Farmers' Knowledge Towards Aerobic Rice Cultivation in Muktsar District of Punjab

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ABSTRACT

In Punjab rice is cultivated mainly through transplanting method which is more laborious, time consuming and water demanding. Aerobic rice is becoming popular among the farmers to overcome these problems and Muktsar district has adopted maximum area under this technology in the state. Therefore a study was conducted to assess the knowledge of farmers regarding agronomic practices of aerobic rice cultivation covering four villages viz Chattiana, Guri sangar, Dhulkot and Kauni of selected district. A sample of 30 farmers was selected from each village by using random sampling technique. Therefore the total samples size for study was 120 farmers. A knowledge test was developed with 11 items related to different agronomic practices of aerobic rice cultivation. One score was given to correct answer and zero score was assigned to incorrect answer. Majority of the farmers had medium level of knowledge. So, more training programmes should be organized to increase knowledge level of farmers regarding aerobic rice cultivation which will help to make a change in present traditional rice cultivation practices. The t-value of correlation coefficient indicated that education, operational land holding, annual income, innovativeness and risk taking capacity characteristics of the farmers were positive significantly correlated with their knowledge level regarding aerobic rice cultivation

Key words: *Aerobic rice; Knowledge test; Knowledge level; t-value;*

Rice is the main staple food crop of India contributing over 43.00 per cent to nation's food grain production covering about 44.13 million hectares area with a total production of 106.65 million tonnes and productivity of 2.41 t ha^{-1} (*Anonymous, 2015*). Firstly, rice was the main crop of West Bengal, but with the new technology, infrastructure and Green Revolution, rice has become an important crop of Punjab region too. In Punjab, rice occupied an area of 2.89 million hectares during 2014-15 with total production of 11.10 million tonnes and productivity of 3.84 t ha^{-1} (*Anonymous 2016*).

In India, especially in Punjab the rice is cultivated mainly through transplanting method into flooded puddled fields. Transplanting of rice is more water demanding, laborious, cumbersome, time consuming and entails a lot of expenditure on raising nursery, uprooting, and transplanting. Scarcity of labour during peak period of transplanting, uncertain supply of irrigation water, depletion of groundwater and increasing production cost necessitate the search for an alternative to the conventional puddled transplanting of rice. As rice production is intricately linked with land and water, this has unique and profound implications for the environment. Therefore, careful management of the natural functioning of rice ecosystems is critically important for protecting the environment while raising rice productivity to meet growing demand (*Ladha et al., 2003*).

Aerobic rice cultivation is the technology which is water, labour and energy efficient along with eco-friendly characteristics and can be a potential alternative to conventional puddled transplanted rice (*Kumar and Ladha, 2011*). The adoption of direct seeding onto flooded and saturated soils has increased in Asia due to labour shortage in rural areas. Direct seeding, however,

requires large quantities of seed. Also weed competition in direct seeded fields is high (*Jha et al., 2012*). Direct seeding of rice was a common practice before green revolution in India and is becoming popular once again because of its potential to save water and labour. Currently, direct seeded rice in Asia occupies about 29 M ha which is approximately 21 per cent of the total rice area in the region. Countries like USA and Australia extensively practicing direct seeding of rice are with profitable results as it avoids all the penalties entailed in transplanting. Direct seeded rice under no/reduced tillage is an efficient resource conserving technology (RCT) holding good promise in coming days (*Pathak et al., 2011*). *Gill et al. (2006)* reported that dry matter accumulation, leaf area index, effective tillers, etc. under direct seeding were significantly more than transplanted rice at PAU, Ludhiana. The direct-seeded crop matured 10 days earlier than transplanted crop. The water productivity in direct seeded rice ranged between 0.40 and 0.46 kg grain/m^3 irrigation water, while under transplanting, it varied between 0.29 and 0.39 kg grain/m^3 irrigation water; clearly showing the more water use efficiency. The maximum productivity was obtained when direct-seeded crop was raised on 10th June and short-duration; early-maturing 'PR-115' variety excelled other medium and long duration varieties in all growth and yield determinants. Direct seeding of rice is an alternative to transplanting that can reduce the delays and cost of rice establishment (*Malik and Yadav, 2006*). A shift to direct seeding would save time and energy, reduce the cost of cultivation and increase net returns, in addition to benefits for soil health. Weed infestation due to poor management of irrigation water is one of the major constraints in direct seeded rice (*Singh et al., 2005*).

