



Seed replacement rate and varietal performance of paddy in lower Indo-Gangetic Basin

A. K. NANDI, M.S. SABLE, ^{1*}R. BISWAS AND ²D. MUKHERJEE

Department of Agricultural Economics, ¹Department of Agricultural Statistics
Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia-741252

² Research Scholar, Viswa-Bharati University, Palli Charcha Kendra, Sriniketan, Birbhum

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ABSTRACT

To increase the agricultural productivity the leading input 'quality seed' is come to the fore for agricultural production. But this basic input gets minimum attention to most of the farmers and they use farm saved seeds without knowing the decline potentiality of repeated use in case of field crops. Introduction of hybrid paddy and de-notification of older varieties are a common slogan for augmentation of yield. In the lower Indo-Gangetic Basin (LIGB) the seed replacement rate of paddy is lower (18-26 per cent) than vegetables (83-99 per cent). Lack of timely availability of quality seeds as well as fear psychosis farmers still depends on farm-saved or locally available seeds. The study examined the varietal performances of paddy, sources of paddy seed and seed replacement rate, seed supply system and policy aspects in the high cropping intensity areas in LIGB. Two hundred samples had been collected from the four districts following on the SRSWOR. In LIGB both winter and summer season the existing HYVs were also capable to get potential yields (55-62 q ha⁻¹). In every four years interval seed replacement is necessary to maintain the required yield in the study region. Therefore, before entering into de-notification a rigorous discussion among agro-biological and social scientists in presence of farmers representatives were essential as because these varieties were not only capable to produce higher yields but also maintain a stock in genetic diversity for main food grain crops.

Keywords: De-notification of paddy varieties, paddy SRR, varietal performances.

Seed is the crucial input to accelerate the growth of agricultural production to meet the increased demand for food grains due to over growing population. The seed replacement rate (SRR) of paddy in India is very low because of technological gap, lack of certified seeds in time, high cost of new seeds and lack of perception of the farmers. They do not realize the importance of quality seeds and settle for farm saved seeds which resulted lower productivity and profitability.

As most of the farmers are small and marginal and their primary goal is to satisfy domestic needs and remaining for market purposes. In India, the seed system on high volume low value crops (mainly food grains) are particularly dominated by public sectors. On the other hand, the private sector is having a leading role in high value low volume crops like vegetables and other horticultural crops (Nandi *et al.*, 2013). As thrust will have to be on raising the productivity per unit of cultivated land, there is need for synergy between the public and private sectors. The private sector is required to be involved in overall national objectives of providing quality seeds including those of high-volume low value seeds to farmers at affordable prices and time (Paroda, 2013). Under this background, the objective of the present study was to study the yield rate of notified traditional high yielding varieties for winter and summer seasons, sources of paddy seed and seed replacement

rate, seed supply system, policy aspects and strategic measures for the improvement of seed industry in the said region.

MATERIALS AND METHODS

The present study has been carried out in four high cropping intensive (Bardhaman, Nadia, Hooghly and Murshidabad) districts of West Bengal selected from both sides of Lower Indo Gangetic Basin (LIGB). For the purpose of present study relevant data has been collected from primary sources through survey methods from 200 sample farmers following simple random sampling without replacement (SRSWOR) engaged both seed and non-seed paddy production. The distribution of samples was made on the basis of higher net cropped area of a particular district and accordingly samples have been distributed on the basis of simple percentage method. The data collection has been done with the help of pre-tested schedule and questionnaire through personal interview. The reference period of investigation was 2010-2011 crop year.

Use of SWOT

The overall sustainable class analysis for a business strengths, weakness, opportunities and threats (SWOT) are useful and incorporated for the production, marketing and distribution strategies both in the external

and internal environments (Crosbie and Knight, 1995). Seed replacement is an important factor to maintain the nonstop flow of good production. Supply of quality seeds at proper time to the farmers is another important factor. The transportation cost of high-volume low value seed crop is very high. So, to increase seed replacement rate at regional level seed production by the local farmer is essential for high volume low value seed crop. If seed production is started at regional basis then market facility is needed at the same place. Farmers may use the seeds for their own farm cultivation and surplus portion of seeds for selling purpose. SWOT method is important to make a decision regarding business opportunity in that particular region.

Seed replacement rate (SRR) may be computed by dividing the quantity of seed sown in a particular year by the quantity of seed required for the entire area under a variety/crop (Singh and Asokan, 1994).

$$SSR = (X/Y) \times 100$$

Where, X = Quantity of quality seed sown in a particular year

Y = Quantity of seed required for the entire area under a variety / crop.

