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Performance of 60-day Cowpea in the Fields of Uttarakhand Farmers: An Adoption Study

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ABSTRACT

Farmer participatory trials of Pant Lobia 1, 2 &3 varieties of '60-days cowpea' were conducted on 236 farms in Uttarakhand and it was found through interviews and focused group discussions conducted on farmers' fields that 60-day cowpea was short duration variety. Pant lobia 2 was more accepted as vegetable. Farmers had adopted simple practices like sowing time and method; harvesting and storage; selection and preparation of field and selection of variety. But important practices involving skills like weeding, disease and insect and pest management; seed treatment, fertilizer and nutrient management and irrigation were adopted by relatively less percentage of farmers. Majority of farmers had medium level of adoption of cowpea production technology and faced constraints like lack of knowledge about plant protection measures. Problem of land fragmentation was more severe in hills as compared to plains where prevalence of pests and diseases was more. It is implied that cooperative farming should be done in hills and specialized one day trainings can be organized by extension agencies on specific problems

Keywords: Performance, cowpea, uttarakhand, adoption

INTRODUCTION

Majority of the Indian people are vegetarian and they depend primarily upon grain legumes for dietary protein. Unfortunately, the production of grain legumes in India remained stagnant since 1950 causing declining per capita availability and widespread malnutrition. This is because most of the good lands have gone to the green revolution led 'wheat-rice' and 'rice-rice' cropping systems and food legumes have been pushed to marginal lands. Also, the traditional food legume varieties are late maturing with low yield potential. As a result of this, there is prevalence of inadequate protein and minerals in the diets of rural and urban masses on one hand and imbalanced soil fertility due to cereal – cereal rotation on the other hand. Therefore increased cultivation of pulses is the need of the hour in a country like India. Now, the major challenge of agricultural research in India is to achieve increased cultivation of pulses with limited land.

The only answer to this is to breed and cultivate short duration food legumes in the existing niches between cereals – cereal systems. Wheat is harvested in March – April and rice is transplanted in July leaving about 80 - 90 days gap in which a short duration food legume can be grown. A number of photo-insensitive and heat tolerant '60-day cowpea' varieties were developed by the International Institute of Tropical Agriculture (IITA) with the support of Harvest Plus Project of Consultative Group on International Agriculture (CGIAR). This project became operational from March 2007 with the objective to multiply seeds of selected improved '60-day' cowpea varieties, to conduct farmer participatory on – farm trials and then to disseminate improved cowpea production, storage and utilization technologies.

It is generally highlighted that the technologies at research stations should have farming system perspective and should be need based. Keeping this in view, the Harvest plus Project of CGIAR aimed at breeding and cultivating short duration food legumes in the existing niches between cereal-cereal systems. In Uttarakhand, rice and wheat being the major cereal crops, have rice – wheat cropping systems. In the beginning of the project in the year 2008, on-farm participatory trials were conducted with the farmers. It is often observed that despite active involvement of the research and extension scientists, the expected results in crop production could not be achieved and there exists a wide gap in productivity between the highest yields recorded at the research farm and those representing the mean performance. Information revolution has taken big strides and it is not only production of knowledge but distribution of knowledge and its adoption that is even more important.

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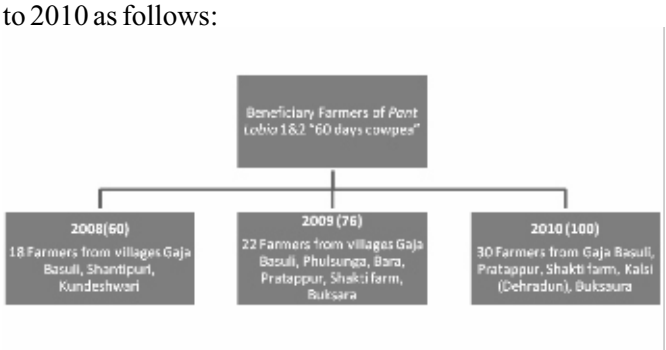
In this context, it is necessary to study the adoption pattern of '60 days cowpea' and also it is deemed important to find out those attributes of '60-day cowpea' which attract the ultimate users of the technology to go for it. It is but natural that farmers come across some impediments in adoption of a technology only when they adopt it, so it becomes all the more important to identify the constraints associated with adoption at the farmers' field.

