

## Viability Status of Ancient Indigenous Paddy (*Oryza sativa* L.) Varieties in Malda and Neighbouring Districts of West Bengal, India

Anil Chandra Sarkar<sup>1\*</sup> and Somnath Roy<sup>2</sup>

<sup>1</sup>Pachim Banga Vigyan Mancha, Malda, West Bengal, India

<sup>2</sup>Entomology Research Unit, Department of Zoology, University of North Bengal, Darjeeling, West Bengal (734 013), India

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### Correspondence to

\*E-mail: acs\_malda@rediffmail.com

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### Abstract

From time immemorial, in India, a large number of indigenous paddy (*Oryza sativa* L.) varieties have been cultivated as India is one of the centres of origin of paddy. But at the advent of green revolution in the middle of the last century (1960s), devastation comes down upon these indigenous varieties. Cultivators refused to cultivate these varieties due to its low yield potentiality and the number of indigenous paddy variety declined down day by day. A five years (2006-2011) survey was conducted to study and collect information and samples; classified as per their availability and acceptability to farmers. Tulaippanji, Gobindabhog, Kataribhog, Madhumalati etc. are still cultivated in small area. Kanakchur, Lalbona, Kalabona, Sete are on extinction and Sadabona, Digha, Boali, Gagoli, Barakalam are endangered. The causes of such variety status and remedial to sustain in our agriculture have also been detected. The cultivators should be convinced and the common people should be approached for consumption of anti-diabetic, anti-oxidant pectin rich indigenous rice which is very necessary for good health. Data were further analyzed and significances of indigenous paddy varieties were highlighted.

### 1. Introduction

Rice, the staple food for more than 70% people of Indians, plays a pivotal role in Indian agriculture (Subudhi, 2008). It is one of the most valuable crops among the food grains of India and covers about 25% of the gross sown area (Singh, 1974). Moreover, more than three billion people throughout the world and particularly in South East Asia depend on rice (Kulkarni et al., 2010). The Indians have a long tradition of rice cultivation. Their country is supposed to be its land of origin, due to the maximum genetic diversity of this crop in the region. In fact, there were about 30,000 types of indigenous rice cultivars available in India (Maheshwari, 1987), possessing many interesting and beneficial characteristics befitting the diverse geo-climatic conditions of this land. Yet, today only about 8000 botanically different varieties of rice are in existence in the whole world, out of which more than 4000 varieties were identified in India (Bajpai, 2010; Yadugiri, 2012).

West Bengal, in Eastern India, harbours a rich diversity of rice varieties and is one of the premier rice growing states in the country. West Bengal is the largest producer, contributing 16.5% of total production, followed by Andhra Pradesh,

Uttar Pradesh, and Punjab, which contribute around 12% and 11%, each (TE 2008/09) (FAO, 2009). The farmers of West Bengal have been cultivating traditional varieties of rice from time immemorial. Their methods have been developed by continuous practice and trial. The knowledge acquired through long experience was transmitted from generation to generation orally in the form of popular folklore and folk sayings (Mohanty and Rout, 2001; Mohanty and Dash 2008; Mohanty et al., 2011).

It has been estimated that about 400,000 varieties of rice existed in India during the Vedic period. Over the last three decades, there has been a progressive decline in the number of rice varieties in India. Thirty thousand indigenous varieties of rice grew in India prior to Green revolution. Today, there not more than fifty are widely known and cultivated (Vijayalashmi and Nambi, 2005; Sarkar et al., 2008). But even more dramatic changes in Indian agriculture have come in the last few decades. With the advent of the Green Revolution in the mid-1960s, a handful of laboratory generated varieties have been promoted over vast areas, particularly in the plains of Northern India.

Agricultural schemes have also attempted to homogenise

growing conditions, for example by surface irrigation, so that where there was earlier a complex mosaic of diverse micro-habitats, there are now immense stretches of uniform agricultural landscape. Inter-cropping is replaced by mono-cropping, a wide diversity of species is replaced by a handful of profitable ones, and genetic diversity within the same crop species is replaced by a narrow genetic range of financially lucrative varieties. The net effect of these and other practices has been a massive displacement of indigenous crop diversity, such that in the case of most crops now, the majority of indigenous cultivars are no longer grown and became extinct or are now on the verge of extinction (Conway, 2001). With the advent of hybrid revolution in agriculture during the 1960s-70s, the farmers welcomed and gladly accepted the hybrid seeds with a higher yield. As a result, the local landraces and specifically the traditional rice varieties have lost their acceptability and were replaced by new varieties, with high yielding characters.

Some of the indigenous rice cultivars became extinct, save a few in some interior places and tribal pockets of the country. Those local landraces of rice, however, regained their importance in the last decade of the 20<sup>th</sup> century, when the hybrid seeds failed to give the desired result being attacked by different infectious pests, diseases and other climatic hazards.

The collection, conservation and maintenance of traditional varieties, then, became inevitable, so that their traits, like resistance to specific pests, diseases, salt and stress tolerance or erratic climate, could be saved and utilized in the future, for developing suitable new varieties. The National Bureau of Plant genetic resources (NBPGR), the premier central organization for conservation of germplasm, in collaboration with IBPGR are taking steps to collect and conserve those genes (Mohanty et al., 2011). But all the interior localities and rural pockets of the state, where tribal and rural folk still cultivate some of the landrace types, are not included in that program. In this context, there are little and no reports from Malda and neighbouring districts (Uttar Dinajpur and Dakshin Dinajpur) of West Bengal. The present study was carried out in rural areas of the district, to survey, explore and document the existence of such indigenous rice varieties and there probable cause of extinction.