RESULTS AND DISCUSSION

Varietal performance of some paddy varieties cultivated by farmers for both in winter and summer period

To analyze the productivity keeping the concept of de-notification of the registered variety, the existing performances of yield is important task to policy planner. For this reason, the attempt has been made to review the yield performances of different varieties of paddy in the selected four districts for both seasons and presented in the Table 1.

It is well known fact that the yield of paddy during summer is higher than winter due to climatic factors and controlled atmospheric situation in summer season. This picture is also prominent in most of the cases. Farmers with their own experiences also screened some varieties either for the winter or summer, as well as both seasons. Except in Murshidabad, the MTU-7029 (*Swarna Mashuri*) is very popular and high yield potential variety. The farmers of Bardhaman district obtained 55.50 q ha⁻¹, which is one of the potential yield among the selected areas of other district during winter season. In summer season, IET-4786 (*Shatabdi*) was prominent and common for all the selected districts with a higher yield potential of 61.5 q ha⁻¹. The Nadia was also close behind Hooghly of 58.95 q ha⁻¹. Except Nadia, the paddy growers preferred IET-3094 (*Lal Swarna*) for the winter season with a highest yield potentiality (Bardhaman 57.83q ha⁻¹) during winter among the selected districts. In both season IR-36 and IR-64 was

cultivated in Bardhaman, Hooghly and Murshidabad to avoid the BPH attack in both season with a high yield potential of 55.60 q ha⁻¹ and 51.85 q ha⁻¹ respectively, for the summer and winter season in Bardhaman. But in Nadia, IET-4094 (*Khitish*) recorded highest yield in summer season (59.90 q ha⁻¹) in the selected areas. It is important to note that a good number of local varieties also persisted in all district with moderate yield potential. Therefore, the concept of de-notification is also a tedious job and it required extensive survey and round table at length discussion among the agro-biological scientist, State officials and the extension agencies. Because the existing varieties may also supply the breeding line for the future stock of paddy and the farmers are also maintaining the germplasm which is important for the developing country like ours.

Sources of seed of the study region

Distribution of high-volume quality seed is not at all easy task among the grower in time for the remote areas because the farmers engaged a series of farming activity and generates only a low surplus and lack of credit facilities. Besides this, sometimes the grower experienced with lower productivity even in replaced seeds. Therefore, they try to purchase the seed or planting materials from public sources. Inter district variation regarding the collection of seeds has also been examined and tabulated in Table 2. One interesting feature is that here also the public sector contribution was around 49.00 per cent in the selected four districts, where the cooperative sector was the major player and the state seed corporation (SSC) is the least contributor among the public avenues of seed distribution. Only 11.50 per cent of the farmer collected the seed material from SAUs, research institutions located in different places.

Seed replacement rate and perceptions of farmers regarding seed replacement rate of the study region

Periodic replacement of seed helps the farmers from loss of production which might result from deterioration in quality of old seeds if it is used beyond the recommended schedule. The replacement rates are also very low in all the states in case of high-volume low value crops (Mandal *et al.*, 2020). Delayed replacement is also an important factor for the slow growth of agricultural production. To accelerate the growth of agriculture it is essential to find different ways by which the replacement of seeds done would be in a systematic way.

From the field survey of the study region, it is revealed that the farmers were not aware about the schedule of recommendation of the seed replacement for the crops. They took decision as and when they observed the substantial decrease of the yield of the crop

