66 | 336 | 26 | 84 | 80 |
| **6** | Balia Roy | 0.33 | 1.33 | 75 | 90 | 75 | 36 |
| **7** | Maduram Roy | 1.32 | 3.33 | | 70 | | 36 |
| **8** | Jahidul Islam | 1.50 | 0.66 | 40 | 40 | 81 | 60 |
| **9** | Shahalam | 1.50 | 1.83 | 121 | 200 | 81 | 66 |
| **10** | Khaza Miah | 0.15 | 0.50 | 13 | 22 | 81 | 45 |

Site-10, **Jamalpur**
Village - Nagerpara, Upazila - Melandah, Dist - Jamalpur

It is one of the oldest sites of hybrid. Sonarbanla is the oldest variety in the area. Farmers since last year also started to grow other varieties, which include Hira, Jagorani, Aftab LP-50. The village Nagerpara is in the outskirts of Melandah Upazila Sadar. Farmers in the nearby villages also grow hybrids. It is a double-cropped site and its soils are moderately fertile. The common non-hybrids are BRRI dhan-29, BR-14, BR-16, BRRI dhan-28 and China.

| ***Sl Nr*** | ***Farmers Name*** | ***Area of rice in Boro 2004 season (acre)*** | | ***Production 2003 (mounds)*** | | ***Average Yield mds/acre*** | |
|---|---|---|---|---|---|---|---|
| | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Razzak Talukdar | 1.05 | 12.25 | 95 | 500 | 86 | 41 |
| **2** | Abul Hossain | 0.58 | 0.49 | 58 | 28 | 100 | 57 |
| **3** | Mosharraf Hossin | 0.35 | 0.70 | 25 | 41 | 75 | 58 |
| **4** | Golam Rabbani | 0.88 | 0.70 | 79 | 36 | 90 | 50 |
| **5** | Md. Abdur Rashid | 1.40 | - | 147 | - | 105 | - |
| **6** | Abul Kashem | 2.45 | - | 257 | - | 105 | - |
| **7** | Nayeb Ali | 0.88 | 0.88 | 66 | 48 | 75 | 54 |
| **8** | Abdul Aziz | 0.52 | 0.35 | 55 | 23 | 105 | 66 |
| **9** | Altafur Rahman | 0.60 | 1.20 | 50 | 65 | 84 | 54 |
| **10** | Al-Amin | 1.16 | 0.33 | 105 | 20 | 90 | 60 |

Site-11, **Moulvibazar**
Village: Nishchintapur, Upazila - Srimangal, Dist - Moulvibazar

Though, it is a very new site but few farmers have started growing hybrid since 2002. The village Nishchintapur is in the western site of Hail Haor. Farmers here started this year's hybrids with seeds from AAS. No dealer is yet to sell hybrid seeds. Although, the crop establishment in this season was very nice, unfortunately, most of them were damaged by flood and hailstorm. Farmers grew all the 6 hybrid varieties. The common non-hybrids are BRR1 dhan-28, BRRI dhan-29, China, Shahjalal and Pashushail. Some of the yields and productions of hybrids are reported from this year's harvest.

| ***Sl Nr*** | ***Farmers Name*** | ***Area of rice Boro 2004 season (acre)*** | | ***Production in 2003/4 (mounds)*** | | ***Average Yield mds/acre*** | |
|---|---|---|---|---|---|---|---|
| | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Ajit Paul | 0.45 | 1.35 | 37 | 27 | 83 | 20 |
| **2** | Arabinda Dev | 0.45 | 0.45 | 26 | 30 | 60 | 48 |
| **3** | Ranadhir Datta | 1.05 | 0.45 | 70 | 15 | 67 | 50 |
| **4** | Ranajit Dev | 0.40 | 0.90 | 16 | 36 | 67 | 40 |
| **5** | Chayan Datta | 0.52 | 0.90 | - | 35 | - | 43 |
| **6** | Nuruj Mia | 0.15 | 1.35 | - | - | - | 17 |
| **7** | Lalit Mohan Basu | 0.60 | 1.50 | 19 | 30 | 57 | 20 |
| **8** | Rabindra Dev | 0.21 | 1.80 | 18 | 60 | 50 | - |

Site-12, **Habiganj**
Village - Hariya, Upazila - Madhabpur, Dist - Habiganj

It is also a very new site. Farmers started hybrid with seeds from AAS. The village Hariya is around 3 kilometers east of Madhabpur Upazila town. All the 6 hybrid varieties including BRRI hybrid-1 were grown by most of the farmers. The common non-hybrids are BRRI dhan-29, BRRI dhan-28, and Gazi. Farmers are yet to harvest the hybrid rice. The growth of hybrid varieties looks much better than the non-hybrids. Farmers mentioned the expected yields of hybrid could be 25-30% higher than those of non-hybrids. It is a double-cropped site, the soils of which are moderately fertile.

| ***Sl Nr*** | ***Farmers Name*** | ***Area of rice in Boro 2004 season (acre)*** | | ***Production in 2003 (mounds)*** | | ***Average Yields mds/acre*** | |
|---|---|---|---|---|---|---|---|
| | | Hybrid | Non hybrid | Hybrid | Non hybrid | Hybrid | Non hybrid |
| **1** | Mst. Masuda Begum | 0.15 | 1.48 | - | 50 | - | 60 |
| **2** | Mst Aysha | 0.15 | 1.12 | - | 25 | - | 64 |
| **3** | Mst. Shafia Khatun | 0.15 | 0.28 | - | 12 | - | 48 |
| **4** | Mst. Banesa Khatun | 0.15 | 4.48 | - | 150 | - | 60 |
| **5** | Mst. Shufia Khatun | - | 0.28 | - | 15 | - | 45 |
| **6** | Mst. Minara | 0.15 | 0.84 | - | 25 | - | 45 |
| **7** | Md. Ramchan | 0.15 | 0.42 | - | 25 | - | 45 |
| **8** | Md. Maram Ali | 0.14 | 1.36 | - | 90 | - | 60 |
| **9** | Mst. Shafia | 0.04 | 0.35 | - | 19 | - | 57 |
| **10** | Mst. Natun nesha | 0.15 | 0.84 | - | 60 | - | 60 |

### 4.1.2 Cost and return

The study team in each site made detailed cost and return analysis with both hybrid and non-hybrid varieties. It was done with a small group of progressive farmers with breaking down the actual cost and returned they accrued from their individual crops. The analysis was further validated in focus group discussions with a large number of farmers. During the analysis most of the farmers mentioned that they required very similar costs to grow all the hybrid varieties and their yields were very similar too, therefore, no attempt was made to prepare separate cost and return analysis for individual hybrid varieties. Similarly, most of the modern non-hybrid varieties require similar production costs. As such a single cost analysis was made for all the non-hybrid varieties. But for the return, since the yields of different non-hybrids vary to a large extent from one another, while computing such yields in each site the highest yielding variety was taken into account as the attempt of such cost and return analysis was to compare the actual benefits between hybrid and non-hybrid varieties.

| **Item** | **Amounts in taka** | |
|---|---|---|
| **Cost** | **Hybrid** | **Non hybrid** |
| land preparation | 600 | 600 |
| labor cost | 3,000 | 3,000 |
| seed | 1,000 | 300 |
| Fertilizers | 2,360 | 2,120 |
| Pesticide | 800 | 600 |
| Irrigation | 1500 | 500 |
| **Total cost** | **9,260** | **7,120** |
| **Return** | | |
| Yield (mounds) | 100 | 70 |
| Income | 24,500 | 17,150 |
| **Net return** | **15,240** | **10,030** |

The above table provides the breakdown of actual cost and return with particular cost items and the specific yields of hybrid and inbred varieties in Gopalganj site. Similar analysis was made in all other sites. The following table provides the summary of cost and return analysis made in ten different sites.

