Research Article

Adoption of Recommended Production Practices of Cardinal Variety of Potato among Potato Growing Farmers in Dadeldhura

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Abstract

The study depicts the livelihood of potato growers and level of adoption of recommended production practices of cardinal variety of potato at farm level. Data were collected from 60 randomly selected potato growers of Amargadhi municipality and Ganyepdhura rural municipality using semi structured interview schedule. Study showed that average land holdings of the respondents was 8.6 ropani and 100% of respondents were using improved varieties of potato but 35% of them had not adopted recommended seed rate and spacing in potato cultivation. It was found that 36.7% of respondents had taken training on potato cultivation techniques. The majority of respondents (73.3%) were cultivating cardinal variety of potato followed by desire. Study revealed that 35% of the respondents were not using chemical fertilizers in potato cultivation. Research site had severe problem of diseases and insect pest but only 51.7% of them were using insecticides and pesticides. The area had a problem of late blight disease and red ant. Only 13.3% of the respondents had irrigation facilities and 50% of them irrigate through sprinkler irrigation. The results indicated that only 28.3% of respondents were adopting haulm pulling practices. The research area had a major problem of irrigation followed by disease and insect pest.

Keywords: Adoption; Potato; Cardinal variety; Cultivation Practices

Introduction

Nepal is an agro-based country and as a source of livelihood of majority of the people, agriculture has remained a dominant sector in Nepalese economy from ancient times since it has wide variety of climate and soil on which a large range of the crops can be successfully grown throughout the country. Out of 1,47,181 Sq. Km. of land area of the country, agricultural land occupies approximately 27%. All agricultural land is not used under crop cultivation, it is estimated that about 20% of the total land is under cropping [1]. The land holding is very small with average size of less than 0.8 ha [2], where most of the cultivated crops are cereal crops like paddy, maize, wheat and finger millets, along with variety of vegetable crops and potatoes are grown.

Potato (*Solanum tuberosum*) is one of the important food crop for food security and fourth most important staple crop of Nepal. Potato is used as a major vegetable in the plains and mid-hills and as a staple food in the high hills and mountains. It is one of the major staple food crops and source of income for smallholder farmers in high mountainous region of Nepal [3]. Seed potatoes grown in higher elevations in mountainous region is a major traditional source of seeds for farmers in lower hills and lowland because of their disease free status [4]. According to the recent statistics [5], potato ranks fifth in area coverage (1,97,037 ha), second in quantity of production (25,86,287 tons) and first in productivity (13.1 t/ha) compared with the main staple food crops of rice, maize, wheat and finger millet grown in Nepal. Due to its potentiality and wider adaptability to grow year round in the country, its importance is ever increasing.

It is grown in almost all of Nepal's inhabited geographic regions and contributes significantly in the country's food security and poverty alleviation due to its short vegetative cycle and high cash and food value compared to any other major cereals. Potato is grown in different production systems in diverse land types (upland and lowlands), and agro ecological conditions ranging from lowland terai (100masl) to high mountains up to 4000masl [6]. Its contribution in AGDP has been estimated at 6.4% and its contribution in GDP is 2.17% [7]. Nepal annually produces well over 2.6 million tons of potato from 1,97,000 hectares of land. The resulting

average yield of 13.1 t/ha is very low compared to the world average and to the neighboring countries such as China and India. However, the potential and attainable yields are much higher than this.

The trend of increase in potato productivity in Nepal from the year 2011/12 to 2015/16 is from 13.58Mt/ha to 14.03Mt/ha (MOAD, 2015/16). Above data shows that there is very low shift in the potato productivity. It shows that potato production in Nepal is not satisfactory. The total import of fresh potato in Nepal from India in the year 2014-15 worth 54.19 in USD million (Source: D/O commerce). India is the top potato exporting country to Nepal. Even farmers are using improved varieties in potato production, their productivity in farm level is still much lower than the production potential of their varieties.

Keeping all these factors in consideration the study was undertaken to determine the level of adoption of recommended production practices of cardinal variety of potato, identify the factors influencing the adoption of recommended potato production practices and recognize the problems of potato production.

Methodology

Sample size and sampling techniques

Study was conducted in ward no.1 of Amargadhi municipality and Ganyepdhura rural municipality. Both Amargadhi municipality and Ganyepdhura rural municipality are located in eastern part of Dadeldhura. The research site was purposively selected on the basis of area under potato zone, famous for potato production, one of the areas where recommended production practices had been introduced and so on. Study was carried out randomly taking 30 respondents among 255 potato growers from Amargadhi-1 and 30 respondents among 280 potato growers from Ganyepdhura-1.

Method of data collection

Primary data were collected using semi-structured interview schedule. These data were supplemented and verified by the data collected through Focus Group Discussion (FGD) and Key Informant Interview (KII). Secondary data were obtained from DADO annual reports, newsletters, bulletins and relevant articles, Department of Agriculture, Ministry of Agriculture and Cooperatives (MOAC).

Data analytical techniques

The obtained data was systematically arranged. Codes were designed and units were standardized wherever necessary before entering the data. Various analytical software was utilized for the analysis of the data obtained. SPSS, MS-EXCEL was used to get the analyzed result.

Chi-square test was done to study whether two variables were independent or associated with each other.

$$\chi^2 = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

Where, χ^2=Chi-square value

O_ij = observed frequency of each ij^{th} term

E_ij= indicates expected frequency of ij^{th} term

i= 1, 2, 3……….. r

j= 1, 2, 3…………k

This was tested at 0.05 level of probability for different degree of freedom.