The saving in production cost is another significant factor in encouraging farmers to switch from transplanted rice to direct seeded rice. The economic analysis based on experimental data and farmers' interview revealed that the highest net return of 33.00 per cent was achieved from drill direct seeded rice followed by zero-tillage direct seeded rice (22%) and wet seeded rice (21%) over conventional transplanted rice (*Tripathi et al., 2004*).

Keeping in view the above facts and importance of this technology it is very important to assess the knowledge level of the farmers towards scientific cultivation of aerobic rice to enhance the productivity of rice in Punjab.

METHODOLOGY

Sri Muktsar Sahib was purposively selected for the study as maximum area under aerobic rice cultivation was grown under this district of Punjab in 2014. Considering the adaptability of the design, *ex post facto* design was chosen as the phenomenon had already occurred. Again from the four blocks of the district Gidderbhaha block of the district was selected purposively on the basis of maximum area under aerobic rice cultivation. From Gidderbhaha block, 4 villages (*Chittana, Gurisangar, Dhoolkot and Kauni*) were selected randomly and from each village 30 farmers were selected by using simple random sampling technique therefore constituting a sample of 120 farmers. The data was collected by personal interview schedule. A knowledge test was developed with items related to agronomic practices such as soil type, sowing time, seed rate, suitable variety, irrigation, weed management etc. The knowledge test was pre-tested with 20 non sampled trainees and split half reliability method was applied for estimating the reliability coefficient. The reliability coefficient (r) was 0.887 for knowledge test. The final knowledge test of aerobic rice cultivation consisted of 11 items. The correct responses given by the trainees by way of recall on a knowledge test administered to them were given score 1 and incorrect responses were given score 0.

RESULTS AND DISCUSSION

Socio-personal characteristics: The results revealed the majority of the respondents belonged to middle age group and all respondents were educated with majority of them passed upto 10+2 class. The farmers were predominantly nuclear family and majority of them possessed 4 to 10 ha of land holding and their annual income ranged between Rs. 2.5 lacs to Rs. 6 lakh. Mass media exposure was studied in terms of reading farm literature and newspaper, viewing television programme and listening to radio. The respondents were placed into three categories by using range method. Majority of the farmers had low to medium level of mass media exposure. Extension contact refers to the frequency of contacts made by the respondents with different extension agencies for seeking information

Table 1. Distribution of respondents according to their socio-personal characteristics (N=120)

Characteristics	Category	No.	%
Age(Yrs)	Young(18-31)	35	29.17
	Lower Middle (32-45)	75	62.50
	Upper Middle(46-59)	10	8.33
Education	Middle	6	5.00
	High School	37	30.83
	10+2	65	54.17
	Graduation	12	10.00
Family Size	Small(< 4)	4	3.33
	Medium(5-8)	88	73.33
	Large(>8)	28	23.33
Family Type	Nuclear	94	78.33
	Joint	26	21.67
Land holding	Small(1-2 ha)	20	16.67
	Medium(4-10 ha)	86	71.67
	Large(>10 ha)	14	11.66
Annual Income(Rs)	250000- 450000	22	18.33
	450001- 650000	78	65.00
	650000- 850000	20	16.67
Mass media exposure	Low (up to 6)	26	21.67
	Medium(7-11)	82	68.33
	High(>11)	12	10.00
Extension contact	Low (up to 6)	5	4.17
	Medium(7-11)	78	65.00
	High(>11)	37	30.83
Innovativeness	Low (up to 6)	8	6.67
	Medium(7-11)	70	58.33
	High(>11)	42	35.00
Risk taking capacity	Low (up to 6)	15	12.50
	Medium(7-11)	66	55.00
	High(>11)	39	32.50

related to production of aerobic rice cultivation. Majority of the farmers had high to medium level of extension contacts. Risk taking capacity refers to the degree to which an individual is oriented towards risk and uncertainty and had courage to face the problems emerging from time to time while starting aerobic rice cultivation. Majority of the farmers had high to medium level of risk taking capacity. Innovativeness is taken as the degree to which an individual is relatively earlier in adopting aerobic rice cultivation technique than other members of his social system. Majority of the farmers had high to medium level of innovativeness.