| SL Nr. | Site | Total cost ( Tk./acre) | | Return ( Tk./acre) | | Net return (Tk./acre) | | Non hybrid variety |
|---|---|---|---|---|---|---|---|---|
| | | Hybrid | Non Hybrid | Hybrid | Non Hybrid | Hybrid | Non Hybrid | |
| 1 | Natore-1 | 14580 | 13320 | 19500 | 16500 | 4920 | 3180 | BRRI dhan-28 |
| 2 | Natore-2 | 10619 | 10169 | 19500 | 13500 | 8881 | 3331 | BRRI dhan-28 |
| 3 | Sirajganj | 9935 | 8450 | 19240 | 14000 | 9305 | 5550 | BRRI dhan-29 |
| 4 | Naogaon | 10025 | 8770 | 25920 | 17160 | 15895 | 8390 | BR-10 |
| 5 | Gopalganj | 9260 | 7120 | 4500 | 17150 | 15240 | 10030 | Bhajan |
| 6 | Jessore | 10885 | 10245 | 21600 | 17550 | 10715 | 7305 | BRRI dhan-28 |
| 7 | Jhenaidah | 10630 | - | 24000 | - | 13370 | - | |
| 8 | Gaibandha | 11196 | 9336 | 20520 | 17160 | 9324 | 7824 | BRRI dhan-29 |
| 9 | Jamalpur | 11680 | 11930 | 29250 | 19600 | 17570 | 7670 | BRRI dhan-29 |
| 10 | Moulvibazar | 6783 | 5400 | 21600 | 14400 | 14817 | 9000 | BRRI dhan-28 |

### 4.1.3 Performances of different varieties

During focus group discussions, farmers in each site were asked about the performances of different hybrid varieties that they had grown. They were particularly asked which varieties performed very well and which not. They provided a list of reasons that they found in the field against their comments, which are carefully and systematically placed in the following table. It needs to be very clear that all these comments and their subsequent reasons are absolutely of those farmers who participated in the focus group discussions.

| Site | Hybrid verities grown | Most successful variety | Reasons | Least successful variety | Reasons |
|---|---|---|---|---|---|
| Natore-1 | GB-4,SB-1,Hira,LP-50,Richer-101 | Before SB-1, now GB-4 | Requires less fertilizer | No variety is bad yet. | _ |
| Natore-2 | Hira,Richer-101,GB-4,LP-50,SB-1,BHD-1. | Hira | Grain size& numbers are better, strong & resistant to wind | GB-4 | Mixture, not uniform. |
| Natore-3 | Hira,SB-1,LP-50,GB-4,Richer-101,BHD-1. | Hira, SB-1, Richer-101 | Higher yields. | GB-4 | Seed quality was mixed. |
| Sirajganj | Hira,SB-1,GB-4,Richer-101 | Hira | Heavy grain, and higher yield | GB-4 | More unfilled grain |
| Naogaon | SB-1,Hira,GB-4,LP-50,Richer-101 | Hira | Higher grains in panicles | All was pretty similar, no one was bad | _ |
| Gopalganj | SB-1,Hira,GB-4 LP-50. | Hira | Grain wt high, higher yields, course grain, higher price | Alok | Unfilled grain, lodging, shattering |
| Jessore | BHD-1,GB-4,LP-50 | GB-4 | Higher yield | BHD-1 | Long duration, unfilled grain |
| Jhenaidah | LP-50,GB-4,SB-1,Richer-101,Hira | SB-1 | Better yields early variety, strong, no lodging, winter tolerant, price better, more straw | No other variety was introduced before SB-1 | _ |
| Gaibandha | LP-50,GB-4 | LP-50 | Need less water | All varieties looks good, not much different | _ |
| Jamalpur | SB-1,GB-4,Hira,LP-50 | SB-1 | Price good, milling rate very good (77.5%) | GB-4 | Mixed seed, flowering not uniform . |
| Moulvibazar | SB-1,GB-4,Richer-101,Hira,LP-50,BHD-1. | SB-1 | Higher yield and more tillers | BHD-1 | Higher percentage unfilled grain, long duration. |
| Habiganj | SB-1,Richer-101,Hira,GB-4,LP-50,BHD-1. | All varieties look pretty similar, crop is not harvested yet | | | |

Our observations, however, are that the performances of all the varieties are pretty similar. There are no significant differences among the varieties, particularly, in terms of yields and other agronomic characters. It could be seen well from the above table that a variety, which performed very well in one site does not necessarily attract the farmers in other sites. Grain size was an important reason in many sites for farmers to choose a variety. In many places the

demand of course rice is higher than that of fine rice, while in other sites, it is vice versa. Those choices accordingly determine the market price of a particular variety.

The other reasons of the success of a variety were the management practices and the soil quality. Due to different management practices applied in the field, yield of a particular variety in the same site varied from one farmer to another. However, for some varieties seed quality was really a problem. Many farmers complained that they were sold the seeds of old stock. Their germination was very poor and that was a genuine reason why farmers considered some particular varieties least successful.

Table: characteristics of different hybrid varies provided by respective seed companies

| ***Variety*** | ***Origin*** | ***Principal Seed company*** | ***Local Organization/ Company*** | ***Characteristics*** |
|---|---|---|---|---|
| Richer-101 | China | Sichuan Huafeng Seed Co. Ltd | Chens Crop-Science Bangladesh Limited with Kustia seed store | ✓ High yielding (about 10 t/ha), short duration, medium height and suitable for Boro season.<br>✓ Low sterility, no shattering, resistant to lodging<br>✓ Fine and medium long grain |
| Aftab LP-50<br><br>(LP-50) | China | Y.L.P Hightech Agricultural Co. Ltd | Aftab Bahumukhi Farm Ltd. | ✓ High yielding (about 10 t/ha) short duration (140-150 days), medium height and suitable for Boro season.<br>✓ Very low sterility, no shattering, and strong and resistant to lodging.<br>✓ Fine-medium long grain with slight aroma. |
| SonarBangla-1<br><br>(SB-1) | China | | Mollika Seed Co. Ltd | ✓ High yielding (10 t/ha), short duration (130-145 days), medium height and suitable for Boro season<br>✓ Very low sterility, no shattering and no lodging.<br>✓ fine and medium long grain. |
| Hira (99-5) | China | | Supreme Seed Co., Ltd. | ✓ High yielding (about 10 t/ha), short duration (145-150 days), medium height and suitable for Boro season.<br>✓ Very low sterility, no shattering and no lodging<br>✓ Bold-medium long grains. |
| Jagoran-1 (GB-4) | China | Hightech Seed Co. | BRAC | ✓ High yielding (About 10 t/ha) short duration (140-145 days) medium height and suitable for Boro season.<br>✓ It has board and erect leaves. Leaves are green and flag leaf remains green and erect upto maturity |
| BRRI hybrid dhan-1<br><br>(BHD-1) | Bangladesh | Breeding Division, BRRI, Gazipur | BADC / NGO | ✓ High yielding (about 9 t/ha), long duration (150-160 days and medium height (100-110 cm) and suitable for Boro season.<br>✓ Strong & resistant to lodging.<br>✓ Fine and medium long grains<br>✓ Moderate sterility and shattering may occur under adverse weather condition. |

### 4.1.4 Agronomic practices in hybrid rice

The following agronomic and management practices that are mentioned in the table against each site were largely mentioned by majority of the farmers. An important reason to the difference of practices from one site to other is the influence of the local practices that farmers have been using in their inbred varieties. Of course, farmer's skill was another important reason. While many farmers mentioned they need 5-6 kg seed to plant one acre of rice, the skilled farmers needed only 3 kg. Seedling age, however, was differed due to prevailing cold temperature during the time in several sites. Many farmers used older seedling to adjust with the excessive winter.