## 2. Materials and Methods

Malda district (87°48'-88°33'30" E and 24°3'-25° 32'33" N) is situated in the gangetic basin of West Bengal and covers an area of 3455 km<sup>2</sup>, with a population of 32,90,160 (2001 Census). Malda district is bounded on the north by the Purnea and Uttar Dinajpur- districts, on the east by Dakshin Dinajpur and Rajsahi on the south by Murshidabad, and on the West by Murshidabad, the Santal Parganas and Purnea. Area of cultivated land of

Malda district is 281208 ha (2009), annual rainfall is 149.8 cm and the range of temperature varied from 9°C to 43°C. The year is divided into three usual seasons. The rains commence about the middle of June and continue till October. The middle of July to the middle of September being the period of greatest rainfall. The cold season lasts from the beginning of November till the middle of the February, in December and January the cold weather disappears with the coming of the paschima or west winds which are usual in March and April. The Malda district is divided into three natural divisions such as *Barind*: the eastern part of Mahananda river. Its characteristic feature is the relatively high undulating land of the red clay soil of the old alluvium. West of the Mahananda the district is again divided into two well defined parts by Kalindri river flowing west and east from the Ganges, North of Kalindri is the *Tal* land and south of Kalindri the continuous line of islands and accretions formed in the bed of Ganges by its ever changing currents and known as *Diara*. The *Tal* and the *Diara* are of land area relatively low land, composed of new alluvial soil. The adjacent two districts Dakshin Dinajpur and Uttar Dinajpur are also of more or less same physiographic condition and soil texture.

The people of Malda district are cultivating the traditional variety of paddy from times immemorial. With the introduction of mechanized agriculture and high yielding variety of hybrid seeds there have been changes in farming patterns. But a few rural and tribal farmers in some interior pockets are still adopting the traditional method, using the indigenous rice varieties inherited from their ancestors' centuries ago.

Our study was conducted for a period of five years (from 2007 to 2011) covering all of the blocks of Malda, Uttar Dinajpur and Dakshin Dinajpur districts. The information, collected from farmers of different villages by a questionnaire regarding name of variety, area of cultivation in different years, yield potentiality, problems of cultivation, market value, market demand. Regular visits are made to these fields farmers for documentation of technical know how of farming and the characteristics of different varieties are also systematically documented.

## 3. Results and Discussion

In this biodiversity survey, the details of local name of the rice variety, characteristic of the variety and area of cultivation, utilization importance, yield, economical value and cultural practices have been summarized in Table 1 and Figure 1. Photographs of the indigenous varieties are shown in Plate 1 and 2. Throughout the surveys, samples were strictly organized according to the local communities' classification and maintenance. This is crucial in assessing their varied management and use patterns. Results of the