Knowledge level of the respondents about recommended agronomic practices in aerobic rice cultivation : The data in Table 2 pertain to knowledge

Table 2. Distribution of respondents according to their knowledge about agronomic practices of aerobic rice cultivation (N= 120)

Agronomic practice	No.	(%)
Field preparation	95	(79.16)
Type of soil	63	(52.50)
Time of owing	43	(35.83)
Depth of sowing of seed	48	(40.00)
Chemical for seed treatment	92	(76.66)
Seed rate	96	(80.00)
Suitable variety	110	(91.66)
Irrigation interval	98	(81.66)
Weed management	92	(76.66)
Management of volunteer seed	35	(29.16)
Last date of irrigation	81	(67.50)

level of the farmers with respect to various aspects of aerobic rice cultivation practices. Aerobic rice is water management technique and it has been sown in medium to heavy textured soil. About 79.00 per cent of the farmers had complete knowledge about field preparation like laser land leveling and field preparation by ploughing with disc harrow and cultivator. Again 52.50 per cent of the farmers had complete knowledge about selection of soil. Short duration varieties of paddy and basmati are very suitable for aerobic rice cultivation and figures from table 2 depict that above 90.00 per cent of the farmers had complete knowledge about recommended and most suitable varieties for cultivation. Direct sowing provides an excellent opportunity to enhance water productivity because the fields no longer require continuous flooding. Again above 80.00 per cent and 67.50 per cent farmers had complete knowledge about critical period for irrigation and cut-off date for last irrigation. Success of any crop depends upon its accurate seed rate, its depth of sowing and its time of sowing. It has seen from the data that about 35.00 per cent and 40.00 per cent of the farmers had complete knowledge about time of sowing and depth of sowing of seed of aerobic rice respectively. But more than 76.00 per cent of the farmers had complete knowledge about the chemical used for seed treatment. For getting good yield from direct seeded rice the effective weed management must be needed. Weed can germinate in flushes during early growing stage. A good percentage of the farmers *i.e* 76.66 per cent of the farmers had complete knowledge about management of leafy and broadleaf weed and type of nozzle used to spray the herbicide. Volunteer seed is likely to become a problem especially

if the fields are sown with different rice/basmati variety to the one grown previously, only 29.16 per cent of the farmers had knowledge about the management of the volunteer seed.

Over all knowledge level of direct seeded rice growers : On the basis of observed scores, three categories were devised by using range method. The data in the table 3 show the overall knowledge level of the farmers. More than half of the respondents had medium knowledge level, 15.83 per cent had low knowledge level, whereas 25.84 per cent of the respondents had high knowledge level.

Table 3. Distribution of respondents according to their overall knowledge level towards aerobic rice cultivation (N=120)

Category	Range (Scores)	No.	%
Low	(< 5)	19	15.83
Medium	(5-8)	70	58.33
High	(>8)	31	25.84

Relationship of socio personal characteristics of respondents with their overall knowledge level: Data presented in Table 4 revealed that the characteristics of the farmers such as education, annual Income, innovativeness and risk taking capacity were positively and significantly correlated at 0.01 level of probability with their knowledge regarding aerobic rice cultivation where as operational land holding was positively and significantly correlated at 0.05 level of probability.

Table 4. Relationship of socio personal characteristics of respondents with their overall knowledge level

Characteristics	(r)	t-value
Age	0.144	1.109
Education	0.399	3.317**
Operational land holding	0.312	2.500*
Annual Income	0.328	2.644**
Innovativeness	0.534	4.808**
Risk taking capacity	0.494	4.329**

CONCLUSION

It can be concluded that majority of the aerobic rice cultivators under study area had medium overall knowledge level. This shows that average knowledge level possessed by the respondents. There were some area like, time of sowing, depth of sowing of seed, management of volunteer seed and type of soil in which the respondents had very less knowledge regarding aerobic rice cultivation. So, there is possibility to enhance the knowledge level of the respondents in these areas. More training programmes regarding agronomic practices aerobic rice cultivation should be organized with the objective to enhance the knowledge level of the farmers to sustain rice production in Punjab.

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