Thus, the present study was carried out with the following objectives' to find out the attributes of '60 – days cowpea' as perceived by the farmers, to study the adoption level of the '60 – day cowpea' by the farmers, to identify the constraints faced by the farmers in adoption of '60-day cowpea' and to suggest strategies for refining the technology of '60-days cowpea'

METHODOLOGY

For the purpose of the study, a sample of 70 farmers was selected from among the 236 farmers who were benefitted from farmer participatory trials of Pant Lobia 1, 2 &3 varieties of '60-day cowpea' by the scientists of those farmers on whose farms the participatory trials have been conducted by the scientists of Govind Ballabh Pant University of Agriculture and Technology, Pantnagar at last three years prior to the study *i.e.* till 2010. The sample was selected through Probability Proportional to Size (PPS) method from among the farmers who were beneficiaries of 2008 (60 no.), 2009 (76 no.) and 2010 (100). Thus, a sample of 70 (30%) farmers was selected from among the beneficiary farmers from the years 2008 to 2010 as follows:



Interview methods were used for data collection. Semi- structured interview schedule and adoption scale was prepared for the purpose of data collection along with focused group discussions to extract the exact information from the farmers who were beneficiaries of the farmer participatory trials of 60- day cowpea (Pant lobia 1, 2 &3) of the Harvest Plus project of the CGIAR at Uttarakhand. Data were collected personally by the investigator.

RESULTS AND DISCUSSION

Based on the objectives set forth, the findings of the present study are presented in this section in the form of analysis of the data, interpretation of results and their discussion.

Majority of the farmers were either middle or old age groups, were men, educated upto high school, were having agriculture as main occupation and animal husbandry as subsidiary occupation, had low annual income upto ₹ 63,000/-, had marginal land holding. Majority of the farmers of Uttarakhand under study were having both subsistence and commercial farming. It is very important and need of the hour that farmers go in for commercial farming along with subsistence because it is high time the farmers consider agriculture as a vocation.

According to Rogers, (1995) the perceived attributes of an innovation are one important explanation of the rate of adoption of an innovation. Most of variance in the rate of adoption of innovation ranges from 49-87 per cent is explained by five attributes: relative advantage, compatibility, complexity, triability and observability. In the present study, there were three varieties of cowpea introduced to the farmers' i. e. Pant Lobia1, Pant Lobia2 and Pant Lobia3 but the field level acceptability of the first two varieties was more so these were only studied. Out of these two, it was found that Pant Lobia 1 which is a white coloured variety was more preferred as a pulse whereas the red coloured Pant Lobia 2 was used for vegetable. The attributes of the 60-days cowpea as perceived by the farmers is discussed as given below:

Relative advantage: Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes. The degree of relative advantage is often expressed as economic profitability, social prestige or other benefits. The relative advantage that the farmers experienced in adopting these Pant Lobia varieties are that it is a short term 60 days variety which can be used in the slack period as a niche crop in rice – wheat cropping system.

This variety was reported to be insect – pest resistant, can be used as seed for coming 2-3 years, high market rate and good taste. It can be concluded that here the relative advantage is expressed as economic profitability and other benefits like insect – pest resistance and taste. Also, the farmers' indigenous variety of cowpea that they were growing was 90 days variety and this is a short duration variety which is no doubt beneficial to them.

Compatibility: This is the degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters. An idea that is more compatible is less uncertain to the potential adopter and fits more closely with the individual's life situation. Thus, an innovation can be compatible or incompatible with socio-cultural values and beliefs, previously introduced ideas or with client needs for the innovation. As far as this aspect of 60–days cowpea is concerned, Pant Lobia 1 had small pods so did not have much acceptability in the vegetable market whereas, Pant Lobia 2 was more accepted due to long pods and more seeds. The seeds were either procured from the nearby University *i.e.* Govind Ballabh Pant University of Agriculture and Technology or own seeds and they also got in time and their demand of seed was fulfilled.

Complexity: This is the degree to which an innovation is perceived as relatively difficult to understand and use. Any new idea may be classified on the complexity – simplicity continuum. The more complex an innovation is, there are less chances of it being adopted. Here, Pant Lobia 1 and 2 were adopted by the farmers as there was no feature of difficulty associated with the package of practices but it was only in terms of maintaining the recommended spacing that the farmers expressed: for example; line – to – line sowing was identified as a more time consuming task and had lack of technical know-how regarding sowing and on top of that the cowpea growers also found this task labour intensive as they were not in practice of line sowing.

Triability: It is the degree to which an innovation may be experimented on a limited basis. Those innovations which are divisible and can be tried on a small scale have more chances of being adopted rapidly as giving a trial is a means to dispel uncertainly regarding new idea. Here, cowpea Pant Lobia 1 and 2 were tried by the farmers on a small scale such as one bigha (0.17 acre) and after they were satisfied with the variety, they adopted it. About 62 per cent had tried whereas the rest 38 per cent of them had just adopted by seeing other trials. In the beginning, the farmers had tried this variety in their kitchen garden or fallow place.

