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Improved Rice Production Technologies in Uttarakhand Hills :

Inquisitiveness, Reversion, Adoption and Constraints

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ABSTRACT

Rice is one of the important kharif crops of the Uttarakhand. There exists a substantial yield gaps (35-55 %) between yield at research farm and farmers' fields. This study was conducted during kharif 2006 to find out the reasons for such gaps. Eleven recommended rice production technologies were tested in six villages for studying the extent of adoption and reversion. Results showed that farmers were inquisitive for high grain and straw yield, lodging resistant, good threshing ability, early to medium duration in a new rice variety. The main reasons for reversion were lack of timely and adequate availability of seeds of desired variety. Majority of the farmers (55.6 %) were medium level adopters. Among technologies, full scale adoption of organic manure was highest (86.7%) followed by line sowing (80.0%), seed rate (63.3%) and fertilizer application (53.3%). Major constraints in adoption were non-availability of quality seeds, lack of motivation for new technology, frequent subsidy in form of inputs, and lack of proper marketing facilities. Suitable strategies need to be worked out to make farmers high adopters of the technologies. Besides, factors responsible for reversion and constraints need to be addressed for sustaining adoption of rice production technologies. This will help in enhancing the rice production in the region, which would, in turn, impart livelihood security and reduce migration of the farmers from hills.

Rice (Oryza sativa L.) is premier crop in terms of caloric contribution to the human diet and monetary value of food production in the developing world. It is grown under the most varied environmental conditions between 55^0N to 35^0S latitudes. Rice is primary staple food for more than 3.26 billion people (half of the total global population of 6.46 billion) of the world. During 2005, about 618 million tonnes of rough rice was produced from 154 million hectares (about 13 % of the total arable land) of land with the average productivity of 4000 kg/ha (FAOSTAT 2005). During same period, the area, production and productivity of rough rice in India was 43.0 million hectares, 129 million tonnes, and 3000 kg/ha, respectively.

In India, total area under hill rice is about 1.8-2.0 million ha, out of which 0.63 million ha area is in North-Western Himalaya, producing about 1.18 million tonnes of rice. The North-eastern and North-western hill states share about 1.89 per cent and 1.42 per cent of rice area and 1.65 per cent and 1.23 per cent of production of the country (FAI, 2006). The rice is the most important kharif crop for the NW hills covering the states of Uttarakhand, Himachal Pradesh and Jammu & Kashmir. Rice occupies a distinct position and well defined role in the food and nutritional security of tribal, backward and hilly areas because it provides access to sufficient food for livelihood at household level. In Uttarakhand, under rainfed upland system, rice is cultivated as spring-sown Chetaki Dhan and Kharif sown mainly in terrace fields constructed on slopes of mid and high hills. Spring rice is sown in last week of March or first week of April and harvested by end of September. Kharif sown rice is grown from May/ June to October. There are many varieties developed by Vivekananda Parvatiya Krishi Anusandhan Sansthan (VPKAS) and other organizations along with suitable

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package of practices for getting better yields at the farmers' fields.

Several studies have indicated that the adoption of recommended rice technology gives high yields and income to the farmers. Higher rice production can be achieved by adoption of recommended technologies by the large number of farmers (Thyagrajan, 2004). It has been observed that recommended rice technologies are not accepted by the farmers at a time and also to full extent. In this context, the study was conducted with the objectives to enumerate inquisitiveness of the farmers, to measure the extent of adoption of improved rice production technologies (IRPT) and investigate the relationship between socio-economic characteristics with the adoption, ascertain the reasons for reversion, and delineate the constraints perceived by the farmers.

METHODOLOGY

Locale of the study: This study was conducted during Kharif 2006 in the institute-adopted villages viz., Tunakote, Tipola, and Chapad (Almora district), Simalkha, Dolkot and Gairkhal (Nainital district) of Uttarakhand. These villages were adopted under DBT sponsored project. Though, major emphasis of the project was on the off-season vegetables, but other technologies developed by the institute were also provided to the adopted farmers for their acceptance and adoption. The study area represents valley conditions with sufficient water availability and suitable crop growing conditions.

Data collection and analysis: An extensive survey was conducted in the adopted villages. A sample of 90 rice growers was drawn from the adopted villages using proportionate random sampling technique. Based on the expert's opinion, eleven recommended rice production technologies were selected for studying the extent of adoption and reasons for reversion by the farmers. All the selected farmers were interviewed personally using a well-structured interview schedule. An adoption index (Obtained score*100/ Max. attainable score) was developed on the basis of which the respondents were categorized into low, medium and high level adopters. For analysis of collected data, descriptive statistics (frequency and percentage) was used. The multiple regression model used to know the effect of different attributes of adoption.