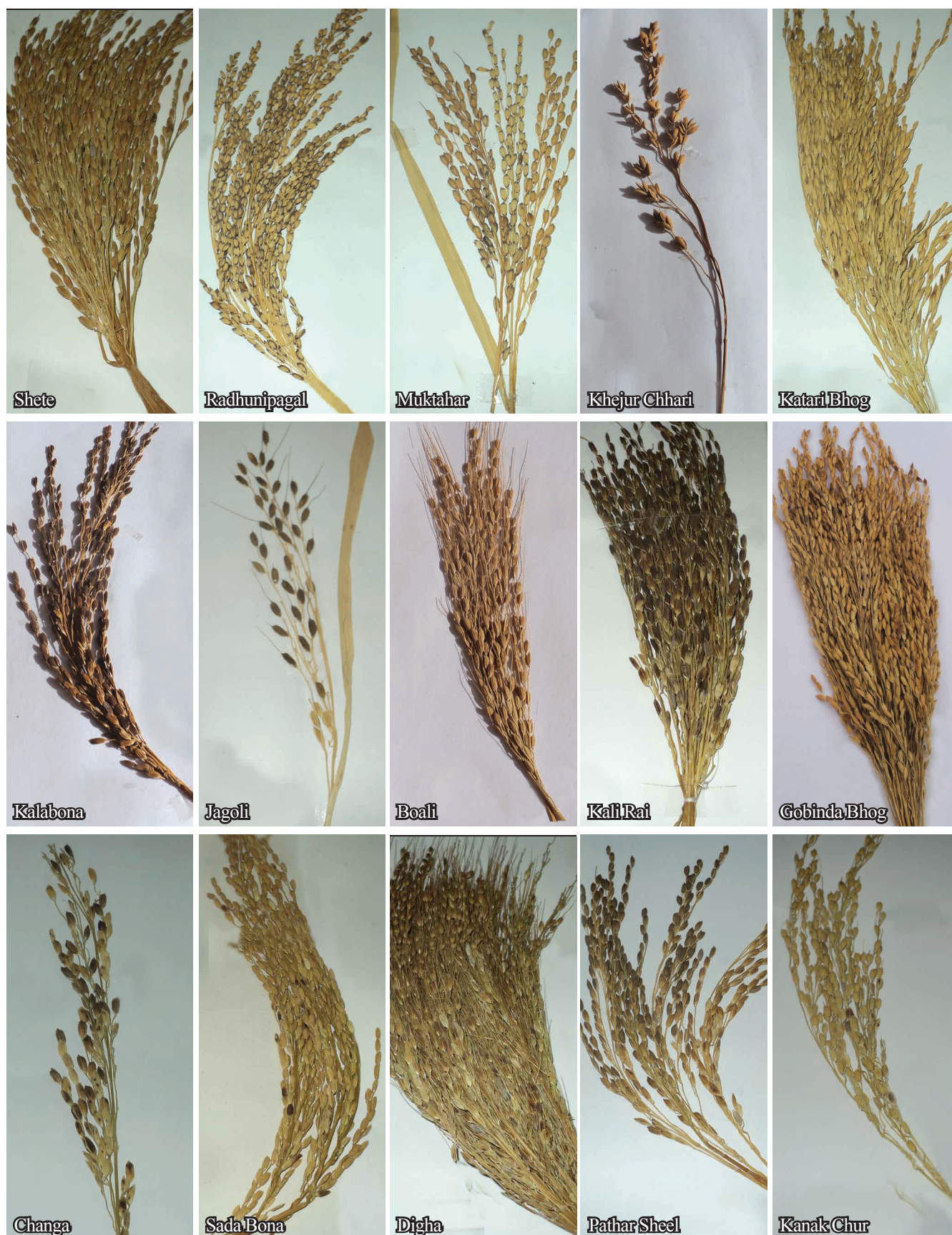


Plate 1: Photographs of the indigenous varieties



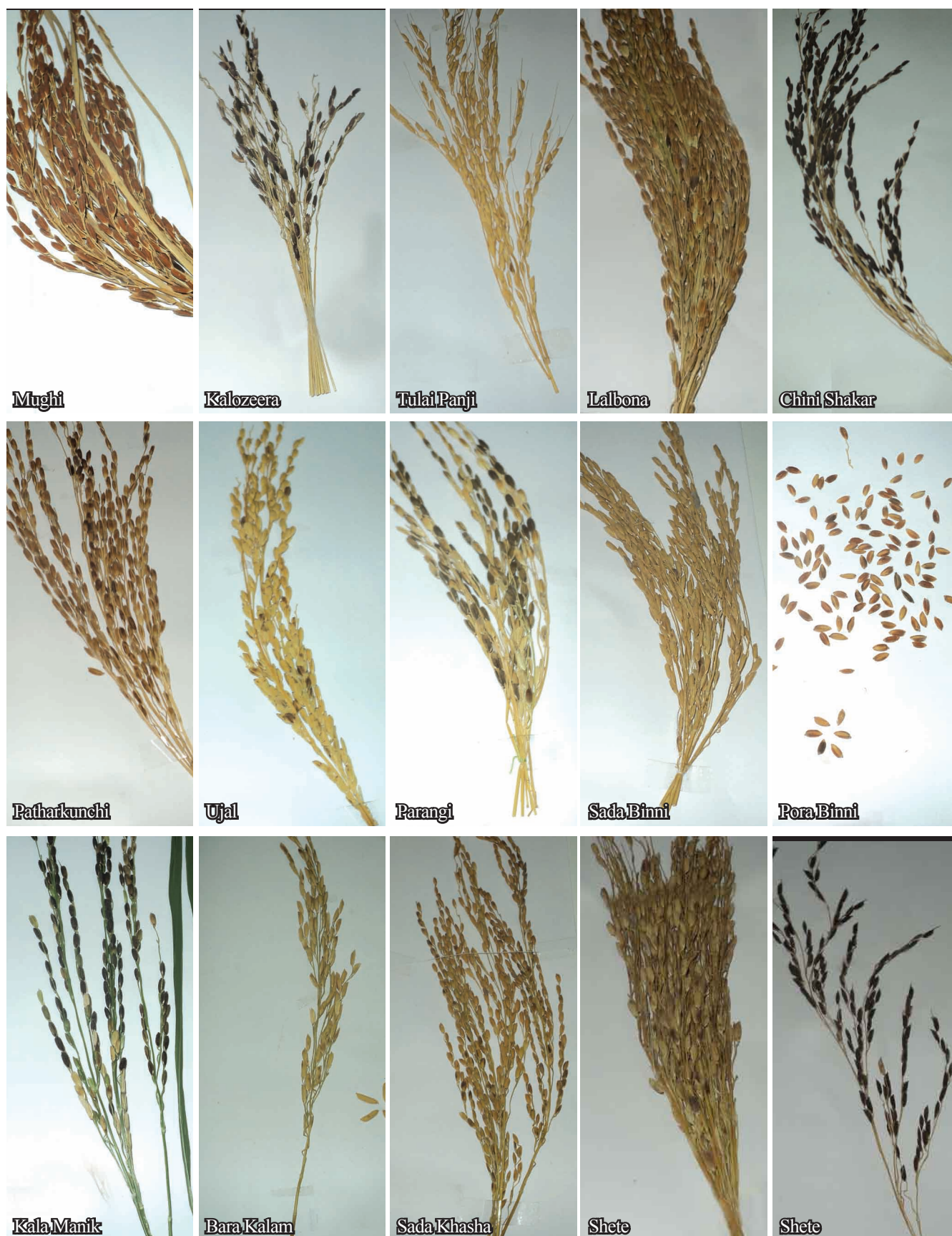


Plate 2: Photographs of the indigenous varieties

Table 1: Survey on biodiversity of indigenous paddy varieties

| Sr. No. | Local name of the variety and season | Characteristic of the variety and area of cultivation                                                                                                                                                                               | Utilization importance                                                                                                                                                               | Yield and economical value                                                                                                                                                             | Cultural practice                                                                                                                                                                                                               |
|---------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | Radhuni-pagal (aman)                 | It is cultivated in the high land; Smaller grains. Highly scented, sweet to taste, delicious and nutritious, easy digestible. Grain colour: brownish white and terminal end black                                                   | It is usually used as unboiled rice for preparation of <i>payesh</i> , fried rice, and <i>polao</i> .                                                                                | Average yield is approximately 10-12 q ha <sup>-1</sup> . Market value ₹ 1700-1900 q <sup>-1</sup>                                                                                     | Cultivate in the middle of July and harvest in the month of early December. Cropping in the highland with out chemical fertilizer and pesticide and depend on rain water.                                                       |
| 2.      | Pora Binni (aman)                    | It is cultivated in the high land. Rich in pectin; semi erect stem. Grain colour: golden and terminal end blackish brown.                                                                                                           | It has a very utilization importance for its vary famous fried grains named <i>Binni Khoi</i> and pectin.                                                                            | Average yield is about 24 q ha <sup>-1</sup> . Market value ₹ 2500 q <sup>-1</sup> and market value of <i>Binni Khoi</i> ₹ 6000 q <sup>-1</sup> . Heavy demand but limited production. | Cultivated in the middle of the July by plantation and harvest in the 2 <sup>nd</sup> week of December. No need of chemical fertilizer and pesticide.                                                                           |
| 3.      | Chini Shakar (aman)                  | This variety is a sophisticated; sweet taste; scented soft and easy digestible, delicious and nutritious. Grain colour: black, small grain.                                                                                         | It takes the lead by its Royal hungering smell and power of nutrition and deliciousness. It is used as special food, <i>polao</i> , <i>payesh</i> , fried rice and flatten rice etc. | Average yield is about 18-20 q ha <sup>-1</sup> . Market value ₹ 2000 q <sup>-1</sup>                                                                                                  | Cultivated in the middle of the June by planting and harvest in the 1 <sup>st</sup> to 2 <sup>nd</sup> week of December. No need of chemical fertilizer and pesticide.                                                          |
| 4.      | Digha (aman)                         | Own variety large grain, sweet taste; mild scent; Drought and water resistant (it can resist about 10-15 ft deep water). Cultivated in the low land by hand sowing. Long and lying stem. Grain colour: golden yellow, white stripe. | Used as regular diet to general people. Puffed rice, fried grains ( <i>Khoi</i> ) and flatten rice prepared from the variety.                                                        | Average yield is near about 30 q ha <sup>-1</sup> . Market value ₹ 1000-1100 q <sup>-1</sup>                                                                                           | Cultivate by seeding in the 2 <sup>nd</sup> to 3 <sup>rd</sup> week of May and harvest in the middle of December. No need of pesticide.                                                                                         |
| 5.      | Gobinda Bhog (aman)                  | This variety is very fine quality rice, highly scented, sweet to taste, delicious and nutritious, easy digestible. Grain colour: whitish yellow.                                                                                    | It is usually used as boiled rice for preparation of <i>payesh</i> , fried rice, and <i>polao</i> .                                                                                  | Average yield is approximately 20-22 q ha <sup>-1</sup> . Market value ₹ 2700-2900 q <sup>-1</sup>                                                                                     | Cultivate in the middle of July and harvest in the month of early December. Cropping in the highland with out chemical fertilizer and pesticide, depend on rain water.                                                          |
| 6.      | Indra Shal (aman)                    | Comparatively large grain, sweet taste, ideal for daily diet, nutritious, delicious, mild scent. Cultivate in the high land in Malda. Grain colour: golden yellow.                                                                  | It is usually used as boiled rice, flatten rice, home made cake etc. Husk is used for extraction of bran oil.                                                                        | Average yield is about 30 q ha <sup>-1</sup> . Market value ₹ 1000-1200 q <sup>-1</sup>                                                                                                | Cultivate in the high land by planting, in the 3 <sup>rd</sup> week of June to 2 <sup>nd</sup> week of July and harvest in the 4 <sup>th</sup> week of November to 1 <sup>st</sup> week of December. No need to pesticide used. |