| Sl Nr. | Site | Seed rate (kg/acre) | Seedling age (day) | Spacing (inch) | Transplanting time (month) | Crop duration (day) |
|---|---|---|---|---|---|---|
| 1 | Natore-1 | 4.5 | 28-35 | 9x6 | January (entire) | 150 |
| 2 | Natore-2 | 4.5 | 30-35 | 8x6 | January (entire) | 155 |
| 3 | Natore-3 | 5 | 30-35 | 9x8 | Do | 155-160 |
| 4 | Sirajganj | 4.5 | 40-45 | 8x6 | Dec (25-27) | 145 |
| 5 | Naogaon | 3 | 28-30 | 8x6 | Do | 145 |
| 6 | Gopalganj | 5 | 21-30 | 8x6 (7x6 less fertile soil) | 15Dec-15Jan | 145 |
| 7 | Jessore | 6 | 25-30 | 8x6 | January (15-21) | 150 |
| 8 | Jhenaidah | 4-6 | 35-45 | 10x8 | January (entire) | 145 |
| 9 | Gaibandha | 6 | 35-45 | 8x6 | Do | 150 |
| 10 | Jamalpur | 4 | 30-40 | 8x6 | January (entire) | 150 |
| 11 | Moulvibazar | 4.5 | 25-30 | 8x8 | Last week of Dec-middle Jan | 155 |
| 12 | Habiganj | 4.5 | 20-25 | 8x8 | Ist week of January | 150 |

The overall practices that have been used in hybrid rice are not much different from those they usually apply in the non-hybrid or inbred varieties. About spacing, though many farmers mentioned the space they used in hybrid varieties are little wider than in inbred varieties. Transplanting time is also pretty similar. However, due to cold temperature in some sites transplanting begins little earlier than other sites. The crop duration of most of the hybrids was almost same, except BRRI hybrid-1, which is at least 10-15 days longer than all other varieties.

The duration of the other 5 hybrids, although is shorter than many varieties, but majority of the farmers in each site mentioned BRRI dhan-28 is the shortest variety. It is even shorter than all the hybrid varieties. Some of the local varieties, which many farmers mentioned, came from India are also of shorter duration.

### 4.1.5 Advantages and disadvantages of hybrid varieties

In every site, farmers were asked about the specific advantages and disadvantages of hybrid rice. The following table has provided the key points of what the farmers expressed to the study team. About the advantages higher yield was very common to each site. The other more common advantages are strong plant, which is resistant to cold temperature, uniform flowering and higher percent of grain filling, which most of the farmers mentioned, is the main reason of higher yields.

*The study team, during their visits to the Srimangal site, noted with great care that while most of the non-hybrid fields were mostly damaged by serious hailstorm which is very common in the season in many sites, the damage to the hybrid fields was very less. Farmers in this site were able to harvest at least 70-80 % of normal production of hybrids. They believe the capacity of grain filling in hybrid varieties is very high*.

| SL | Site | Advantages of hybrid rice | Disadvantages of hybrid rice |
|---|---|---|---|
| 1 | Natore-1 | Requires less seeds, early ripening, good price, resistant & strong plant | Rice is sticky, eating quality not good, Difficult to make puffed rice |
| 2 | Natore-2 | Resistant to winter, higher yields, strong plant | Eating quality not good, price low, insect problems, duration longer than BRRI dhan28 |
| 3 | Natore-3 | Resistant to winter, milling output high, higher yields, early to harvest | Seed crisis, insect infestation higher, eating quality low |
| 4 | Sirajganj | Higher yields | Insect infestation high, cannot produce seeds |
| 5 | Naogaon | Higher yields, need less irrigation, price high, duration less. | Insect infestation high, requires higher fertilizers, eating quality not good. |
| 6 | Gopalganj | More production, less amount of seed, short duration, uniform flowing, resistant to lodging | Insect infestation high, rat infestation high, milling problem, husk is soft, need more water and fertilizers, price low, cost high, amylose percent high, low eating quality |
| 7 | Jessore | Strong plant, better yield | BHD-1 long duration, more unfilled grains, need more fertilizers |
| 8 | Jhenaidah | Higher yields, strong and resistant, no shattering | SB-1 late harvest (5 days longer), more insects, rice quality not good |
| 9 | Gaibandha | High yields, high price, plant strong, cold tolerant | Insect infestation high, require more fertilizers, |
| 10 | Jamalpur | Higher price, higher yields, eating quality good, strong plant | Price of seed is high. Seeds are not always available |
| 11 | Moulvibazar | Higher yields, no unfilled grain, duration medium, higher price, | Need more insecticides, eating quality not good, not good for puffed rice |
| 12 | Habiganj | Higher yields | Seed can not be produced |

About disadvantages higher insect infestations and more fertilizers were very common to each site. Many farmers mentioned due to succulent plants insect infestations with the hybrid varieties were very high and to produce more yields the variety needed more amounts of fertilizers. Therefore the overall cost goes higher. However, in Melandah, Jamalpur site, it was very interesting to not that the average cost of hybrid varieties was lower than that of non-hybrid varieties. The most important reasons the farmers mentioned are that they have not applied any insecticides. ***Participating in IPM farmer field school, they learned that insecticide is not necessary at all to produce rice. Many farmers mentioned using and not using insecticide does not make any difference to the yields of rice***. The other reason of higher cost with non-hybrid is that the variety needs more water since they grow BRRI dhan 29, the duration of which is longer than the hybrids.

### 4.1.6 Overall performances

*Based on the overall yields, and gross and net returns that are mentioned in section 4.1.1 and 4.1.2, it is absolutely clear that hybrid varieties have tremendous potentials over the existing modern inbred varieties. The study was conducted in different soil conditions. In the twelve sites where the study was conducted, the soil quality ranges from moderately fertile to highly fertile. In each of those soil types the yield increase with hybrid varieties was found tremendously higher. The cropping pattern of the sites was from single to double crop. In each crop condition, nevertheless, significant yield increase was noticed. See the table below.*

Table: Yields and differences of relevant costs between hybrids and non-hybrids

| ***Sl No.*** | ***Site*** | ***Soil types*** | ***Cropping system*** | ***Average yield (mds/acre)*** | | ***Yield gains*** | ***Added cost*** |
|---|---|---|---|---|---|---|---|
| | | | | Hybrid | Non Hybrid | (mds/acre) | (Tk/ac) |
| 1. | Natore-1 | High fertile | Single crop | 87.7 | 66.0 | 21.7 | 1260 |
| 2. | Natore-2 | High fertile | Single crop | 89.0 | 59.5 | 29.5 | 450 |
| 3. | Natore-3 | High fertile | Single crop | 85.3 | 53.87 | 31.43 | |
| 4. | Sirajganj | High fertile | Single crop | 73.9 | 54.75 | 19.15 | 1485 |
| 5. | Naogaon | High fertile | Single crop | 93.3 | 63.77 | 29.53 | 1255 |
| 6. | Gopalganj | High fertile | Single crop | 84.6 | 57.13 | 27.47 | 2140 |
| 7. | Jessore | Moderate fertile | Double crop | 76.8 | 60.0 | 16.8 | 640 |
| 8. | Jhenaidah | Moderate fertile | Double crop | 77.0 | 53.4 | 23.6 | |
| 9. | Gaibandha | Moderate fertile | Double crop | 77.4 | 63.78 | 13.62 | 1860 |
| 10. | Jamalpur | Moderate soil | Double crop | 91.5 | 54.25 | 37.25 | -250 |
| 11. | Moulvibazar | High fertile | Single crop | 48.0 | 34.0 | 14.0 | 1383 |
| 12. | Habiganj | Moderate fertile | Double crop | - | 56.6 | | |

*The average yield differences between hybrids and non-hybrids in different soil conditions and cropping systems ranged from 13.62 to 37.25 mounds per acre. Based on the cost and return analysis, the amount of money that was needed to produce such extra yields required no cost (in Melandah site) to 2140 tk (Silona site) based on farmer's skill and management of the rice paddy.*