Table 1: Varietal performances based on yield during 2010-11

Variety	Average Yield Particulars (q ha ⁻¹)									
	Bardhaman		Hooghly		Nadia		Murshidabad		Combined	
	W	S	W	S	W	S	W	S	W	S
MTU 7029* ¹	55.50	-	50.45	-	52.46	-	-	-	52.80	-
GS-1	-	-	-	-	48	-	-	-	48	-
GS-3	-	45.00	-	-	53.67	-	-	-	53.67	45
Ranjit	-	-	-	-	41.72	-	-	-	41.72	-
Pratikha	-	-	47.10	51.04	50.98	-	-	-	49.04	51.04
WGL- 20471	-	-	-	-	49.39	-	-	-	49.39	-
IET 8002	-	-	-	-	52.09	-	-	-	52.09	-
IET 5656* ²	-	-	-	-	47.33	-	-	-	47.33	-
IRRI	-	-	-	-	36.00	-	-	-	36.00	-
IET 4786* ³	41.60	54.69	-	61.50	-	58.95	-	54.74	41.60	57.47
Parasmonni	49.93	-	-	-	-	52.35	-	-	49.93	52.35
Nayanmonni	-	-	-	-	-	45.70	-	-	-	45.70
Ratana	39.26	-	-	-	-	43.95	-	-	39.26	43.95
CR 1006	51.73	-	-	-	-	-	-	-	51.73	-
IET 4094* ⁴	44.12	-	-	-	-	59.90	-	-	44.12	59.90
Gontra -1	-	-	47.82	53.21	-	-	-	56.25	47.82	54.73
Dhanraj	-	-	47.77	-	-	-	-	-	47.77	-
IR-64	48.98	51.00	51.05	54	-	-	49.14	-	49.72	52.50
IR-36	51.85	55.60	-	-	-	-	-	-	51.85	55.60
IET3094* ⁵	57.83	-	52.07	-	-	-	55.83	-	55.24	-
Amrapali	-	-	43.72	-	-	-	-	-	43.72	-
Swarna Sub 1	49.46	-	-	-	-	-	-	-	49.46	-
IET-9947* ⁶	-	-	50	-	-	-	51.86	57.56	50.93	57.56
MTU 1010	-	44.51	-	-	-	-	47.25	59	47.25	51.76
CM(BB-11)	-	-	-	-	-	-	51.75	-	51.75	-
Afgan	-	-	-	-	-	-	52.50	-	52.50	-
Jalajog	-	-	-	-	-	-	30	-	30	-
Ramchndi	-	-	-	-	-	-	43.27	-	43.27	-
Bidhan	-	-	-	-	-	-	-	58.32	-	58.32
M Shankar	-	-	48.75	-	-	-	-	-	-	48.75

Note: w=winter and s=summer.

*¹SwarnaMasuri, *²SwarnaDhan, *³Shatabdi, *⁴Khitish, *⁵LalSwarna, *⁶Lallat

Table 2: Sources of paddy seeds purchased by the farmers in the selected region during 2010-11 (In percentage)

Source	Bardhaman	Hooghly	Nadia	Murshidabad	Combined
SSC	4.54	NA	2.27	NA	2.00
Cooperatives	31.82	43.75	56.82	18.97	35.50
SAU/ R. station, Panchayat etc.)	4.54	NA	15.91	22.41	11.50
Public Total	40.90	43.75	75.00	41.38	49.00
Farm saved seeds	59.10	56.25	25.00	58.62	51.00

or the saved seed has been physically damaged by storage insects or diseases. Sometimes the farmers applied higher level of inputs and other cultural practices to increase the yield of their crops without knowing where the actual problem persisted for the yield reduction.

Farmers also opined that cost of seed was not at all a problem for the replacement decision. Only some marginal farmers reported the problems of seed cost due to lack of credit during that time, but it may also be overcome if the quality may be ensured at least 10-15 per cent of yield augmentation.

Table 3: Seed replacement rate of different crops in the selected regions

Districts.	Total area paddy (ha)	Area under certified seed (ha)	Total seed under entire area (Kg)	Total certified seed used (kg)	SRR (%)
Bardhaman	170.48	28.48	8234.10	1375.57	16.71
Nadia	67.43	15.99	3240.13	768.35	23.71
Hooghly	56.89	12.09	3919.35	832.92	21.25
M.Bad	85.68	18.12	4822.62	1019.91	21.15
Combined	380.48	74.68	19733.55	3873.27	19.63

Table 4: Strategy for seed supply system (SWOT analysis)

Strengths	Weakness
<ol style="list-style-type: none"> 1. Technical know how 2. Trained personnel. 3. Drying and cleaning facilities. 4. Excellent field conditions. 5. Approval of the certification agency. 	<p>Apart from these, there are also several weaknesses:</p> <ol style="list-style-type: none"> 1. Lack of qualified personnel 2. Limited area for certified seed production 3. Lack of access in processing facilities in some locations. 4. Poor linkages between other institutions and seed production organizations.
Opportunities	Threats
<p>Under the present circumstances, national support and policy intentions (public – private interactions) are the major opportunities:</p> <ol style="list-style-type: none"> 1. National support regarding seed production and processing facility. 2. Willingness of farmers to produce seeds. 3. Awareness to use good quality seeds. 4. Development of seed production team by internal training. 	<p>Need based objectives have to be ascertained to be sure that the seed production, processing and marketing is not jeopardized. If not alerted these can cause the following threats</p> <ol style="list-style-type: none"> 1. Poor marketing due to lack of motivation to implement the seed development programmes. 2. Lack of interest to use good quality seeds due to low margin and delayed payment to farmers by public sectors. 3. Increased input cost can hinder the use of good quality seeds.