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| 7.  | Kalabona (aman)      | Drought and water resistant (it can resist about 12' deep water); cultivated in the low land by seeding. Long lying stem.<br>Grain colour: pale black.            | Course grains, but sweet taste cooked rice emits a sweet hungering smell, pectinous. Puffed rice, fried grains (Khoi) prepared from the variety.                            | Average yield is about 30 q ha <sup>-1</sup> .<br>Value more or less ₹ 1000 q <sup>-1</sup>                                     | Cultivated in the middle of May, harvested in the middle of December.                                                                                                                               |
| 8.  | Kali Rai (aman)      | Long term variety; water resistant (it can resist about 15' deep water); drought resistant; cultivated in the low land.<br>Grain colour: black brown.             | It has a great utilizational importance as common food grains of common people; sweet taste; easy digestible; pectinous; , use as common food, puffed rice, flatten rice.   | Average yield is about 30 q ha <sup>-1</sup> .<br>Value ₹ 900-1000 q <sup>-1</sup>                                              | Cultivation done by sowing seed in the middle of the May, harvested in the 2 <sup>nd</sup> and 3 <sup>rd</sup> week of December, need 230-240 days to harvest.                                      |
| 9.  | Kalozeera (aman)     | Super quality rice, Cultivated in the high land of Barind area, Malda.<br>Grain colour: total deep black.                                                         | Great utilizational importance, polao, fried rice, payesh, and flatten rice are prepared, very delicious and easy digestible.                                               | Average yield is about 16-18 q ha <sup>-1</sup> .<br>Value ₹1500-2000 q <sup>-1</sup> .<br>Heavy demand among the local people. | Cultivation done by plantation in the middle of the June, harvested in the middle of December. Chemical fertilizer not require, depend on rain water.                                               |
| 10. | Kanak Chur (aman)    | Own variety; erect stem; cultivated in transit land of <i>Barendra Bhumi</i> i.e. <i>barind</i> .<br>Grain colour: offwhite.                                      | It has a great utilization value as fried grain for preparation of very famous sweet the "Moya of Jaynagar" of Uttar 24 parganas, West Bengal.                              | Average yield is about 24 q ha <sup>-1</sup> . Market value ₹ 1700-2000 q <sup>-1</sup>                                         | Cultivate in the 1 <sup>st</sup> to 2 <sup>nd</sup> week of August and harvest in the 2 <sup>nd</sup> to 3 <sup>rd</sup> week of December. No need to pesticide used.                               |
| 11. | Kartick Shal (aman)  | Cultivated in the barind region of Malda, very sweet, it has heavy demand as staple food in this area.<br>Grain colour: pale golden.                              | It is very delicious and full of vitamin-"A". it has a great demand in market.                                                                                              | Average yield is about 25 q ha <sup>-1</sup> . Market value ₹ 1400 q <sup>-1</sup> .                                            | It is an early variety cultivated by plantation in the 2 <sup>nd</sup> week of June and harvested in the 2 <sup>nd</sup> to 3 <sup>rd</sup> week of November.                                       |
| 12. | Katari Bhog (aman)   | This variety is fine quality rice, scented, and sweet to taste; nutritious, delicious. Cultivate in the high land in Malda. Grain colour: grayish white.          | This variety is used as different food items such as <i>polao</i> , fried rice, <i>biriani</i> , <i>payesh</i> , Used as regular diet to general people and easy to digest. | Average yield is near about 22-24 q ha <sup>-1</sup> .<br>Market value ₹ 1500-1600 q <sup>-1</sup> .                            | Cultivate in the 2 <sup>nd</sup> to 3 <sup>rd</sup> week of August and harvest in the 1 <sup>st</sup> to 2 <sup>nd</sup> week of December. No need to pesticide used, depend on natural rain water. |
| 13. | Khejur Chhari (aman) | Grains are inserted in cluster in the spike, coarse grains but sweet to taste. Cultivated in transit land of <i>Barendra Bhumi</i> . Grain colour: grayish white. | It is very ideal for puffed rice, boiled rice, flatten rice.                                                                                                                | Average yield is about 25 q ha <sup>-1</sup> . Market value ₹ 1000 q <sup>-1</sup> .                                            | Cultivated in the middle of the July by plantation and harvest in the 2 <sup>nd</sup> week of December. No need of chemical fertilizer and pesticide.                                               |
| 14. | Lalbona (aman)       | Drought and water resistant (it can resist about 12 ft deep water); cultivated in the low land.<br>Grain colour: golden red.                                      | Course grains, but sweet taste cooked rice emits a sweet hungering smell, pectinous. Puffed rice, fried grains (Khoi) prepared from the variety.                            | Average yield is about 30 q ha <sup>-1</sup> .<br>Value more or less ₹ 1000 q <sup>-1</sup> .                                   | Cultivated in the middle of May, harvested in the middle of December.                                                                                                                               |

