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Article in *The North American Journal of Economics and Finance* · July 2018

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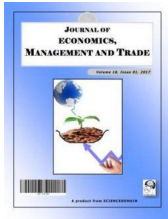
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## **A Study on Sources and Management of Paddy Seed in Eastern Uttar Pradesh, India**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author GP designed the study, write the methodology, made the survey, performed the statistical analysis and wrote the first draft of the manuscript. Authors KUB, SPJK, KVS and DKA managed the analyses of data and information, literature searches and provide support in drafting the manuscript of the study. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/JEMT/2018/42384

#### Editor(s):

(1) Dr. John M. Polimeni, Associate Professor of Economics, Albany College of Pharmacy & Health Sciences, New York, USA.

#### Reviewers:

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(4) Subrata Kumar Mandal, Central Mechanical Engineering Research Institute, India.  
Complete Peer review History: <http://www.sciencedomain.org/review-history/25381>

**Original Research Article**

**Received 10<sup>th</sup> April 2018**  
**Accepted 18<sup>th</sup> June 2018**  
**Published 4<sup>th</sup> July 2018**

### **ABSTRACT**

**Aims:** To study the different sources of paddy seed, share of different varieties, seed replacement rate and management of paddy seed by the farmers in Eastern Uttar Pradesh.

**Study Design:** The present study is based on primary data and information. One development block was selected randomly from the Mau district, and five villages were again selected randomly from the selected block. From each selected village, the data and information were collected from 20 randomly selected farmers on the basis of probability proportional to the total number of farmers in each farm category.

**Place and Duration of Study:** The present study was conducted in Mau district of Uttar Pradesh during the agricultural year 2013-14.

**Methodology:** The Seed Replacement Rate (SRR) in paddy was worked out both in case of certified and quality seed separately. Certified seed meant that each bag of seed used by the farmers has certification tag and label. Quality seed includes both seed, i.e. certified seed and

truthfully labelled seed (TLS). TLS production is entirely free from government certification scheme, but Labelling is also compulsory in case of TLS.

**Results:** The analysis of data for procurement of paddy seed from different sources shows that farmers used the maximum quantity (31.65 per cent) of farm-saved seed followed by private seed dealers (22.70 per cent), Research Institute (20.06 per cent), Department of agriculture/ Co-operatives (12.71 per cent) and authorized dealers (9.75 per cent). The farmers were using 26.47 kg paddy seed per ha in comparison to the recommended level of 30 kg/ha. Seed replacement rate for paddy was 42.99 and was 63.46 per cent with respect to certified seed and quality seed respectively. The ratio of public and private sector paddy varieties regarding area covered in the study area was 77:23. It was found that 51.00 per cent farmers paid attention to the crop in the field itself to select the crop to be used as seed. Past experience of the farmers was the main criteria for judgments on purity and quality of paddy seed.

**Conclusion:** The study suggests that farmers may be motivated and educated for the use of quality seed and seed replacement from authentic sources. Also, seed agencies need to strengthen their distribution network for easy and timely availability of quality seed to the farmers.

*Keywords: Paddy seed; source; management; seed replacement rate; quality judgment.*

## 1. INTRODUCTION

Seed is a crucial, vital, basic and essential input for attaining sustained growth in agriculture production and productivity. A sustained increase in agriculture production and productivity has depended on the development of new improved variety, timely and adequate supply of quality seed to the farmers. It is estimated that the direct contribution of quality seed alone to the total production is about 15-20 per cent depending upon the crop and it can be further raised up to 40 per cent with effective management of other inputs [1]. The value in agricultural genetic resources lies in the diversity within a crop and seed is the vehicle for carrying this genetic diversity over time and space [2].

Paddy is one of the principal crops which form a staple diet of the majority of the population in the country. It is most important crop in respect of area and production in Uttar Pradesh. The area under paddy crop was 5.86 m ha (13.82 per cent to the national area), and production was 14.41 m tons (13.80 per cent to national production) during the year 2012-13 [3]. Eastern Uttar Pradesh is covering 15 districts which, constitutes about 30 per cent area to total paddy cultivation in the state [4]. The general farm produce retained for seed cannot be substituted for quality seed, farm-saved seed generally lacks genetic vigour and has poor germination [5]. [6] reported that SRR of paddy was 24 per cent and it has a direct relationship with farm size. Again [7] reported that majority of farmers (75 per cent) used farm-saved seed in case of wheat due to confidence in farm-saved seed and low degeneration in self-pollinated crops. [8] reported

that most of the farmers buy fresh seed from the market to get pure seed of popular varieties. [9] mentioned the reasons for low seed replacement rate of paddy. Introduction of improved paddy variety in Tungabhadra project area has resulted into higher net return and low pests and diseases incidence as it was new for the ecosystem [10].