Observability: This is the degree to which the results of an innovation are visible to others. In the present study, the most trusted sources of information were friends and relatives and the farmers found observable results in the fields of their fellow farmers regarding results of 60–day's cowpea which motivated them to adopt the same.
Thus, regarding the attributes of 60 – days cowpea, it was found that majority of farmers found the variety to be at a relative advantage than the existing variety. It was compatible to them due to long pods, was tried by them on a small scale, the results of which were also visible on one farm were visible to others. This eased the adoption process. At the same time, some amount of complexity was observed by the farmers such as line sowing which was a part of package of practices of 60 – day's cowpea but not a part of their culture. It is concluded that those practices which are not part of their previous operations, if told to adopt; farmers find it difficult.

Table 1: Distribution of farmers according to adoption level of '60 – day cowpea' production technology

Adoption level	No. of farmers (n=70)
Low (1-9)	12 (17.15%)
Medium (10-17)	48 (68.57%)
High (18-34)	10 (14.28%)

Adoption level of 60 – day's cowpea by the farmers

Adoption is a decision taken by an individual to practice the innovation as advocated or designed by the research and development agencies in its full form. Lionberger (1965) defined adoption as the integration of an innovation in farmers' ongoing operation through repeated and continuous use. Adoption may be continued use by an individual or a group of recommended idea or practice over reasonably long period of time. For the present study, it refers to acceptance and practicing the recommended practice of "60-days cowpea". For this, adoption scale was developed by the investigator with the help of research scientists in the field of cowpea and agricultural extension. Total questions included to test the adoption pattern of the respondents were 34 practices. So, the maximum possible score was 34 and minimum was zero.

Table 2: Distribution of farmers according to adoption level of different practices in cowpea production technology

Operations in Cowpea production technology	Adoption level of farmers (n=70)	
	No. of sub - items	Adoption
Selection & preparation of field	5	54.06%
Fertilizers & Nutrient	5	34.69%
Selection of Variety	1	51.56%
Sowing time & sowing method	5	75.31%
Seed treatment	3	3.15%
Weed Management	4	37.50%
Disease management	2	35.15%
Insect & pest management	4	3.90%
Irrigation	1	25.00%
Harvesting & Storage	3	62.50%

It is clearly indicated in Table 2 that majority (68.57%) of the farmers had medium level of adoption of cowpea production technology followed by low (17.15%)

and high (14.28%). Table 2 further makes the picture clear stating that majority of the farmers (75.31%) had adopted sowing time and sowing method followed by farmers harvesting and storage (62.50%), selection and preparation of field (54.06%), selection of variety (51.31%), weed management (37.50%), disease management (35.15%), fertilizer and nutrient management (34.69%), irrigation (25%), insect and pest management (3.90%) and seed treatment (3.15%).

Thus, it is indicated that farmers had adopted simple practices like sowing time and method; harvesting and storage; selection and preparation of field and selection of variety. But important practices involving skills like weed, disease and insect & pest management; seed treatment, fertilizer and nutrient management and irrigation were adopted by relatively less percentage of farmers. These findings are similar to the findings of Meti et. al. (1997), Shinde *et. al.* (1997), Kubde *et. al.* (1999), Singh (2001), Bhimawat and Gupta (2005) and Chand (2006) who found that majority of farmers had medium level of adoption and the adoption level was high in practices like recommended seed variety, seed treatment, chemical fertilizer application, pest and disease management.

Constraints faced by the farmers in adoption of 60 days cow pea

Constraints have been operationally defined as problems or difficulties encountered with the adoption of recommended production technology for Pant lobia cowpea. Questions were asked to the respondents to elicit their responses whether they encounter problems or difficulties or not. The frequency and percentage of each of the constraints encountered by the respondents were then worked out. All the possible constraints were divided into six headings, namely: Input constraints, technical constraints, economical constraints, fragmentation of land, irregularity of rainfall and insect and disease infestation.