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| 15. | Laxmi Digha (aman)   | Own variety; Water and drought resistant, cultivated in the low land. Grain colour: pale golden.                                                                                                 | Sweet to taste, beside this, puffed rice, home cake; flatten rice also made from it.                                                               | Average yield is about 30 q ha <sup>-1</sup> . Market value ₹ 1000 q <sup>-1</sup> .                                   | Cultivate by seeding in the 2 <sup>nd</sup> to 3 <sup>rd</sup> week of May and harvest in the middle of December. No need of pesticide.                                                                                         |
| 16. | Mughi (aman)         | Very sweet taste; boiled rice slightly yellowish in colour. Cultivated in highland of <i>Barendra bhumi</i> . Medium quality rice. Grain colour: Deep golden.                                    | It is used mainly as staple food in the “Barind” region, beside this, puffed rice, home cake; flatten rice also made from it.                      | Average yield is about 25 q ha <sup>-1</sup> . Market value ₹ 1200 q <sup>-1</sup> .                                   | Cultivated in the middle of the July by plantation and harvest in the 2 <sup>nd</sup> week of December. No need of chemical fertilizer and pesticide.                                                                           |
| 17. | Muktahar (aush)      | Short durational; early variety; water tolerant; Coarse grains but sweet to taste. Cultivated in Gangetic plains in Malda (low land) Grain colour: grayish white and terminal end black.         | Coarse grains, sweet taste; very fine quality puffed rice is prepared from this variety.                                                           | Average yield is about 20 q ha <sup>-1</sup> . Value ₹ 900-1000 q <sup>-1</sup> .                                      | Cultivation done by sowing seed in the middle of the May, harvested in the middle July, 75-80 days require for ripping                                                                                                          |
| 18. | Nagra Kalam (aman)   | Cultivated in the high land of Barind area, Malda. Long grain; semi erect stem. Grain colour: off-white.                                                                                         | Quality rice for the middle class people. Delicious; puffed rice, flatten rice, home cake, fried grains ( <i>Khoi</i> ) prepared from the variety. | Average yield is about 30 q ha <sup>-1</sup> . Value ₹ 1000-1500 q <sup>-1</sup> . Good demand among the local people. | Cultivation by plantation, 2 <sup>nd</sup> -3 <sup>rd</sup> week of the June, harvested in the middle of December. Chemical fertilizer not require, depend on rain water.                                                       |
| 19. | Pathar Sheel (aman)  | Cultivated in the semi low land. It can resist 5-6 ft deep water; erect; Barind. Grain colour: blackish brown.                                                                                   | Coarse grains very sweet to taste, ideal for common food to common people.                                                                         | Average yield is about 30 q ha <sup>-1</sup> . Market value ₹ 1200 q <sup>-1</sup> .                                   |                                                                                                                                                                                                                                 |
| 20. | Pathar-kunchi (aman) | It is a medium quality rice, medium size grain, sweet taste, delicious and nutritious, easy digestible. Grain colour: golden yellow.                                                             | It is used as boiled rice for daily food, home cake, puffed rice also prepared from it. Husk for bran oil.                                         | Average yield is near about 30 q ha <sup>-1</sup> . Market value ₹ 1200-1400 q <sup>-1</sup> .                         | Cultivate in the high land by planting, in the 3 <sup>rd</sup> week of June to 2 <sup>nd</sup> week of July and harvest in the 4 <sup>th</sup> week of November to 1 <sup>st</sup> week of December. No need to pesticide used. |
| 21. | Ring Shal (aman)     | It is a medium quality rice, medium size grain, sweet taste, delicious and nutritious, easy digestible. Grain colour: deep off-white.                                                            | It is used as boiled rice for daily food, home cake, puffed rice also prepared from it. Husk for brain oil.                                        | Average yield is near about 30 q ha <sup>-1</sup> . Market value ₹ 1200-1400 q <sup>-1</sup> .                         | Cultivate in the high land by planting, in the 3 <sup>rd</sup> week of June to 2 <sup>nd</sup> week of July and harvest in the 4 <sup>th</sup> week of November to 1 <sup>st</sup> week of December. No need to pesticide used. |
| 22. | Shete (aman)         | Short durational; early variety; drought resistant; water tolerant; Coarse grains but sweet to taste. Cultivated in Gangetic plains in Malda. Grain colour: golden red with long whitish stripe. | Cooked rice has a sweet mild smell, pectinous, use as common food, puffed rice.                                                                    | Average yield is about 20 q ha <sup>-1</sup> . Value ₹ 900-1000 q <sup>-1</sup> .                                      | Cultivation done by sowing seed in the middle of the May, harvested in the middle July, 60-65 days require for ripping                                                                                                          |