Table: Unit costs of rice with hybrid and non-hybrid varieties

| ***Sl No.*** | ***Site*** | ***Average yield (mds/acre)*** | | ***Average cost (tk/ac)*** | | ***Cost to produce 1 mounds of rice (Tk.)*** | |
|---|---|---|---|---|---|---|---|
| | | *Hybrid* | *Non-hybrid* | Hybrid | Non Hybrid | Hybrid | Non-hybrid |
| 1. | Natore-1 | 87.7 | 66.0 | 14580 | 13320 | 166 | 202 |
| 2. | Natore-2 | 89.0 | 59.5 | 10619 | 10169 | 119 | 171 |
| 3. | Natore-3 | 85.3 | 53.87 | | | | |
| 4. | Sirajganj | 73.9 | 54.75 | 9935 | 8450 | 134 | 154 |
| 5. | Naogaon | 93.3 | 63.77 | 10025 | 8770 | 108 | 138 |
| 6. | Gopalganj | 84.6 | 57.13 | 9260 | 7120 | 109 | 125 |
| 7. | Jessore | 76.8 | 60.0 | 10885 | 10245 | 142 | 171 |
| 8. | Jhenaidah | 77.0 | 53.4 | 10630 | - | 138 | |
| 9. | Gaibandha | 77.4 | 63.78 | 11196 | 9336 | 145 | 146 |
| 10. | Jamalpur | 91.5 | 54.25 | 11680 | 11930 | 128 | 220 |
| 11. | Moulvibazar | 48.0 | 34.0 | 6783 | 5400 | 141 | 159 |
| 12. | Habiganj | - | 56.6 | | | | |

While looking at the cost many would argue that the production cost of hybrid rice is comparatively high. This is absolutely true if the cost is calculated on area basis. However, to farmers the importance is not the area but the amount of rice that is produced. In such case, if the cost is calculated based on the unit volume of rice produced, it is much lower with hybrid rice. From the above table, one could see very clearly that the cost to produce a mound of rice with hybrid varieties ranges from taka 108 to 166, while this cost with non-hybrid is 125 - 220 taka.

If the higher cost of hybrids is justified with added return, then perhaps, there are no big disadvantages of hybrid rice, as traditionally in non-hybrids, farmers also apply chemical fertilizers and insecticides, which many consider are problems to hybrids. Although in some places lower prices and low eating qualities are problems to some hybrids but in many sites price of hybrid rice is higher and the eating quality could be adjusted over time.

## *4.2 Impacts of hybrids on livelihoods*

### 4.2.1 Changes in rice provision ability

An important purpose of the study was to see how farmer's rice provision abilities are changed with the introduction of hybrid varieties in the rural areas. This was done by assessing the amount of rice on an average a farmer could consume and sell before and after the hybrid rice.

For individual interviews although the farmers were selected randomly, based on their land holdings, nevertheless, majority of them do not fall under resource poor category, since they hold more than one acre of rice land. It needs to be mentioned here that average landholdings of farmers where hybrids are grown are usually higher than the national average landholding capacity of farmers. Therefore, majority of the farmers were found to have self-sufficient with rice for their own consumptions. The major differences that are noticed after hybrids are grown are the amounts of rice that each family has sold. Depending on the land size and the management of the rice field each family was noticed to sell a significant amount of rice in each site.

The amount of sale, however, depended on the area of land brought under hybrid rice cultivation. From the table below it could be seen that farmers in Moulvibazar and Habiganj where hybrids were grown in a very small scale since it was their first year with hybrid, have been able to sell smaller amount than the farmers in Patul, Ghorshal, Gopalbati and other older sites where hybrids have been grown in large scale for more than one year.

Table; Average rice provision ability of farmers before and after hybrid rice is grown

| | | *Before Hybrid* | | *After hybrid* | |
|---|---|---|---|---|---|
| Sl Nr. | Site | Consumption (months) | Sale Average (mds) | Consumption (months) | Sale Average (mds) |
| 1 | Natore-1 | 12 | 62.5 | 12 | 91.7 |
| 2 | Natore-2 | 12 | 190.5 | 12 | 336.6 |
| 3 | Natore-3 | 12 | 214.1 | 12 | 316.1 |
| 4 | Sirajganj | 12 | 215.2 | 12 | 263.8 |
| 5 | Naogaon | 12 | 312.5 | 12 | 358.5 |
| 6 | Gopalganj | 11 | 17.2 | 12 | 64.2 |
| 7 | Jessore | 12 | 335 | 12 | 357.91 |
| 8 | Jhenaidah | 12 | 203 | 12 | 306.5 |
| 9 | Gaibandha | 12 | 52.1 | 12 | 84.3 |
| 10 | Jamalpur | 12 | 70.2 | 12 | 104.1 |
| 11 | Moulvibazar | 12 | 13.17 | 12 | 22.8 |
| 12 | Habiganj | 12 | 36.25 | 12 | 58.75 |

Although majority of the farmers who took part in both individual interviews and focus group discussions were medium to rich farmers but there were few resource poor farmers in many sites. Their percentage could be somewhat 8 -10. In the following table attempts are made to show how the rice provision abilities of those farmers have been changed with hybrid rice.

Table: Rice Provision ability of resource poor farmers

| Sl Nr. | Site | Average landholding | Before Hybrid | | After hybrid | |
|---|---|---|---|---|---|---|
| | | | Consumption (months) | Sale Average (mds) | Consumption (months) | Sale Average (mds) |
| 1 | Natore-1 | 0.41 | 11 | 6.25 | 12 | 13.00 |
| 2 | Natore-2 | 1.00 | 10 | - | 12 | 10.00 |
| 3 | Natore-3 | Above 1ac. | - | - | - | - |
| 4 | Sirajganj | Above 1ac. | - | - | - | - |
| 5 | Naogaon | Above 1ac. | - | - | - | - |
| 6 | Gopalganj | 1.00 | 12 | - | 12 | 25.00 |
| 7 | Jessore | 0.70 | 6 | 14.00 | 9 | 17.00 |
| 8 | Jhenaidah | 0.76 | 8 | 20.00 | 11 | 35.00 |
| 9 | Gaibandha | 0.83 | 12 | 26.00 | 12 | 50.00 |
| 10 | Jamalpur | 1.00 | 12 | 2.00 | 12 | 6.00 |
| 11 | Moulvibazar | 0.90 | 12 | 4.00 | 12 | 10.00 |
| 12 | Habiganj | 0.47 | 8 | 4.00 | 8.5 | 5.00 |

As the soils of the majority of the sites are very fertile, the average production levels of farmers in those sites are very high compare to other parts of the country. Therefore, with limited landholding many resource poor farmers are seen to have already attained complete self-sufficiency. With the introduction of hybrid each of them was able to increase the volume of sale.

Gabinda Chandra Hira, a small farmer, holding 2.5 acres of land of Silna village, under Ragunathpur union of Gopalganj Sadar Upazila, first heard about hybrid in 2001/2. He was too curious to see the performance of hybrids and purchased 2 kg seeds from a local seed shop at Gopalganj town. With this amount in 2001he planted 32 decimals of land. After harvest, when he measured the yields of his plot, he could not believe his own eyes. It was 42 mounds, more than double of his usual harvest. Next year in 2002/3, he bought 300 kg seeds of the same variety, and planted 2 acres. The rest of the seeds he sold to other farmers. Being they noticed his yields, it was very easy for him to sell the seeds. He made 10 taka margin from a kilo of seed, plus he was able to harvest 218 mounds of rice from his two acres of land. The new money changed his life style. He built a new house and at the same time became a small seed dealer. This year he sold 1,500 kg seeds and was able to profit around 15,000 taka from the sale. He planted 2 acres hybrid too, and is expecting similar yields as harvested previously.