Some farmers replace old seeds with good one acquiring from fellow farmers. This lateral spread of crop produces for the first or second year certified or truthfully labeled seeds with better production not yet counted in the macro level seed replacement (Singh *et al.*, 1990). It is also difficult to estimate but needs to incorporate otherwise the underestimation of replacement leads to surplus or deficit in a particular region which causes loss both in traders and sometimes the farmers.

From the survey over and above 60 per cent of the farmer reported that availability of seed was not at all a problem, but the reliability was a question because the available seeds were spurious in nature and for this reason, they delayed the replacement decision.

Improvement of SRR is the main thrust in the selected region as because the estimated SRR in the selected region were below 20% as revealed from the Table 3. Quality seed is made available within the

production zone preferably 5-10 km with adequate quantity and affordable price. This can be done with well-organized local based production and efficient delivery mechanism.

Seed supply system

The seed growers have gathered the experience on cultivation and are able to play important role in seed production process because they are also confronted with different aspects. The cultivation of rice was an age-old practice in the surveyed area; the growers were witnessing the fluctuations of supply and prices in the market during the last decades and relied on their own informal system farm saved system as well as exchange with fellow farmers.

Lack of qualitative data the supply system has been done with the help of SWOT analysis and represented in the Table 4. Efficient delivery system means the availability of a particular material at doorstep of the

user with a fair and appropriate price. Storage, transportation, and the finance are the three legs to supply the high-volume seed materials. The dealers and traders do not always fix the price for the farmers. In most of the cases, the demand and supply situations hiked the prices of seed material and showed artificial crisis in the selected areas. The primary agricultural cooperative societies in the surveyed areas were also interested to organize the producer for production and to establish the seed processing equipments with a technical monitoring. But coordination among the different organization like the state agriculture department, financial institutions, and the department of agriculture may play better role in this respect. Because of the lack of foundation seeds the interested seed growers fail to capture the benefit and bound to go the seed companies with only 10-12 per cent higher prices over the prevailing grain prices in the market. Normally distributors obtained a commission of 15-20 percent of which 12-17 per cent was passed on to the dealers and dealers in turn passed on 9 to 4 per cent to the retailers as a usual practice (Nandi *et al.*, 2013).

There are enough possibilities to enhance the seed supply system for the greater interest of agricultural development. Therefore, an integrated approach is indispensable for a sustainable improvement of the public seed production and distribution system.

Policy aspects

To perform any activity, one has to go through the three windows; i) technical feasibility, ii) economic viability and iii) social acceptability with specific objectives. Considering the above phenomenon, the development of strategy for the seed production and distribution are the prime aspects for high volume low value seeds.

The scope of seed production for paddy persists in almost all agro-climatic zones of West Bengal during winter and summer time. It can safely be concluded that public sector initiatives are essential for seed production of high-volume low value crops. The new alluvial zone may be demarcated as seed production for most of the crops. The programme may be started in the block and district seed farms in the specified zone (Nandi *et al.*, 2013). The study region may have enough scope to produce high volume low seeds crops. Seed village scheme should be started in greater scene to the study region for better agricultural practices. The scheme is running in some parts in the surveyed area. But lack of market linked system the trained farmers engaged in seed production for his own needs. Linking with the primary cooperative credit societies may lead success to some extent.

Strategic measures for the improvement of seed industry

A clear road map for seed production and development is essential with the following initiatives: Farmers right regarding production, exchange and retailing in the regional level are important for higher production and availability of seed in time.

Action should be taken regarding the older and obsolete varieties or hybrids based on performances in this region through phasing out of de notification of varieties. In this context discussion with the SAUs and ICAR and farmers' representatives are essential. For the interest of further research, this may be retaining in Gene bank.

The State Seed Corporation mainly procures the seed based on tender system and it leads to low quality and lower production performances. This practice of procurement should be avoiding and on the other hand, the scope of seed production through different rural institutions in both public and private sector has to be explored well in advance. Community based paddy seed production through Primary Agricultural Cooperatives was also proved (Banani, 2006) the significant role in the surveyed region also.

The seed sectors have to be linked with other input organizations in respect of effective marketing channels for the interest of farmers in the study region.

Due to the lack of seed processing unit, the seed growers' fails to achieve the premium prices of field crops and this incidence hampered the seed production of open pollinated crops. Special emphasis has to be taken care for the development of seed entrepreneurs in this region.

Existing HYVs are potential in the selected region and adaptive research on package of practices for seed production which are the prime concern to the policy planners for the improvement of SRR and thereby the production also.

The yield potentiality of the suitable varieties has to be judged first apart from other socio-economic parameters. The cropping pattern and the monsoon condition are the important criteria which have to be recorded well in advance. Prices must be fixed in such a way that both the companies and the farmer get an optimal benefit.

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