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| 23. | Tulai Panji (aman)  | Own variety quality rice, highly scented, fine, sweet to taste. Cultivate in the high land in Malda.<br>Grain colour: brownish white                                                                                      | This variety is used as different food items such as polao, fried rice, biriani, payesh,                                                         | Average yield is about 24 q ha <sup>-1</sup> . Market value ₹ 2500-2600 q <sup>-1</sup> . Heavy demand in the market.                | Cultivate in the high land after harvesting jute in the 2 <sup>nd</sup> week of August and harvest in the 1 <sup>st</sup> and 2 <sup>nd</sup> week of December. No need to use to chemical fertilizer and pesticide. |
| 24. | Ujal (aman)         | Cultivated in the semi low land. It can resist 5-6 ft deep water; erect; Barind.<br>Grain colour: deep off-white.                                                                                                         | Coarse grains very sweet to taste, ideal for common food to common people.                                                                       | Average yield is about 30 q ha <sup>-1</sup> . Market value ₹ 1200 q <sup>-1</sup> .                                                 | Cultivated in the transit land by hand sowing in the middle of May and harvest in the middle of December.                                                                                                            |
| 25. | Bansh Phool (aman)  | Small grain semi erect stem; scented; sweet taste, rich in amylase; cultivated in high land of Malda.<br>Grain colour: deep off-white.                                                                                    | It is used as occasional super diet, polao, fried rice, biriani and payesh prepared.                                                             | Average yield is about 30 q ha <sup>-1</sup> . Market value ₹ 1200 q <sup>-1</sup> .                                                 | Cultivate in the 2 <sup>nd</sup> week of June and harvest in the 1 <sup>st</sup> and 2 <sup>nd</sup> week of December. No need to use to chemical fertilizer and pesticide.                                          |
| 26. | Metegarol (aman)    | Drought and water resistant (it can resist about 12 ft deep water); cultivated in the low land by seeding. Long lying stem. Grain colour: yellowish brown.                                                                | Course grains, but sweet taste cooked rice emits a sweet hungering smell, pectinous. Puffed rice, fried grains (Khoi) prepared from the variety. | Average yield is about 30 q ha <sup>-1</sup> .<br>Value more or less ₹ 1000 q <sup>-1</sup> .                                        | Cultivated in the middle of May, harvested in the middle of December.                                                                                                                                                |
| 27. | Madhu Malati (aman) | This variety is cultivated in the high land of Barind area of Malda District, very smaller grains. It is highly scented, delicious, nutritional and sweet to taste. Colour of the grain is creamy white. Short high stem. | Unboiled rice is usually used for preparation of payesh, polao and fried rice etc.                                                               | Average yield is about 10-12 q ha <sup>-1</sup> .<br>Value more or less ₹ 3000-3200 q <sup>-1</sup> .                                | Cultivated in the middle of July and harvest in the first week of December. Cultivation done by plantation (hand sowing). No need to use to chemical fertilizer and pesticide and grow on rain water.                |
| 28. | Boali (Boro)        | It is cultivated in the low land of Malda District, own variety, moderate size, colour yellowish white, sweet taste. Short height stem.                                                                                   | It is used as daily food for common people. Home maid cake prepared from it extent.                                                              | Average yield is about 30-32 q ha <sup>-1</sup> .<br>Value more or less ₹ 1200-1500 q <sup>-1</sup> . It has a demand in the market. | Cultivated in the month of February and harvested in April. Organic manuring results best. Moderate irrigation is needed for good yield. Pesticides not required.                                                    |
| 29. | Jagoli (Boro)       | It is cultivated in the low land of Malda District, own variety, long size, colour of grain black, Short height stem.                                                                                                     | It is used as daily food for common people. Home maid cake prepared from it extent.                                                              | Average yield is about 30-32 q ha <sup>-1</sup> .<br>Value more or less ₹ 1200-1500 q <sup>-1</sup> . It has a demand in the market. | Cultivated in the month of February and harvested in April. Organic manuring results best. Moderate irrigation is needed for good yield. Pesticides not required.                                                    |

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| 30. | Sada Binni (aman) | This variety is cultivated in the high land of Barind area and Tal area of Malda District. Grains are comparatively long and large, colour of the grains is yellowish white. | It has a utilization importance for its famous fried grains named <i>Binni Khoi</i> and it is used as common food for daily use.                 | Average yield is about 15-18 q ha <sup>-1</sup> . Value more or less ₹ 2000-2500 q <sup>-1</sup> . It has a demand in the market. | Cultivated in the month of July and harvested in December. Cultivation done by plantation, organic manuring results best. Pesticides not required. Depend on rain water. |
| 31. | Sada Bona (aman)  | Drought and water resistant (it can resist about 12 ft deep water); cultivated in the low land. Grain colour: creamy white.                                                  | Course grains, but sweet taste cooked rice emits a sweet hungering smell, pectinous. Puffed rice, fried grains (Khoi) prepared from the variety. | Average yield is about 30 q ha <sup>-1</sup> . Value more or less ₹ 1000 q <sup>-1</sup> .                                        | Cultivated in the middle of May, harvested in the middle of December.                                                                                                    |
| 32. | Parangi (aush)    | Drought cultivated in the Gangetic plains. Grain colour: black.                                                                                                              | Course grains, but sweet taste, pectinous. Puffed rice prepared from the variety and it is used mainly as daily diet.                            | Average yield is about 25 q ha <sup>-1</sup> . Value more or less ₹ 1000 q <sup>-1</sup> .                                        | Cultivated in the middle of April, harvested in the middle of August.                                                                                                    |
| 33. | Changa (aman)     | Drought and water resistant (it can resist about 5-8 ft deep water); cultivated in the semi low land by seeding. Long lying stem. Grain colour: black.                       | Course grains, but sweet taste cooked rice emits a sweet hungering smell, pectinous. Puffed rice, flatten rice prepared from the variety.        | Average yield is about 30 q ha <sup>-1</sup> . Value more or less ₹ 1000 q <sup>-1</sup> .                                        | Cultivated in the middle of May, harvested in the middle of December. No need of chemical fertilizer and pesticides.                                                     |

ethnobotanical study revealed specific socio-cultural and use factors underlying these distinct selection pressures. Both farmers and ethnobotanists identified distinct taro types. The paddy, the principal crop of the district, is cultivated in all three seasons, namely Aush varieties (May to September), Aman varieties (August to February), and Boro varieties (December to May). The following 33 traditional varieties of paddy have been located in Malda district of West Bengal at three different seasons (Table 1): Aman varieties-Radhunipagal, Pora Binni, Chini Shakar, Digha, Gobinda Bhog, Indra Shal, Kalabona, Kali Rai, Kalozeera, Kanak Chur, Kartick Shal, Katari Bhog, Khejur Chhari, Lalbona, Laxmi Digha, Mughi, Nagra Kalam, Pathar Sheel, Patharkunchi, Ring Shal, Tulai Panji, Ujal, Bansh Phool, Metegarol, Madhu Malati, Sada Binni, Sada Bona, Changa; Boro varieties-Boali, Jagoli; and Aush varieties-Muktahar, Shete, Parangi.