Keeping in view all this, the present study has been undertaken with the objectives to study the different sources of paddy seed, a share of different varieties, seed replacement rate and management of paddy seed by the farmers.

## 2. METHODOLOGY

Paddy is significant crop of Mau district and occupied around 44 per cent of the gross cropped area of the district [11] selected purposively for the present study. One development block was selected randomly from the district, and five villages were again selected randomly from the selected block. From each selected village, the data and information were collected from 20 randomly selected farmers on the basis of probability proportional to the total number of farmers in each farm category.

The paddy growers were stratified into four size groups, viz., marginal (up to 1 hectare), small (1.01 to 2 hectares), medium (2.01 to 4 hectares) and large (above 4 hectares). The primary data for the agricultural year 2013-14 were collected from the sample paddy growers with the help of schedules specially designed for the purpose. Simple average and percentages were used to analyse the data.

The Seed Replacement Rate (SRR) in paddy was worked out both in case of certified and quality seed separately. Certified seed, meant that each bag of seed used by the farmers has certification tag and label. Quality seed includes both seed, i.e. certified seed and truthful labelled seed (TLS). TLS production is entirely free from government certification scheme; therefore, no inspection is needed at a field or tagging from any other agency because the producers themselves perform these functions. Labelling is also compulsory in case of TLS.

The SRR in paddy was worked out as given below-

**a) Certified seed**

$$SRR = (C \times 100) / (A \times K)$$

Where; SRR- Seed Replacement Rate

C- Certified seed used by the farmers

A- Area under paddy crop

K- Seed rate per unit of area

**b) Quality seed**

$$SRR = (Q \times 100) / (A \times K)$$

Where; SRR- Seed Replacement Rate

Q- Quality seed used by the farmers

A- Area under paddy crop

K- Seed rate per unit of area

**3. RESULTS AND DISCUSSION**

The sources of paddy seed for cultivation with the selected farmers have been presented in Table 1. The table indicated that the farmers used the maximum quantity (31.65 per cent) of farm-saved seed of the previous crop. The large farmers use lesser quantity of farm-saved seed in comparison to other size group farmers due to the fact that large farmers have more investment capacity and technical knowledge in comparison to other farmers. The marginal, small and medium farmers were found to prefer the farm-saved seed in comparison to any other sources of seed. The significant reasons expressed by farmers for using farm-saved seed was the non-significant difference in yield, quality of seed, high price of seed, no degeneration in the seed of self-pollination crop and confidence in self-retained seed.

About 22.70 per cent farmers purchased quality seed of paddy from private seed dealers, who

sold truthfully labelled seed which is not certified by any seed certification agency but labelling is done on packets. Among the different group of farmers, large farmers purchase highest quantity (28.10 per cent) followed by small farmers (26.43 per cent), marginal farmers (22.17 per cent) and medium farmers (15.73 per cent). Prices of seed sold by a private dealer are higher in comparison to other sources even though farmers purchase the seed from the private dealer due to easy availability and higher productivity.

It was found that 20.06 per cent and 12.71 per cent of paddy seed was procured from Research Institute and Department of agriculture/ Co-operatives respectively. All the farm categories have procured seed from this source. Research Institute, Department of Agriculture and Co-operatives were found to benefiting all categories of farmers by fulfilling their paddy seed requirement. The primary reason for procurement from this source was repute of Institute, higher yield, timely availability and reasonable price of seed.

It was also observed that 9.75 per cent of paddy seed used by sample farmers were taken from the authorised dealers. Large farmers made majority of procurement from this source. Around 3.13 per cent farmers procure paddy seed from relatives/ friends/ fellow farmers. Except for large farmers, all other farmer using this source of purchase and it was mainly due to the no transportation cost, sometimes seed is available free of cost and no immediate cash payment.

The seed rate of paddy used by the farmers has been presented in Table 2. The recommended seed rate for paddy (transplantation) is 30 kg/ha [12]. The selected farmers were using 26.47 kg paddy seed per ha. The paddy seed rate used was around 11.77 per cent less in comparison to the recommended level. The farmers were an opinion that there is no productivity difference by reducing the seed rate. It is also clearly indicated for the table that as the farm size increases, the seed rate of paddy decreases.