Gobinda and wife with their new house

### 4.2.2 Incomes and changes in livings

The introduction of hybrid has remarkably changed the average income levels of farmers in every site. The incomes came from the amount of extra rice they produced with hybrid varieties. The total amount of incomes, however, depends on the price of rice. Farmers, who can hold the rice for four to five months, can avail a better price since the price goes up in this period. Others, who have many necessities, have to sell immediately after the harvest, when the price is very low. Nevertheless, all the farmers mentioned they are very happy with the increased yields and subsequent incomes.

The new incomes have also changed the livelihoods of majority of the farmers. While many of the farmers mentioned the added incomes they spent to meet the new expenses of the families, the majority were able to purchase new lands, build new houses, buy motorcycles, cows, farm machineries such as power tillers etc. The specific changes of livelihood that the farmers mentioned during individual interviews and focus group discussions are mentioned in the corresponding columns of the table below.

Table: Farmers' changes of living with added incomes from hybrids

| SL | Site | Amount of extra rice produced per family (mds) | Extra income per family (Tk) | Livelihood changes |
|---|---|---|---|---|
| 1 | Natore-1 | 31.20 | 9170.00 | Met additional family expenses, settled daughter's wedding, children's education, purchased and leased new lands, built new ponds. |
| 2 | Natore-2 | 146.80 | 42065.00 | Purchased goat, new cloths, bought land & power tiller, met additional expenses of the family, and invested in new business. |
| 3 | Natore-3 | 102.00 | 23223.65 | Paid loans, met family expenditure and children's education |
| 4 | Sirajganj | 48.60 | 12636.00 | Purchased boat, and cow, bought new lands, taken land mortgage, paid loans & taxes, Met the expenses of children's marriage. |
| 5 | Naogaon | 47.00 | 11705.00 | Purchased motor cycle, bought new lands, sent son abroad, leased new lands, paid loans, and invested in business. |
| 6 | Gopalganj | 47.00 | 13849.50 | Bought new STW, boat, purchased new lands, build new houses, increased cultivable area, invested in business, have better education for family members. |
| 7 | Jessore | 26.40 | 6650.00 | Purchased cow, bought new lands, settled daughter's marriage, and met additional expenses of the family. |
| 8 | Jhenaidah | 103.50 | 27845.00 | Purchased new lands and cow , built new houses, met the expenses of daughter's marriage, and children education. |
| 9 | Gaibandha | 35.78 | 8822.00 | Paid loan, met children's education & family expenses, invested in poultry business, and increased the area of cultivation. |
| 10 | Jamalpur | 33.90 | 10013.50 | Built new houses, and ponds for cultivating fish, purchased cow and new lands, met expenses of children's education, and extra expenditure of the family, and invested in business. |
| 11 | Moulvibazar | 9.66 | 2750.00 | Hailstorm & flood damaged most of the crops, the small amount of extra incomes was spent for family maintenance. |
| 12 | Habiganj | 22.5 | 5850.00 | Want to build new building. |

### 4.2.3 Percent of lands grown under hybrid rice

During the interviews and focus group discussions important attempt was made to see the scale of adoption of hybrid varieties by different categories farmers in each site. Based on the information provided by the farmers it appears that in older sites, where hybrids have been introduced since more than a year ago, almost all the farmers are growing hybrid varieties whereas, in new sites such as Gaibandha, Moulvibazar and Habiganj the percent of farmers practicing hybrids is still very low. Nonetheless, most of the farmers mentioned that in the coming years majority of them would practice hybrid since they already witnessed the yield advantage of hybrid varieties

In the older sites, majority of the farmers have been growing hybrid varieties in larger part of their fields. As a result, hybrid varieties are gradually taking over all the rice lands of those sites. In beel areas such as Natore-1, Natore-2, Natore-3, Naogaon and Gopalganj sites more than 70% of the rice lands are already covered with hybrid varieties. In the coming year this percent will be even higher.

| *Sl Nr.* | *Site* | *Total Nr. of farmers* | *Total Nr. of farmers growing hybrid* | *Total rice area (acre)* | *Percent with hybrid rice* | *Avg. area of a family growing hybrid (acre)* |
|---|---|---|---|---|---|---|
| **1** | Natore-1 | 230 | 230 | 368 | 75 | 1.20 |
| **2** | Natore-2 | 400 | 400 | 667 | 75 | 1.25 |
| **3** | Natore-3 | 400 | 400 | 2353 | 85 | 5.00 |
| **4** | Sirajganj | 300 | 300 | 1250 | 40 | 1.67 |
| **5** | Naogaon | 667 | 667 | 2667 | 75 | 3.00 |
| **6** | Gopalganj | 350 | 350 | 896 | 75 | 1.92 |
| **7** | Jessore | 131 | 131 | 131 | 60 | 0.60 |
| **8** | Jhenaidah | 120 | 120 | 267 | 45 | 1.00 |
| **9** | Gaibandha | 150 | 100 | 333 | 25 | 0.83 |
| **10** | Jamalpur | *8000 | 8000 | 7619 | 70 | 0.67 |
| **11** | Moulvibazar | 100 | 12 | 200 | 02 | 0.33 |
| **12** | Habiganj | 150 | 38 | 200 | 04 | 0.21 |

* Number of farmers in the surrounding villages of Melandah town

Saful's rice paddy with hybrid

Shaiful Islam a young farmer in Ghorshal village, of Jhenaidah sadar under Ghorshal union tells us how his experience influences the other farmers in his village to grow hybrid rice. It was in 2000 that Saiful started growing hybrid with a small amount of seed of Sonarbangla that he received from Agricultural Advisory Society (AAS). With that amount he planted one acre of land and was able to harvest 100 mounds of rice. For the first time he was surprised how a variety could produce such yield but interestingly no response from other farmers - still lot of doubt to their eyes! Next year he planted 2 acres and harvested 200 mounds. The villagers started moving. In 2002/3 Saiful planted 9 acres of lands along with 7/8 farmers of his village, each planting one acre. They all were surprised and overwhelmed by the harvest - not less than 100 mounds per acre. Currently all the farmers of Ghorshal with more than 120 families are fully engaged with hybrid rice. In addition, majority of farmers in 6 surrounding villages are also growing hybrids. They all are grateful to Saiful for his effort, particularly for helping them information with seeds and other technical support.

### 4.2.4 Total lands under hybrid rice in the country

Since there has been no solid data available regarding the areas it was too difficult to find the actual area brought under hybrid rice cultivation in whole Bangladesh. Nevertheless, our basis of calculation of the total area of hybrid rice was the amount of seeds sold by different companies. During individual interviews and focus group discussions majority of the farmers were found to use on an average 5 kg seeds to grow rice in one acre. In the current year, (2003/4) the amount of total sales of seeds of all the hybrids by different companies stands at 613.5 tons. Based on this amount the total area grown with hybrid comes to **122,700 acres.** The area last year was 67,300 acres. Please see all the details in the following table.

| *Year* | *Seed company* | *Variety* | *Seed sold (tons)* | *Seed rate (kg/acre)* | *Area coverage (acre)* |
|---|---|---|---|---|---|
| **2002/3** | Mallika Seed Company | Sonarbangla-1 | 125 | 5 | 25000 |
| | Supreme Seed com | Hira | 100 | 5 | 20000 |
| | Aftab Bahumukhi Farm Ltd. | | - | - | - |
| | Chens Crop- Science Bangladesh Ltd. | | - | - | - |
| | BADC | BRRI hybrid Dhan-1 | 7 | 5 | 1400 |
| | BRAC | GB-4, BRRI hybrid dhan-1 | 104.5 | 5 | 20900 |
| **Total** | | | **336.5** | | **67,300** |
| **2003/4** | Mallika Seed Company | Sonarbangla-1 | 150 | 5 | 30000 |
| | Supreme Seed com | Hira | 162 | 5 | 32400 |
| | Aftab Bahumukhi Farm Ltd. | Aftab LP-50 | 50 | 5 | 10000 |
| | Chens Crop- Science Bangladesh Ltd. | Richer-101 | 15 | 5 | 3000 |
| | BADC | BRRI hybrid Dhan-1 | 17 | 5 | 3400 |
| | BRAC | GB-4, BRRI hybrid dhan-1 | 219.5 | 5 | 43900 |
| **Total** | | | **613.5** | | **122,700** |

## *4.3 Seeds: supply, distribution and availability*

### 4.3.1 Status of the availability of hybrid seeds

The way hybrids are getting popular the availability of seeds would be an important factor towards it sustainability. Though, most of the farmers mentioned seeds were available, but the amount they said was not sufficient. They even did not have choice to buy a particular variety they like since the availability of seed was limited. Most of the seeds, at farm levels, are sold by local sub-dealers or agent who, purchase from companies' sole dealers or agents located mostly in the district towns. In addition, BRAC area offices located in the communities also sell seeds. Besides, BADC has some sale centers where BRRI hybrid seeds are sold.