Table 3: Distribution of farmers according to constraints faced in adoption of recommended cowpea production technology

Constraints	Number of farmers (N=70)
Input Constraints	
Unavailability of recommended variety	27 (38.57%)
Unavailability of FYM or compost	14 (20%)
Unavailability of bio fertilizers	20 (28.57%)
Unavailability of plant protection equipment	13 (18.57%)
Lack of market & transport facility	26 (37.14%)
Unavailability of credit	08 (11.42%)
Technical Constraints	
Recommended space maintenance is time consuming & labour intensive	36 (51.42%)
Lack of knowledge about seed rate of cowpea	17 (24.28%)
Lack of knowledge about use of bio fertilizer	38 (54.28%)
Lack of knowledge about right time of sowing	04 (5.71%)
Lack of knowledge about use of fertilizers	29 (41.42%)
Lack of knowledge about weedicides	47 (67.14%)
Lack of knowledge about plant protection measures	48 (68.57%)
Economic Constraints	
High cost of seeds	46 (65.71%)
High cost of fertilizers	55 (78.57%)
High cost of chemicals used in plant protection	54 (77.14%)
High cost of plant protection equipment	41 (58.57%)
High cost of labour	15 (21.42%)
Fragmentation of land	43 (61.42%)
Irregularity of rainfall	64 (91.42%)
Insect and disease infestation	58 (82.86%)

Table 3 indicated that the major input constraints were unavailability of recommended variety (38.57%) and lack of market and transport facility (37.14%). There was no proper shop for recommended seed in local market and except the university scientists or farmers own seeds there was no source available. These findings can be supported by Nirmal *et. al.* (1995), Rao *et. al.* (1995), Jain (2001), and Kadam *et. al.* (2003) that non availability of improved seed, lack of marketing facilities and poor transport and unavailability of bio fertilizer were the major constraints.

To address this problem, the agricultural university meant for catering to the need of the farmers of this region through Krishi Vigyan Kendras can provide recommended variety with government assistance. Lack of market and transport facility was another major constraint but the severity of this problem was more in hill villages as compared to villages in plains. Hill villages are poorly connected with road and very remote from the district market. The transportation cost in hill villages was also high.

Therefore they have to sell their produce to middlemen in which price decided by middleman is generally less than the wholesale market. To overcome this problem, government can purchase the produce directly from farmers. Farm produce of small farmers is required to be purchased by government agency at appropriate price. None of the farmers faced constraints regarding lack of storage facility because most of the farmers told that there was no damage to seed by any insect or pest during storage and viability remains good.

Table 3 revealed that in technical constraints, major constraints were lack of knowledge about plant protection measures (68.57%) followed by lack of knowledge about weedicides (67.14%), recommended space maintenance is time consuming & labour intensive (51.52%) and lack of knowledge about use of bio – fertilizers (54.28%). It indicates that most of the farmers were unaware about different operations in cowpea cropping period. Most of the farmers of Uttarakhand were following their traditional practices of cultivation of cowpea. These findings are identical to the findings of Dholes (1995), Dolli *et. al.* (1995), Ingale *et. al.* (1995), Nirmal *et. al.* (1995), Jahagirdar and Sundaraswamy (2002), Bagle *et. al* (2003) and Shinde *et. al.* (2003) who found that majority of the farmers reported constraints in lack of knowledge about improved practices.

To overcome these problems, university scientists, KVK staff should arrange campaigns, meetings and demonstrations of '60–days cowpea' along with the ongoing project.

The major constraints reported by the farmers in the area of economic constraints were high cost of fertilizers (78.57%) followed by high cost of chemicals used in plant protection (77.14%), high cost of seeds (65.71%) and high cost of plant protection equipments (58.57%). It reveals that high cost of crucial inputs like seed; fertilizer, plant protection chemicals and plant protection equipment were serious constraints in adoption of recommended technology. Though nitrogenous fertilizers mainly urea and sometimes di ammonium phosphate (DAP) were provided by cooperative society at cheaper rate but they were available in small quantities. Phosphate (P) and potash (K) fertilizers were not available in cooperative society. Therefore, farmers had to buy fertilizers from open market which was costing them more. Problem of high cost of chemicals like pesticides, fungicides and herbicides was more prevalent. In all the villages, occurrence of pest, disease and weed was more. But, still farmers were not practicing these measures due to high cost of chemicals and inadequate knowledge regarding recommended plant protection measures. These findings are similar to that of Joshi (1986), Dolli *et. al.* (1995), Jain (2001), Ranish *et. al.* (2001), Jahagirdar and Sundaraswamy (2002), Bagle *et. al.* (2003) and Sharma and Sharma (2003) who found that high cost of seeds, fertilizers and pesticides were the major constraints.

To overcome these problems seeds, fertilizers, plant protection chemicals and equipments should be made available to cooperative society at a cheaper rate by the government or government can make the policies to subsidize the prices of agricultural inputs. Also, self help groups could be another answer to it through which expensive equipments can be brought and be used by poor farmers as well as they can be members of those groups.