The seed replacement rates (SRRs) in case of sample farmers for certified and quality seed have been worked out separately and presented in Table 3. The study indicated that seed replacement rate for paddy concerning certified seed was 42.99 per cent. This result is supported by [13 and 14] which claim SRR in paddy was 52.80 per cent. The farm category-wise analysis revealed that the large farmers had the highest

**Table 1. Sources of paddy seed (quintals)**

Farm category/ Sources of seed	Marginal	Small	Medium	Large	Total
Own seed	247.00 (31.93)	280.00 (30.21)	520.00 (37.78)	310.00 (25.62)	1357.00 (31.65)
Relative/ friend/ fellow farmers	25.00 (3.23)	42.00 (4.53)	67.00 (4.87)	-	134.00 (3.13)
Research Institutes	160.00 (20.69)	200.00 (21.58)	340.00 (24.70)	160.00 (13.22)	860.00 (20.06)
Department of Agriculture/ Co-operatives	120.00 (15.51)	160.00 (17.26)	115.00 (8.36)	150.00 (12.40)	545.00 (12.71)
Authorized dealers	50.00 (6.47)	-	118.00 (8.57)	250.00 (20.66)	418.00 (9.75)
Private dealers	171.50 (22.17)	245.00 (26.43)	216.50 (15.73)	340.00 (28.10)	973.00 (22.70)
Total	773.50 (100)	927.00 (100)	1376.50 (100)	1210.00 (100)	4287.00 (100)

Note:1. Figures in parentheses indicate percentage of their respective total

SRR (47.28 per cent) followed by marginal farmers (42.67 per cent), medium farmers (41.53 per cent) and small farmers (38.84 per cent). Quality seed includes both certified seed and truthfully labelled seed and SRR for paddy concerning quality seed was 63.46 per cent. The farm category-wise analysis revealed that the large farmers had the highest SRR (71.38 per cent) followed by the small farmer (63.17 per cent), marginal farmers (62.64 per cent) and medium farmers (57.16 per cent). The higher SRR of paddy with large farmers is due to their better financial position and technical knowledge.

**Table 2. Seed rate of paddy used by the farmers (Kg./ha.)**

Farm category	Seed rate of paddy (Kg./ha.)
Marginal	27.67
Small	26.74
Medium	26.00
Large	23.00
Total	26.47

The major variety of paddy used by farmers in the study area has been presented in Table 4. The ratio of public and private sector paddy varieties in terms of area covered in the study area was 77:23. In case of public sector variety, MTU 7029 occupies the maximum area (31.13 per cent) followed by BPT 5204 (24.55 per cent), Sarju 52 (7.30 per cent) and HUR 105 (4.25 per cent). The major reason for higher area under MTU 7029 and BPT 5204 was late maturity, better productivity and tolerance to many diseases. In case of private sector variety, Moti occupies the maximum area (12.34 per cent)

followed by Sampurna (2.72 per cent), Rekha (2.35 per cent) and Komal 101 (1.65 per cent). The higher area under moti variety is mainly due to semi-dwarf variety with long panicle and higher productivity.

**Table 3. Seed replacement rate**

Farm category	Seed replacement rate (per cent)	
	w.r.t. certified seed	w.r.t. quality seed
Marginal	42.67	62.64
Small	38.84	63.17
Medium	41.53	57.16
Large	47.28	71.38
Total	42.99	63.46

Stages of attention at which the farmers adopt to select the crop to be used as seed have been presented in Table 5. It was found that 51.00 per cent farmers paid attention to the crop in the field itself, 25 per cent at the time of pre-harvesting, 9.00 per cent each at the time of pre-storage and post-storage while, only 6.00 per cent at the time of harvesting. Farm category-wise analysis showed that 63.64 per cent large farmers paid attention for selection of paddy seed in a field, 18.18 per cent each in pre-harvesting and pre-storage stage, indicating that they were more conscious about seed quality in preliminary stages of crops. None of the large farmers was found to select the paddy seed at threshing and post-storage stage. 50.00 per cent marginal farmers paid attention for selection of paddy seed in field while another 50.00 per cent farmers paid attention at pre-harvesting, threshing, pre-storage and post-storage stage,

indicating that they were less careful in the selection of seed.

Farmer's judgment on purity and quality of paddy seed have been presented in Table 6. The table reveals that past experience of the farmers was the main criteria (79.00 per cent) followed by other factors like advise of known person (62.00 per cent), repute of Institute (52.00 per cent), tag of seed certification agency (27.00 per cent) and testing by seed testing agency (14.00 per cent) for judgments on purity and quality of paddy seed. Farm category-wise analysis showed that in each category of farmers, a majority of farmers have to judge the purity and quality on the basis of their past experience. Advice of known person is the main judgment criteria for marginal, small

and medium farmers. Only four per cent farmers were going for seed testing by the testing agency as it requires money.