Apart from the above traditional varieties of rice, 14 other paddy varieties (Sirumani, Manavari, Seeraga samba, Kitchidi samba, Ondarai kitchidi, Payagunda, Kappa karu, Kullan karu, Kalar palai, Malai kitchidi, Bangalore kar, Thuya malli, Vadan samba, and Malai Nellu) were also planted by the local farmers. The indigenous rice varieties can be used as a value added items and their special features are: Drought and water

resistant varieties-Changa, Sada Bona, Metegarol, Shete, Laxmi Digha, Lalbona, Kalabona, Digha; Drought resistant variety-Parangi; Water resistant variety-Kali Rai; Short durational variety-Shete and Muktahar; long term variety-Kali Rai; Scented rice varieties-Gobinda Bhog, Digha, Chini Shakar, Indra Shal, Radhunipagal, Katari Bhog, Tulai Panji, Bansh Phool, Madhu Malati; Amylase rich-Bansh Phool; Pectin rich-Pora Binni, Shete, Sada Bona, Parangi; Vitamin A rich-Kartick Shal. Kanak Chur is used for the preparation of very famous sweet the *Moya of Jaynagar* (a local sweet dish) of Uttar 24 parganas, West Bengal and Sada Binni has a utilization importance for its famous fried grains named *Binni Khoi*. Most of the rice varieties are having good yield potential (26-32 quintals ha<sup>-1</sup>-Digha, Indra Shal, Kalabona, Kali Rai, Lalbona, Laxmi Digha, Nagra Kalam, Pathar Sheel, Patharkunchi, Ring Shal, Ujal, Bansh Phool, Metegarol, Boali, Jagoli, Sada Bona, Changa rice varieties) with cheaper price per quintal (₹ 1000-1200-Metegarol, Shete, Digha, Indra Shal, Kalabona, Kali Rai, Khejur Chhari, Lalbona, Laxmi Digha, Mughi, Muktahar, Pathar Sheel, Ujal, Bansh Phool, Sada Bona, Parangi, Changa) (Table 1). The average yield and price of the other rice varieties were as follows: Yield (q ha<sup>-1</sup>)-10-12-Radhunipagal, Madhu Malati; 15-18-Kalozeera, Sada Binni;



Table 2: Productivity and area of cultivation of indigenous paddy varieties

| Sl. no. | Name of the indigenous variety | Total area under cultivation (ha) |      |      |      |      | Mean±SE    |
|---------|--------------------------------|-----------------------------------|------|------|------|------|------------|
|         |                                | 2007                              | 2008 | 2009 | 2010 | 2011 |            |
| 1.      | Radhunipagal                   | 650                               | 620  | 420  | 350  | 110  | 430±98.3   |
| 2.      | Pora Binni                     | 130                               | 70   | 25   | 00   | 00   | 45±24.8    |
| 3.      | Chini Shakar                   | 660                               | 520  | 525  | 565  | 480  | 550±30.6   |
| 4.      | Digha                          | 745                               | 650  | 440  | 655  | 510  | 600±54.8   |
| 5.      | Gobinda Bhog                   | 1020                              | 670  | 520  | 715  | 825  | 750±83.4   |
| 6.      | Indra Shal                     | 125                               | 90   | 130  | 150  | 105  | 120±10.4   |
| 7.      | Kalabona                       | 60                                | 44   | 32   | 12   | 2    | 30±10.5    |
| 8.      | Kali Rai                       | 620                               | 410  | 425  | 345  | 420  | 444±46.3   |
| 9.      | Kalozeera                      | 325                               | 280  | 210  | 270  | 165  | 250±28.1   |
| 10.     | Kanak Chur                     | 430                               | 340  | 330  | 255  | 245  | 320±33.5   |
| 11.     | Kartick Shal                   | 520                               | 490  | 345  | 285  | 360  | 400±44.9   |
| 12.     | Katari Bhog                    | 1200                              | 950  | 800  | 650  | 750  | 870±95.6   |
| 13.     | Khejur Chhari                  | 8                                 | 9    | 7    | 6    | 0    | 06±1.6     |
| 14.     | Lalbona                        | 635                               | 520  | 240  | 75   | 30   | 300±119.9  |
| 15.     | Laxmi Digha                    | 810                               | 840  | 625  | 415  | 185  | 575±123.6  |
| 16.     | Mughi                          | 140                               | 155  | 138  | 127  | 65   | 125±15.6   |
| 17.     | Muktahar                       | 10                                | 6    | 4    | 0    | 0    | 4±1.8      |
| 18.     | Nagra Kalam                    | 1000                              | 1200 | 600  | 450  | 250  | 700±175.3  |
| 19.     | Pathar Sheel                   | 400                               | 225  | 220  | 110  | 95   | 210±54.6   |
| 20.     | Patharkunchi                   | 110                               | 130  | 55   | 45   | 60   | 80±16.8    |
| 21.     | Ring Shal                      | 150                               | 40   | 30   | 25   | 35   | 56±23.6    |
| 22.     | Shete                          | 85                                | 60   | 78   | 62   | 65   | 70±4.88    |
| 23.     | Tulai Panji                    | 6000                              | 3050 | 4500 | 5000 | 5600 | 4830±513.2 |
| 24.     | Ujal                           | 72                                | 45   | 78   | 60   | 45   | 60±6.7     |
| 25.     | Bansh Phool                    | 350                               | 330  | 280  | 305  | 590  | 371±56.0   |
| 26.     | Metegarol                      | 4                                 | 3    | 3    | 00   | 00   | 2±0.8      |
| 27.     | Madhu Malati                   | 800                               | 650  | 520  | 500  | 280  | 550±86.2   |
| 28.     | Boali                          | 150                               | 125  | 75   | 95   | 80   | 105±14.2   |
| 29.     | Jagoli                         | 80                                | 75   | 55   | 65   | 75   | 70±4.4     |
| 30.     | Sada Binni                     | 75                                | 50   | 42   | 55   | 53   | 55±5.4     |
| 31.     | Sada Bona                      | 220                               | 230  | 110  | 100  | 190  | 170±27.3   |
| 32.     | Parangi                        | 125                               | 80   | 60   | 65   | 70   | 80±11.7    |
| 33.     | Changa                         | 340                               | 300  | 210  | 180  | 220  | 250±30.0   |

18-20-Chini Shakar, Muktahar, Shete; 21-25-Pora Binni, Gobinda Bhog, Kanak Chur, Kartick Shal, Katari Bhog, Khejur, Chhari, Mughi, Tulai Panji, Parangi and price (per quintal) ₹ 1200-1400-Patharkunchi, Kartick Shal, Ring Shal, Boali, Jagoli; ₹ 1500-1900-Katari Bhog, Radhunipagal, Chini Shakar, Kalozeera, Kanak Chur, Nagra Kalam; ₹ 2000-2500-Pora Binni, Tulai Panji, Sada Binni; ₹ 2700-2900-Gobinda Bhog; ₹ 3000-3200-Madhu Malati; and ₹ 6000-Pora Binni. Further, there was a great demand in the market for the following rice varieties-Sada Binni, Kalozeera, Pora Binni, Jagoli and Boali, Tulai Panji, Nagra Kalam and Kartick Shal (Table 1 ).