Perusal of table 3 clearly depicts that 61.42 per cent farmers had problem regarding fragmentation of land. But problem of land fragmentation was more serious in hill villages of Uttarakhand where majority of the farmers had small and marginal land holdings. The land in hill villages was fragmented in very small pieces around the village in such a way that mechanization of farm was not possible. Even it is difficult to perform bullock drawn operations. This finding can be supported by the study conducted by Sumarno (2000) who found that the smallness of farm size was major constraint faced by farmers.

A high majority of the farmers were experiencing the problem regarding irregularity of rainfall. It is revealed that irregularity of rainfall was the topmost constraint faced by farmers in cowpea cultivation. Pant lobia varieties were mainly grown by the villagers under study as a kharif crop in rain-fed conditions so the monsoon decides success and failure of crop. As the monsoon rain is erratic and irregular in the cowpea cropping season, which was causing great damage to cowpea crop during its growth, flower to pod development and finally in yield of crop. The low lying areas in plains were having irrigation facility but these facilities were irregular. Also, in hill village fields which were located on higher side were totally dependent upon rain. They did not have any irrigation facility. This finding has conformity with that of Soni and Chauhan (1997) and Bagle *et. al.* (2003) who found that problem of long dry spell and erratic rainfall was faced by most of the farmers. To overcome this problem, farmers should arrange proper irrigation facility in time for cowpea crop. Also, government should provide irrigation scheme for the fields which are located on high altitudes.

A high majority (82.86%) of farmers had problem regarding insect and disease infestation. Still when seen village wise, no doubt more number of hill farmers had reported the problem as compared to farmers belonging to plains but this problem was comparatively more severe in plain villages. Also, prevalence of pests like girdle beetle and diseases were more in plain region as compared to hill region. The main reason is that farmers are unaware about what plant protection measures should be taken to control these infestations. These findings are very much in line with that of Joshi (1986), Dolli *et. al.* (1995) and Soni and

Chauhan (1997) who found that majority of farmers faced constraints regarding more infestation by insect –pest and disease.

To address these problems, university scientists, extension personnel and KVK staff should recommend plant protection chemicals according to the availability in the local market. Also these plant protection chemicals should be made available at reasonable rates. Introduction of mobile plant protection clinics by government or some private agencies which would reach the doorsteps of the farmers could be another measure in this regard.

CONCLUSION

While finding out the attributes of the technology, it was found that except complexity, all the attributes were favourable to the farmer that. But it was found that after adopting, there was insect pest problem which is clearly visible in the constraint section. The various reasons are that Uttarakhand farmers are not used to any chemical insecticides or pesticides. They should be trained in this regard that it is essential to use needed dose of pesticides. One more problem was the pods of Pant Lobia 2 were too long, so much that during rainy season in plains, it gets disintegrated with water and becomes useless for the farmers. The planting method should be in high land or it should be given some structures to climb.

It was observed that the adoption of '60-days cowpea' was found at medium level. Still majority of the farmers had not adopted practices like insect pest and disease management, fertilizer and disease management and line sowing. In context to this, it is suggested that farmers should be motivated to adopt the practices of seed treatment by explaining probable benefits of these practices to them. Weed control, pest and disease control must be adopted by them to increase the yield level. It is suggested that farmers should be made aware about these practices and the demonstrations as well as farmers training should be carried out to upgrade the farmers with skill to carry all the operations related to cowpea production technology. In order to achieve this purpose, there is a need of organizing result demonstrations on farmers' field and farm tours should be conducted for the farmers on University Research Stations and farm of progressive cowpea growers to observe the practices under natural setting which will certainly facilitate the dissemination of recommended 60 –days cowpea production technology and will certainly get integrated into the ongoing farming practices by the farmers. Constraint analysis reveals that ignorance of farmers about the recommended cowpea production technology has been observed to be one of the major constraints for non–adoption of practices like plant protection measures, weedicides, use of bio fertilizers, and chemical fertilizers. It is thus implied that the extension agency may arrange method demonstrations to improve skills in application of bio fertilizers, use of weedicides, fungicides and secondly literature on use of bio fertilizer and plant protection may be brought out for the use of cowpea growers. It helps to provide how to knowledge and can be used as a reference for future so that they eliminate the constraints as s result of the use of plant protection measures, fertilizers and bio fertilizers. It is also suggested that line sowing of seed should be brought about as a practice among the farmers and also they should be made aware of the advantages of line sowing as compared to broadcasting which involves wastage of seeds. Small one day training programmes can be carried out by the KVK personnel on line sowing for the farmers of the study area.

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