Storage is useful in crop and seed preservation, quality improvement, quantity equalisation and market price stabilisation of agricultural produce [15] and is form of saving [16]. The storage structures used by the selected farmers were presented in Table 7. The study revealed that majority of selected farmers (62 per cent) used gunny bag for storage of paddy seed followed by 16 per cent in metal bin and 22 per cent in both i.e. gunny bag and metal bin. [13] has reported that 46 per cent farmers used plastic bag for paddy seed storage.

**Table 4. Variety of paddy used by farmers**

Sl.	Name of variety	Variety developed by	Area covered (%)
1	MTU 7029	Public sector	31.13
2	BPT 5204	Public sector	24.55
3	Sarju 52	Public sector	7.30
4	HUR 105	Public sector	4.25
5	Other variety	Public sector	9.65
Sub total			76.88
6	Moti	Private sector	12.34
7	Sampurna	Private sector	2.72
8	Rekha	Private sector	2.35
9	Komal 101	Private sector	1.65
10	Other variety	Private sector	4.06
Sub total			23.12
Grand total			100.00

**Table 5. Stage of attention for selection of paddy crop to be used as seed**

Farm category /Stage of crop	Marginal	Small	Medium	Large	Total
In field	18(50.00)	14(51.85)	12(46.15)	7(63.64)	51(51.00)
Pre-harvesting	6(16.67)	9(33.33)	8(30.77)	2(18.18)	25(25.00)
Threshing	3(8.33)	3(11.11)	-(0.0)	-(0.0)	6(6.00)
Pre-storage	5(13.89)	-(0.0)	2(7.69)	2(18.18)	9(9.00)
Post-storage	4(11.11)	1(3.71)	4(15.39)	-(0.0)	9(9.00)
Total	36(100)	27(100)	26(100)	11(100)	100(100)

Note1. Figures in parentheses indicate percentage of their respective total

**Table 6. Judgement on purity and quality of paddy seed**

Farm category / Factors	Marginal	Small	Medium	Large	Total
Past experience	24(66.67)	22(81.48)	23(88.46)	10(90.91)	79(79.00)
Repute of Institute	17(47.22)	15(55.56)	12(46.15)	8(72.73)	52(52.00)
Tag of seed certification agency	5(13.89)	6(22.22)	9(34.62)	7(63.64)	27(27.00)
Advise of known person	20(55.56)	21(77.78)	18(69.23)	3(27.27)	62(62.00)
Testing by seed testing agency	-(0.0)	1(3.70)	1(3.85)	2(18.18)	4(4.00)

Note: 1. Figures in parentheses indicate percentage of their respective total

2. Percentage total is more than 100 because the sample farmers have given more than one response

**Table 7. Storage structures used for paddy seed**

Sl.	Storage structure	Number of farmers
1	Gunny bag	62
2	Metal bin	16
3	Gunny bag and metal bin	22

#### 4. CONCLUSION

Around 31.65 per cent farmers use farm-saved paddy seed followed by seed procured from private seed dealers (22.70 per cent), Research Institute (20.06 per cent), Department of agriculture/ Co-operatives (12.71 per cent) and authorised dealers (9.75 per cent). The large farmers use lesser quantity of farm-saved seed in comparison to other size group farmers due to their high investment capacity and technical knowledge. Farmers prefer to procure seed from public sector due to the reputation of Institute, higher yield, timely availability and reasonable price of seed. The paddy seed rate used was around 11.77 per cent less in comparison to recommended level in the study area. Seed replacement rate for paddy was 42.99 and was 63.46 per cent with respect to certified seed and quality seed respectively. The higher SRR of paddy with large farmers is due to their better financial position and technical knowledge. The ratio of public and private sector paddy varieties regarding area covered in the study area was 77:23. In case of public sector variety, MTU 7029 occupies the maximum area (31.13 per cent), and in case of private sector variety, Moti occupies the maximum area (12.34 per cent). It was found that 51.00 per cent farmers paid attention for selection of crop to be used as seed to the crop in the field itself, 25 per cent at the time of pre-harvesting, 9.00 per cent each at the time of pre-storage and post-storage while only 6.00 per cent at the time of harvesting. Past experience of the farmers was the main criteria for judgments on purity and quality of paddy seed. The advice of known person is the main judgment criteria for marginal, small and medium farmers. Majority of farmers (62 per cent) used gunny bag for storage of paddy seed. The study suggests that farmers may be motivated and educated for the use of quality seed and seed replacement from authentic sources. Also, seed agencies need to strengthen their distribution network for easy and timely availability of quality seed to the farmers.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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