The study team during its mission spoke with a number of dealers and sub-dealers about the availability of seeds of different varieties. They were mentioned the same thing. Many dealers told the study team that they even had not got half of what they demanded to the seed companies. Some dealers, nevertheless, explained that the seed companies were very cautious this year about the amount of supply since some of the dealers last year had to return some of the unsold seeds to their companies.

This makes an important problem to the availability of seeds. Since the seed companies cannot appropriately assess the market, particularly the demand of their variety, they don't want to make any risk. On the other hand company's suddenly changing a variety also creates problems among the farmers. During the field visits in every site, farmers were found to be mad about the earlier variety of Sonarbangla, which was a course variety. But this year's Sonarbangla was a fine variety. In many sites farmers complained about this. They indicate this a crucial problem of the seed supply and availability. For hybrid rice farmers have to be always driven by the seed companies instead them driven by the farmers.

The following table provides the specific status of availability of different varieties and their particular problems.

| *Sl* | *Site* | *Seed sources* | *Seed quality* | *Seed availability* |
|---|---|---|---|---|
| 1 | Natore-1 | BRAC, Dealer, Local agent. | Not uniform in flowering & plant height | Availability was sufficient |
| 2 | Natore-2 | Dealer | Good, GB-4 was mixed. | Availability was limited because high price & adulteration |
| 3 | Natore-3 | Dealer, BRAC | GB-4 was mixed & SB-1 was old & germination was low. | Artificial crisis is a problem. |
| 4 | Sirajganj | Dealer | Good but germination of SB-1 50% | High price, dealer isn't nearby. |
| 5 | Naogaon | Dealer | SB-1 germination was not so good. | Supply was limited. |
| 6 | Gopalganj | Dealer, Local agent | Hira, GB-4, SB-1 Germination was less | Availability was limited in both time& amount. |
| 7 | Jessore | BADC, BRAC, Local agent. | Good | Was available |
| 8 | Jhenaidah | AAS office | All seeds good, except SB-1 (less germination) | Good seed was not easily available. Old seed was sold. |
| 9 | Gaibandha | Dealer | Good | Supply was limited. |
| 10 | Jamalpur | Dealer | GB-4 & Hira had problems this year; mixed seed, plant height not uniform. | Seed was available but not adequate, not timely. |
| 11 | Moulvibazar | AAS office | Good | Very limited, seeds were supplied by AAS. |
| 12 | Habiganj | AAS office | Good | Very limited. Seeds were supplied by AAS. |

### 4.3.2 Seed prices and qualities

While the ordinary seed price was not problem to many farmers but some complained that during the peak period both the dealers and sub-dealers excessively raised the price. The normal prices of hybrid seeds were 170 - 200 taka per Kilogram, during the peak period, the price soared up to 350 taka. This indicates that there are serious problems in the honesty of the seed business. While taking this to dealers and sub-dealers, many of them complained that during the peak period of the demand, the seed companies bypassed them and directly sold to the local small dealers and sub-dealers. This has made an enormous problem to maintain the price. *However, the farmers mentioned, whatever were the cases, these are insincerity and dishonesty of the seed channel. This will continue to grow with the advancement of hybrid rice. Majority of the farmers requested to this team to seriously highlight this issue in the study report.*

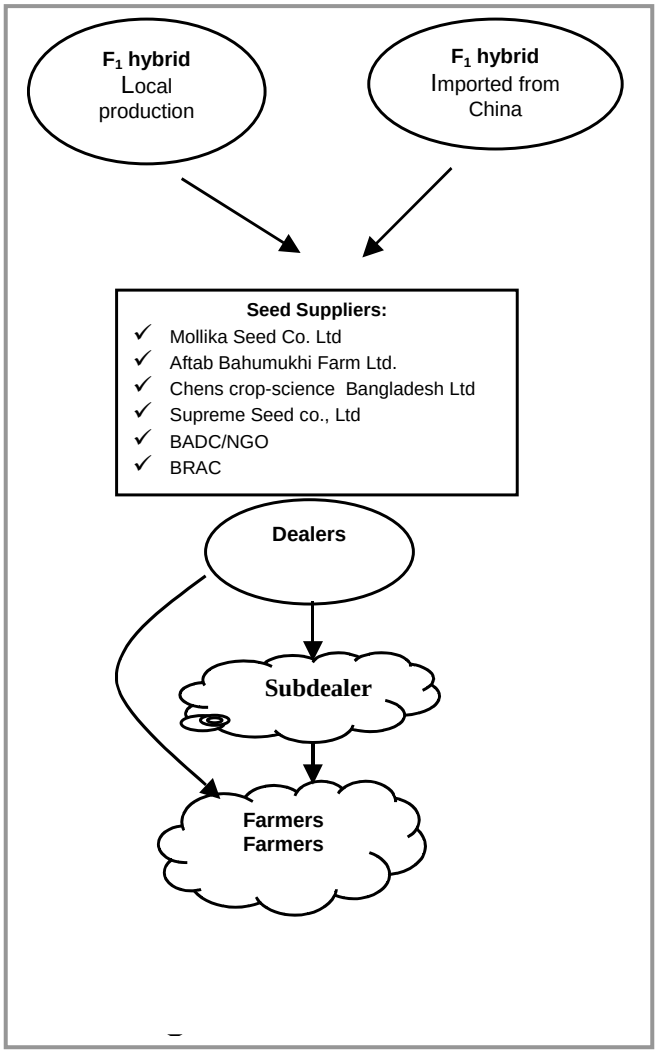
About the qualities many varieties have serious problem of germination. While the extent of this problem is not still very high but certainly this would make serious problem in future when the area of hybrid rice would significantly increase. From the above table in section 4.3.1, it is highly noted that most of the problems are associated with the old varieties such as Jagorani and

Sonarbangla. In addition to germination, the varieties have problems with flowering. Many farmers complained that the flowering of the varieties was not uniform. They called it a mixture of short and tall variety since they found some plants were tall and some short. When talking about this to the seed companies they mentioned this happened with the seeds of local productions due to some percent of cross-pollination. They said 2-3% mixture should not be a problem, while many farmers mentioned the mixture was more than that.

Farmers have also complained about the sale of old seed. They believe all those problems happened with the old stocks since with the new stocks, which were directly imported from China, they have not encountered any problems. When talking to BRAC about Jagoroni, they mentioned all the seeds of Jagoroni were produced in the country. So the problem was not part of the reason of local production, it was perhaps the problems of maintaining the quality or could be the old stock, which was not stored and maintained properly. For the new varieties farmer's impressions are that since the varieties are still new the companies are very sincere to attract the market therefore, there is no problem yet.

### 4.3.3 Seed companies, their supply and marketing network

Currently there are four seed companies such as Aftab Bahumukhi Farm, Mallika Seed Company, Supreme Seed Company, and Chens Crop-Science in association with Kustia Seed Store, and BRAC and BADC marketing all the hybrid seeds in the country. Among them BADC and BRAC don't import any F1 seed from abroad. BRAC imports only parent lines from China and produces F1 seeds in the country whereas, BADC receives parent lines from BRRI and produces F1 in the country. The other companies mostly import F1 seed from China. Some of them, however, have been trying to produce F1 seeds in the county since this year.