$$Y = a + b\ x1 + x2 + x3 + x4 + \ldots\ldots\ldots + x10 + u1$$

Where, Y= dependent variable

X_1 to X_{10} = independent variables

RESULTS AND DISCUSSION

Socio-economic profile of the rice growers

In order to know the background and socio-economic status of the respondents, it is important to analyze these characteristics. In all 10 socio-economic variables were studied using appropriate tools. The analyzed data showed that majority (68.00 %) of the respondents were from middle-age group (31-50 years). The maximum proportions of the respondents (48.59 %) were educated upto X^{th} class, whereas 35.11 per cent were Undergraduate & above and only 16.30 per cent were illiterate. Majority (62.00 %) of the rice growers were operating in smaller holding (1.10 to 2.4 acres) and 28.00 percent of them in marginal holdings (upto 1.0 acres). Majority of the respondents (69.00 %) had medium level of farming experiences (3 -5 years). The maximum proportions of the respondents (49.30 %) were having middle-level of annual income (Rs. 9100 to 20000) followed by 35.42 per cent low income (< Rs. 9100) and 15.28 percent high annual income (> Rs. 20000). About three-fourth (76.51 %) of the respondents had medium level of economic motivation. A large majority (94.35 %) of the respondents was participated in one organization and 59.00 percent were members in more than two organization. Regarding extension contacts, majority (65.89 %) of the respondents had medium level of extension contacts. Majority (59.62 %) of the respondents had medium exposure of mass media. Majority of the respondents (58.75 %) possessed two to four farm implements, followed by 30.00 percent (above four farm implements).

Inquisitiveness of hill farmers apropos IRPT

Inquisitiveness has been defined as - the disposition to seek explanation and information; curiosity to learn what is unknown; esp., uncontrolled and impertinent curiosity (Cassidy, 1913).

It is important for the scientists to identify the aspects of the rice production technologies about which majority of farmers are curious to know. On the basis of these points, exhibition and other extension materials should be prepared so that the farmers could be benefited maximum within the short time period. In this study, the inquisitiveness was studied in two forms:

(I) **Varieties:** In general, hill farmers use their own two to three years old seeds due to lack of seed availability and for reducing risks of environmental variations. Farmers try to clear following points in a newly developed rice variety-

(a) High grain & straw yield

(b) Lodging resistant

(c) Easy threshing ability

(d) Early/medium duration

(II) **Package of practices:** Due to rainfed conditions, though rice growers are curious about the suitable package of practices recommended by the scientists. But, most of the cases they modify the agronomic practices as per their growing conditions.

Correlates of adoption

With the assumption that adoption is influenced by various socio-economic characteristics of the respondents, the relationship of various socio-economic variables with the adoption of IRPT among respondents, Pearson product moment correlation coefficient 'r' was computed and compared. The results are presented in Table 1.

From the data depicted in Table 1, it is clear that correlation coefficients of seven variables viz., age, education, land holding, farming experiences, annual income, extension contacts and mass media exposure were significant at 0.01 level of probability with adoption of IRPT. Among these, only age was found negatively correlated which infers that young growers had higher adoption score than old-aged growers.

It is clear from the above findings that there were significant correlations between majority of the characteristics of respondents and the extent of adoption of IRPT. The variables showing positive and significant relationship need greater attention on the part of extension agency to enhance the adoption of IRPT in the area.

Effect of farmers' attributes on adoption

The data depicted in Table 2 shows that the model used in the study fits well. As R square value is 0.82 which indicates that 82.0 variability in dependent variable (i.e. adoption) is contributed by the independent variables. Moreover, F test of the analysis is also highly significant (22.46) at 0.01 level of probability showing the fitness of the model. Coefficient of the age, land holdings, farm experiences and available farm implements were highly significant showing the magnitude of these variables affecting adoption. Extension contacts and annual income were significant at 5% level of significance. In this model six, out of ten variables are affecting the model positively and significantly except age which has negative coefficient. This is obvious also as the age increases, rate of adoption decreases.

Overall extent of adoption of IRPT

The extent of adoption in respect of improved rice production technologies was studied by adding individual scores received on different practices. On the basis of the total score, they were categorized into three categories and the results are presented in Table 3. The data shows that majority of the respondents (55.55 %) were had medium level of adoption of improved rice production technologies. A negligible percentage of the respondents i.e. 26.67 per cent and 17.78 had low and high adoption level respectively. The results suggests a need for greater extension effort to provide know how of the improved rice production to the respondents so that their adoption level is enhanced. Moreover, it was observed that farmers with more economic resources and extension agents' contact were able to adopt more production technologies than others.

Technology-wise extent of adoption

In order to ascertain extent of adoption of the improved rice production technologies, the responses of respondents were collected on 11 selected technologies (Table 4). Technology-wise responses were categorized into three levels of adoption i.e. full (score 4), partial (score 2) and nil adoption (score 0).

Organic manure application: Majority of the farmers (86.67%) fully adopted organic manure application for their rice cultivation. Limited supply and availability of the chemical fertilizers to the farmers was the main reason for such high rate of adoption. However, it was observed that though partial (10.0 %) and non-adopters (3.33 %) were also convinced, but the non-availability of the organic manures in their areas was the reason for their low/non-adoption.

Line sowing: Majority of the farmers (80.0 %) fully adopted the line sowing practice in rice cultivation, though they perceived it more labour intensive and time consuming. But they are convinced with the benefits of line sowing specially in weed and pest management. Only limited proportions of the rice growers' i.e.13.33 % and 6.67 % were partial and non-adopters of the technology which was mainly due to their poor economic conditions and scanty labour availability in their situation.