As per our classification, Tulaippanji, Gobindabhog, Kataribhog, Madhumalati etc are still cultivated in small area, these are rare varieties. Abolishing varieties are Kanakchur, Lalbona, Kalabona, Sete, etc., and some are endangered varieties such as Sadabona, Digha, Boali, Gagoli, Barakalam which needs conservation very early (Table 1).

The major reason for the disappearance of thousands of local rice varieties is their steady replacement with the high-yielding varieties (HYVs) introduced in the 1960s with the green revolution. Farmers were impressed by the initial high yields of these so-called ‘miracle’ seeds and ignored the associated

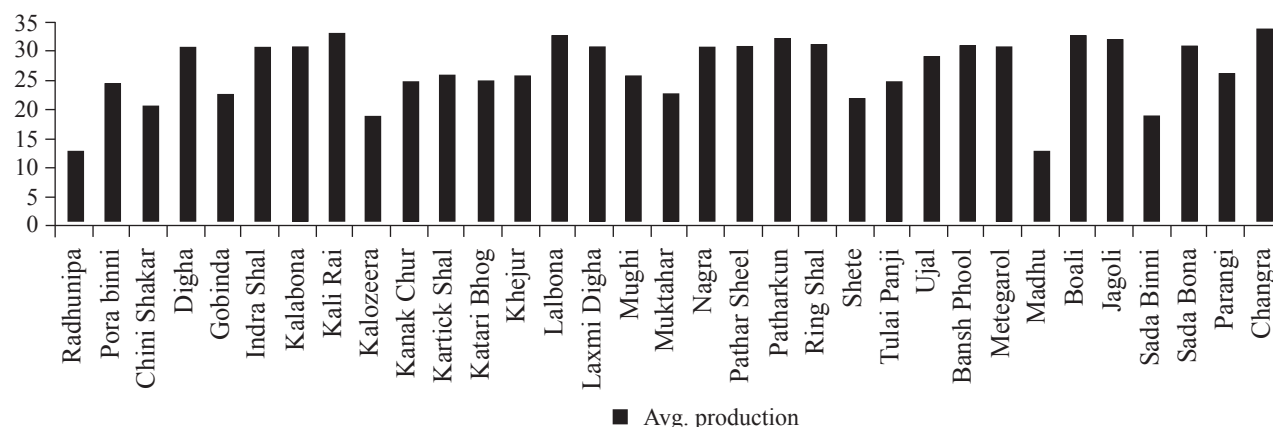


Figure 1: Average production (in quintal) of the indigenous varieties

costs of external inputs, subsequent loss of non-grain bio-mass, loss of desirable traits (like tolerance to diseases and pests, drought, floods, etc.), and the extensive deterioration of the environment, including soil and water.

Despite the apparent failure of the long term sustainability and viability of the green revolution technological fixes, and growing threats of the Gene Revolution (using genetic engineering), these so-called scientific and modern varieties continue to be aggressively promoted at the expense and exclusion of traditional varieties. An investigation into the reasons for the continuation of their cultivation highlighted the following factors:

- The small and marginal farmers (most of them indigenous tribals) who grow the indigenous rice varieties were too impoverished to buy the costly inputs for growing HYVs.
- The HYVs failed to grow in dry uplands and wet lowlands, where only a few specially adapted local varieties could grow.
- Certain native varieties had distinct cultural or religious values and were used during certain special religious or social ceremonies like Mughi, Madhumalati, Gobindabhog.
- Many native varieties were grown for their special aroma and flavour, which were distinctly lacking in the HYVs like Tulaipanji, Katatibhog, Gobindabhog.
- A small number of native varieties fetched higher market prices than the HYVs like Mughi, Madhumalati, Gobindabhog, Tulaipanji, Katatibhog, Radhunipagal, Binni, Kanakchur.
- The dwarf and poor quality straw of the HYV paddy was unsuitable for thatching huts, and could not compare with the folk variety paddy straw like Indrasal, Pathar Kunchi

Landraces or traditional cultivars have a certain genetic integrity. They are balanced in population, variable and in equilibrium with both the environment and the pathogens and are genetically dynamic. Most importantly they are genetically diverse (Harlan, 1975). The genetic variability

of these land races provides some built-in insurance against hazards of diseases and pest. They also provide some yield despite drought, flooding, hail, frost, diseases and pests etc. (Mehera, 1981). Such indigenous plants have a good power of physiological adaptation, they integrate in the ecosystem, mixed cultivation, along with fish, ducks and mollusks. Most of them have good yield without or with little need for fertilizers and pesticides. They are not long termed deleterious biological magnifiers in the ecological food chain.

Based on the above conclusions it can be claimed that persistence of indigenous rice varieties completely depends on the small and marginal farmers who are still cultivating these varieties in this locality. Thereby they become instrumental in saving it from the brink of extinction even in the face of hybrid revolution.

#### 4. Conclusion

The viability status of the indigenous varieties all over the world is despondent. Now-a-day's traditional variety of rice in Malda and neighbouring districts are drastically cornered by high yielding varieties for its prowess of yield and the traditional varieties are going beyond the reach of our hand due to unacceptability of traditional varieties to cultivators. On the other hand the modern high yielding varieties have not established their genetic stability and there is every possibility for food insecurity in near future. Therefore, we should conserve these traditional varieties for the benefit of our next generation and our scientist for significant investigations.

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