All the companies sell their seeds throughout the country with their own marketing network, which comprises a significant number of dealers located in the major towns of the potential hybrid sites. The dealers sell the seeds to small dealers or agents who directly sell to the farmers. In some areas the dealers also directly sells to the farmers where they have direct farmer network. BADC, nevertheless, sells through their own sale centers. In addition to an emerging dealer network most of the seeds of BRAC are sold through their area offices, which are mostly located in the Upazila towns.

### 4.3.4 Local capacity for seed production

Since farmers have already accepted the hybrids, its use would continue to grow based on the availability of quality seeds of their chosen varieties. Currently, the supply and distribution of hybrid seed has been mostly dominated by the import from China. For long-term sustainability, nonetheless, this could be a problem. The seed companies or the suppliers, therefore, are highly needed to attain the capacity of local production.

Although many believe it is easier to import than local production, some companies such as BRAC, Supreme Seed Company and Aftab Bahumukhi Farm have already started local production. This is of course a great sign. BRAC in 2002/3 produced 189 metric tons of Jagoroni seeds. This year (2003/4) their expected production is 140 tons. Since 2001 BRAC has not imported any hybrid seeds from abroad. In addition to Jagorani, BRAC also produced seeds of BRRI hybrid dhan-1. BRAC has their own seed production facilities in Joydepur. Similarly, along with the import, Aftab Bahumukhi Farm since this year has started seed production in around 10 hectares of land at Bajitpur in their own farm. They are expecting around 20 tons of harvest. Supreme Seed Company has also started seed production in Madhupur this year. BADC has been producing seeds of BRRI hybrid dhan-1.

| *Year* | *Seed company* | *Seed imported (tons)* | *Seed produced (tons)* | *Seed sold (tons)* | *Left-over (tons)* | *Management of the leftover* |
|---|---|---|---|---|---|---|
| **2002/3** | Mallika Seed Company | 125 | 0.5 | 125 | 1.3 | Stored in BADC controlled Godown |
| | Supreme Seed com. | 100 | 12 | 100 | 0 | |
| | Aftab Bahumukhi Farm Ltd. | - | - | - | - | - |
| | Chens Crop- Science Bangladesh Ltd. | - | - | - | - | - |
| | BADC | - | 17 | 7 | 0 | |
| | BRAC | - | GB-4: 189<br>BHD-1:1.7 | 101<br>3.5 | 28<br>8.5 | Stored in dehumidified store, capacity: 500 ton |
| **2003/4** | Mallika Seed Company | 150 | 15-20 (expected) | 150 | 0.5 | Stored in BADC controlled Godown |
| | Supreme Seed com | 150 | 55 | 162 | 0 | |
| | Aftab Bahumukhi Farm Ltd. | 51 | 15-20 (expected) | 50 | 1 | Stored in own company's facilities |
| | Chens Crop- Science Bangladesh Ltd. | 15 | 1 hac. under trial | 15 | - | Have their own conditioned store |
| | BADC | | 50 (expected) | 17 | 0 | |
| | BRAC | | 130-140 (expected) | GB-4: 217<br>BHD-1: 2.5 | 0<br>7.7 | Stored in dehumidified stores, capacity :500 ton |

But the major problem of local seed production is the availability of needed expertise. Almost all the companies and seed suppliers mentioned this is a great challenge for them since in this venture all of the companies except BRAC are new. BRAC in the meantime has gained significant experience. However, still they mentioned maintaining purity is a problem. The locally produced seeds contain 1-3% mixture due to cross-pollination, which they mentioned is not a big problem; overtime this percent could be significantly reduced. The other companies would also have the similar problems. In addition, many mentioned bringing synchronization in

flowering is a serious problem. One important reason of this is the low yields of seeds. This is a general problem for all the seed companies and seed suppliers. Till today they cannot exceed 2 tons yields per hectare.

Another important aspect of seed production is the processing and storage facilities. Except BRAC and BADC no other companies or suppliers have independent processing and storage facilities. As the locally produced seeds are sold in the next year there is a greater need of independent processing facilities. Besides, leftover seeds are needed to be properly stored. Currently those companies who have no storage facilities store the leftover seeds in BADC facilities. Overtime when the demand of hybrid seeds would be enhanced finding such facilities with other companies would be very difficult.

### 4.3.5 The overall challenges with seeds

Based on what has been happening in the field, the growing challenge of seeds, as the demand for hybrids are sharply expanding, would be to maintain a smooth supply as per the actual demand of farmers. Most of the seed companies don't maintain any market survey prior to produce or import the seeds. For many the amounts of seeds they produce or import are determined by two important factors; one is the amount of sale in the previous year and the other is their financial capacity. Although, this has put the companies in safe side but for farmers this is a big problem, since in every site during the field interviews many of them mentioned that the supply of the seeds was not adequate. The seed companies, however, mentioned the different thing. According to them, it is the government who controls the volume of import. No company can import any amount unless the concerned authority of the government approves it.

With the progress of hybrids the demands of seeds of particular varieties would be always up and down based on the performance of the varieties. Therefore, the seed suppliers need to carefully assess this particular situation. To maintain a smooth supply, the suppliers, should have adequate capacity to produce or import more than the actual demands. This means they have to have enough capacities and appropriate facilities to store some of the unsold seeds. Unfortunately, for small seed companies all these are a great challenge.

Maintaining quality is another important challenge with seeds. In many areas farmers have experienced varieties of problem with some varieties. Among them low germination, and impurity of the variety were some common problems. In the national Dailies, there were several news about how farmers in some areas have lost their crops due to the impurities of some hybrid varieties. Most of the seed suppliers while talking with them have mentioned that they are very serious about the quality of their varieties. Before selling any seed, they organize tests; if they are satisfied with the tests only then they sell the seeds. About impurity as mentioned earlier, they said 1-3% mixture is not a serious problem. Although, the gravity of all these problems are still very low, this can expand very rapidly if the companies are not very serious to contain them at this stage as in Bangladesh whether public or private in seed trading honesty is a big problem.

Controlling seed price is another but a crucial challenge. Until today majority of the farmers did not find any problem with the existing retail prices of different varieties. But as the areas of hybrids continue to grow, the price needs to be very competitive. Unfortunately, in Bangladesh the private business is the absolute monopoly of few companies. Apparently, there has been no control over them. They themselves are the ones to determine the price. They have no regret over the excessive charges the customers usually pay for their products and services. An

apparent example is the mobile telephone companies in Bangladesh. The call charge with each of the companies is five to six times higher than that of other companies operating in the neighborhood of Bangladesh.

Currently, the average retail price of hybrid seeds sold by private companies and suppliers is around 200tk per kg, whereas the price of BADC seed (BRRI hybrid dhan-1) is 100 tk per kg, which is already half of the price of the seed companies. However, at this stage this exorbitant price of the private seed companies can be justified in a way that a number of years in the past many of them were completely lost dealing with some Indian hybrid varieties. But in the future the price needs to be adjusted to make it very competitive, as the imported price is not that much high, which is little over than a US Dollar per kg. This, however, could be great challenge for many seed companies.

To maintain a balance between import, production and supply is an important aspect to attain sustainability in seed business as well as the availability of seeds across the country. To acquire such balance adequate technical and financial capacities as well as necessary infrastructures are greatly needed. Nonetheless, for many companies attaining such capacities is a great problem. Since seed is a very delicate item and it involves many risks, for the small companies, larger investment is quite risky unless there is adequate financial support from elsewhere. For example local seed production is always risky since the climate during pollination and harvesting period in Bangladesh is not very stable. Technical capacities are always important to make sure the seeds that are locally produced are of good and pure quality. Attaining such capacity for the small companies is also a challenge. For them import is rather safer than local production. However, for greater sustainability of the availability of seeds there is a need for local production. Adequate infrastructure is very important for seed processing, and storage. This again involves huge investment, which for the small companies is a great challenge.