Appropriate seed rate: It was adopted by 63.33 percent of the rice growers in the study area. Moreover, the partial (22.22 %) and non-adopters (14.44 %) were also convinced with the technology but to minimize risks of re-sowing and poor germination due to low soil moisture, they

are using higher (1.5 -2 times) seeds than recommended seed rate.

High yielding varieties: Majority of the respondents (51.11%) fully adopted the high yielding variety seeds in their cultivation. On the other hand, considerable proportions (37.78%) were partial adopters and 11.11 percent were non-adopters. Actually these growers were using their local varieties due to unavailability of HYVs and also to reduce environmental risks. In fact, these growers were low risk takers.

Age of seedlings: This is very important aspect in transplanted rice cultivation. In fact, it's a determinant for rice yield. Majority (52.22%) of the respondents fully adopted the recommended age of seedlings i.e. 21-30 days. Though, 36.67 and 11.11 percent of the rice growers are partial and non-adopters of the technology. The non-adopters were mostly ignorant and had less interested in scientific farming.

Besides, farmers have adopted the other recommended rice technologies also, but their proportion is still below 50 percent, and is a matter of concern for the scientists. Suitable strategies could be worked out for further motivating the farmers for adopting the other recommended rice technologies for enhancing rice production and productivity.

Reversion of the IRPT:

Rice has been a major kharif crops in Uttarakhand hills. It was very interesting to find out the reason for the reversion of the rice production technologies previously accepted by the farmers. There were several reasons, out of which major reasons are being listed below.

- Unavailability of the quality seeds of high yielding varieties
- Unable to visualize the benefits of the new production techniques
- Engaged in subsistence farming
- Doubtful about the better performance of the new technologies
- Erratic climatic conditions accelerates reversion
- Shifting from cereal based farming to vegetable farming

Constraints in the adoption of IRPT:

Constraints are the hindrances in the adoption of the recommended improved technologies at the farmers' fields. In this study, constraints have been categorized in four group viz., production, technological, socio-economic and institutional and presented in Table 5.

I. Production: Non-availability of high yielding variety seeds was found the most important constraint reported by 91.11 percent of the respondents and ranked first. High yielding variety seeds were not available in time and adequate quantity to fulfill their needs. Fragile and diverse climatic conditions were second most important production constraint told by 83.33 percent of the respondents. Heavy weed infestation was reported by 76.60 percent respondents as a constraint in rice production. High cost of HYV seeds was expressed as a constraint by 64.44 percent of the respondents.

II. Technological: Less motivation for new rice production technologies as major constraint was expressed by 87.78 percent of the respondents and ranked first. This may be due to the fact that farmers are practicing subsistence farming and not commercial farming. Non-availability of the desired rice technologies in the remote villages was mentioned by 77.80 percent of the respondents and ranked second. Complexity of the improved practices ranked as the third important constraint by the 70.0 percent of the respondents. In fact, respondents thought that adoption of new practices required specialized skills, new implements and more labour. Though, lack of awareness and knowledge about certain improved rice technologies was the constraint for 64.44 percent of the respondents.

III. Socio-economic: Poor investment capacity was major constraint in the adoption of new rice technologies as expressed by the 78.89 percent of the respondents. Scarcity of the labour for agricultural operations due to regular migration as a constraint was reported by 74.44 percent of the respondents. However, small and scattered land as a constraint was mentioned by 67.78 percent farmers. In addition, old-aged persons' involvement and desire for free inputs were also constraints as accepted by 63.33 and 53.33 percent of the respondents, respectively.

IV. Institutional: Besides production, technological and socio-economic constraints, some institutional constraints were also identified and are being discussed. Lack of proper marketing facilities was utmost important constraint as expressed by the majority (92.22 %) of the respondents. Weak extension services at the village level were reported by 86.67 percent of the respondents. Costly transportation facilities and insufficient communication networks were expressed by 76.67 and 63.33 percent of the respondents, respectively.

CONCLUSION

On the basis of afore-said discussions, it is clear that farmers are inquisitive about new variety than agronomic practices. However, agronomic practices also play important role in yield enhancement but due to rainfed farming, farmers are unable to realize it properly. The reversion of the rice technology was mainly due to non-availability of the concerned technology well on time and adequate quantity. Majority of the farmers are medium adopters which could be converted into high adopters. The constraints faced by the hill farmers should be taken care by the extension machinery operational in hills so that farmers could easily adopt the recommended rice production technology and can enhance their income.

The findings of this study are highly useful for the rice breeders as they can include the selected parameters in their breeding programme. Besides, extension worker and change agents can take care of the factors affecting adoption and can try for reducing the constraints faced by the farmers. Moreover, higher adoption of the rice technology will enhance the production, which in turn it will lead to the sustainable livelihood and improved quality of life of the rural hill farmers. Ultimately, this may help in reducing migration of the people from hills to plains in the search of employment and livelihood.

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