# 5 Conclusion

Considering the average yields obtained per acre, overall production per farm family, subsequent incomes and enhanced rice provision ability attained by a family and the comparative cost and return analysis between hybrids and non-hybrid, it is very obvious to note that the farmers are gradually shifting from non-hybrids to hybrids.

Irrespective of varieties the comparative yield advantages of hybrids are found significantly higher, which is the most important reason why most of the farmers are making this shift. As a result, the area under hybrids continues to increase based on farmer's years of experiences with the hybrids. Although, at the initial stage there were some speculations that hybrid would

perform better only in high fertile soils, but the overall findings of the study indicate that they are doing better also in moderately fertile soils with single to double crops per year.

It needs to be mention here that although hybrids were introduced in 1997, but the experience until 2001 were really very bad with an exception of a Chinese variety named Sonarbangla-1. The performances of all other varieties originated from India were found very low. Since then farmers were very scared of hybrids as they incurred serious loss with those Indian varieties. The private seed companies along with BRAC then moved their attention to China and brought some Chinese varieties. The year 2001/2 was a serious year for them, as they have to struggle a lot with the push sales of those Chinese varieties to gain for the first time spontaneous response of farmers about hybrid varieties.

Year 2002/3 was the real beginning of hybrids with farmers planting in a sizeable area across the country, which was around **67,300 acres**. The area this year (2003/4) has expanded to **122,700 acres**. Currently there are five Chinese varieties widely grown across the country based on the availability of seeds of the varieties. All these varieties are performing very well. Their average yields are recorded as 10 tons per hectare. The added yields have significantly contributed to enhance farmers overall incomes and rice provision abilities. Along with the Chinese varieties, large scale trials have been going on with another variety released by Bangladesh Rice Research Institute. The growth and color of the variety was found very excellent and attractive to many farmers. However, its long duration and higher percentage of unfilled grains became important impediment towards it compatibility with those Chinese varieties. The variety therefore needs further research on it.

Based on comparative cost and return analysis, however, the hybrids are found to have some additional costs associated with the use of some extra chemical fertilizers and insecticides. Farmers mentioned the hybrids need more fertilizers than non-hybrids and they have comparatively high insect infestations. This is, however, a general problem in chemical farming. Now the introduction of hybrids is going to add on the problem.

Though, farmers, at this stage, are not so serious about the gravity of the problem, as they are overwhelmed with the added amount of rice yields, but efforts are needed to minimize the chemical use. Otherwise for long term, the expansion of the hybrid rice would face a serious problem. In this context, the experiences of farmers in Jamalpur who participated in IPM Farmer Field School are highly remarkable as they were able to grow hybrids without using any insecticides. They could even manage to bring down the production cost lower than the non-hybrids.

The sustainability of the hybrid varieties is also dependent on the supply and availability of quality seeds at farm level. At this stage, although, there has been no major problem seriously hindering the supply and availability of hybrid seeds but in future when the demands of hybrids would be gradually higher, serious problems can occur unless attempts are made now to handle those small problems that farmers have mentioned with the study team, specifically about the seed quality and purity of some particular varieties.

The supply of hybrid seeds all across the country started with absolute import from China. But some companies have already started local productions, among them BRAC has made a significant breakthrough. This is, of course, a great sign, nevertheless, the challenge towards the future supply and availability of hybrid seeds would be the limited technical expertise and capacity for local seed production, inadequate infrastructure needed for seed processing and storage, lack of enough financial resources, particularly for the small companies.

# 6 Recommendations

**Market survey:** Based on the status of the existing levels of availability of hybrid seeds, the supply of none of the variety was found adequate by the farmers. Part of the reason was that seed suppliers and companies were not able to assess the actual demand of their variety. Therefore, there is a greater need by each of the companies or suppliers to be involved in systematic market survey to determine the actual demand of a particular variety, while making adequate preparations well ahead of time to seek government approval of for the said amount identified in the survey.

**Ensuring full demand with quality:** As hybrids are making breakthrough the demands of seeds for next years would continue to enhance. Based on what has been observed by the study team while discussing with the farmers and the seed dealers the demands of seeds for the next year are expected to be more than double. To meet such enormous demands the seed companies need to make well preparation to arrange the supply in time. Availability of seed in time was also a problem this year, mentioned by many farmers.

Besides, as there has been report of impurity and low percentage of germination of some particular varieties, the respected companies of those varieties need to investigate the actual nature and extent of the problems so that they can identify the appropriate reasons of the problems. This would largely help to prevent any such problems in future.

**Price and import policy:** About price there is a greater need of some concrete policies to determine the wholesale and retail price of the hybrid seeds. Currently, there has been a big gap between the price of seeds sold by BADC and other private seed companies. Policies are also needed among the seed companies how to contain the price during peak demands of seeds in the field as the exorbitant price hike during the peak period was a serious problem this year.

Since government largely controls the import of hybrid seeds, there needs to be certain policies to determine the quantity of import based on the actual demand of seeds by farmers. As the demands of hybrid seeds are sharply increasing, the need of such policy is very urgent. In this context, the seed companies putting together the actual demands of their seeds can press the concern authorities of the government to bring some policy implications to make a balance between import and local production of hybrid seeds.

**Emphasize local seed production:** The current supply and marketing of hybrid seeds are exclusively dominated by imports. While this could be justified as the current years are the initial years of hybrids for many companies. However, to attain greater sustainability and to maintain a steady supply there has to be greater emphasis to produce locally the larger part of the demands of most seeds. Like what BRAC has done could be a model for the other seed companies. BRAC is no longer importing any F1 hybrid from abroad. Although, some companies have already started the production of hybrid in small areas, the effort needs to be continued while gradually expanding the areas for larger production.

**BADC involving in large-scale seed production and marketing:** BADC has been pioneered in seed production in Bangladesh with lot of good expertise and abundant facilities of seed processing and storage. Currently, it has been involved in $F_1$ seed production of BRRI hybrid dhan-1 in a limited scale with technical assistance from BRRI. With this effort, even then, most its facilities and expertise have remained very much underutilized. There are huge potentials to

maximize the use of all these facilities, if BADC is involved in large scale seed production, particularly with all the currently available hybrid varieties in Bangladesh.

In this context the recent remarks of Finance and Planning Minister of the government of Bangladesh is highly encouraging. He has already asked BADC in a meeting with the representatives of the Ministry of Agriculture on May 11, 2004, to restructure its operation for seeds and irrigation. If all this happens, BADC can directly import the parent lines of all the currently successful hybrid varieties along with some more new lines from China and can produce $F_1$ seeds in its own farms. This would highly bring fair competitions among hybrid seeds, and would ultimately help to contain the market price within the limits of farmers as both public and private sectors would run together.

In addition, BADC can try to bring directly some B-lines from China. At this stage, although, it might be difficult for BADC alone, but the issue could be brought to the concerned authorities of the government to discuss the feasibility of making some special collaboration with Chinese government. In near future, if such collaboration can happen it would be a remarkable achievement to attain some degree of sustainability of hybrid seeds in the country.

**BRRI-Chinese Hybrid Institutions joint collaboration:** Bangladesh Rice Research Institute can also undertake collaborative research with Chinese Institutions involving research on hybrid rice. Since China is the pioneer in hybrid technologies, collaborative research program between China and Bangladesh would benefit more to Bangladesh to gain necessary expertise to develop locally appropriate hybrid varieties. It needs to be mentioned here that BRRI with the help of IRRI has already made a breakthrough to develop the first hybrid variety in Bangladesh. While this collaboration can go parallel, the new expertise with Chinese assistance can further improve the capacity of BRRI scientist to develop more promising varieties in Bangladesh.