Results and Discussions

Adoption of improved potato production technology

Almost all the respondents were adopting improved varieties of potato mainly cardinal and desire in the study area. It was found that majority of the respondents (66.7%) were adopting recommended seed rate while (33.3%) were non adopters. Similarly recommended spacing adopters were (63.3%) in the study area. Recommended dose of micronutrients adopters were (23.3%) only. Study showed that only (28.3%) of the respondents were adopting haulm pulling practices in potato while others were non-adopters.

Potato production practices	Adopters %	Non adopters %
Improved varieties	100	0
Seed rate	66.7	33.3
Spacing	63.3	36.7
Micronutrient use	23.3	76.7
Haulm pulling	28.3	71.7

Table 1: Adoption of recommended potato production practices in study area.

Improved potato production practices

Table 2 shows that only 36.7% of the respondents had taken training on potato cultivation practices. 65% of the respondents were using chemical fertilizers in potato production. Chemical fertilizers used were mainly urea, DAP and MOP. Study revealed that only 13.3% of the land in the area had permanent source of irrigation facility.

Table 2 shows that majority of the respondents (98.3%) were having problem of late blight in the research area which may be due to the higher use of sprinkler irrigation and it is supported by

Potato production practices	Percentage (%)
Training	
Received	36.7
Not received	63.3
Chemical fertilizers	
Used	65
Not used	35
Irrigation facility	
Irrigated land	13.3
Non irrigated land	86.7
Disease problems	
Late blight	98.3
Scab	20
Wart	18.3
Viral diseases	6.7
Insect pest problem	
Red ant	65
White grub	55
Potato tuber moth (PTM)	8.3
Aphid	5
Insecticides and pesticides	
Used	52
Not used	48

Table 2: Potato production practices in the study area.

[8] which states that favorable late blight without rain is a factor of sprinkler irrigation. Study showed that (65%) of the respondents were having problem of red ant followed by white grub (55%). Research area had a major problem of irrigation and soil of that area was sandy loam type. So, it might be the reason for high incidence of red ant which is supported by [9] which stated that dry land surface favor population build up which consequently increase their incidence on potato grown in sandy loam soil. Major land area of research site had acidic type of soil (Zone, Dadeldhura). So, it might be the reason for higher incidence of white grub and it is supported by [10] which states that grub number are more in acidic nature of soil.

Although the study area had higher incidence of diseases and insect pest, only 52% of the respondents were using insecticides and pesticides in potato cultivation.

Influence of independent factors on selected recommended potato production practices

Association between educational status and adoption level

Table 3 shows that association between educational status of respondents and adoption level are statistically significant. It means there is association between educational status of respondents and adoption level. It is expected that farmers education level influence on the adoption of recommended production practices. It is assumed that educated farmers adopt recommended production practices than the non-educated one.

Educational status	Adoption level		Total	Chi square value
	Low and medium adopter	Highly adopter		
Illiterate	13(8.4)	10(14.6)	23(23.0)	
Only read and write	6(4.0)	5(7.0)	11(11.0)	
Less than SLC	1(1.5)	3(2.5)	4(4.0)	12.85***
More than SLC	2(8.1)	20(13.9)	22(22.0)	
Total	22(22.0)	38(38.0)	60(60.0)	

Table 3: Association between educational status of respondents with adoption level is described below:

Figures in parentheses indicates expected frequency

*** denotes significant at 0.01 level of significance

An educated farmer generally absorbs information on new technologies better and faster than non-educated one [11]. For example, In Thailand, farmers with four years of schooling were three times more likely to use new chemical inputs than farmers with one to three years of schooling (world bank, 1991).

Association between training received and adoption level

Table 4 shows that association between training received by respondents and adoption level are statistically significant. It means

there is association between training received by respondents and adoption level. It is expected that trained farmers have greater possibility of adopting recommended potato production practices. It is assumed that training can change the perception level in farmer and they starts to adopt the recommended practices in potato production after training.

Farmers training have strong positive relation with adoption of improved farm practices [12].

Training received	Adoption level			Chi square value
	Low and medium adopters	Highly adopter	Total	
Yes	2 (8.1)	20 (13.1)	38 (38.0)	
No	20 (13.9)	18 (24.1)	22(22.0)	11.37***
Total	22 (22.0)	38 (38.0)	60 (60.0)	

Table 4: Association between trained respondents with the adoption level is described below.

Figures in parentheses indicates expected frequency

*** denotes significant at 0.01 level of significance

Involvement of a literate and educated population in training and farming could increase their understanding of the subject matter, thus increasing the adopters innovations and technologies [13].

Association between annual income from potato and adoption level

Table 5 signifies that association between annual income of respondents from potato and adoption level are statistically significant. It means there is association between annual income of respondents from potato and adoption level.

Income from potato	Adoption level			Chi square Value
	Low and medium adopter	Highly adopter	Total	
Less than 17,000	3(2.6)	4(4.4)	7(7.0)	
17,000-1,06,000	19(16.1)	25(27.9)	44(44.0)	
More than 1,06,000	0(3.3)	9(5.7)	9(9.0)	6.13**
Total	22(22.0)	38(38.0)	60(60.0)	

Table 5: Association between annual income from potato and adoption level is described below:

Figures in parentheses indicates expected frequency

** denotes significant at 0.05 level of significance

There might be positive relationship between annual income with adoption level which is supported by [14] which states that there was a positive and significant association between annual income and extent of adoption of respondents. The reasons might be that the respondents who had more annual income will have good farm machinery, quality of seed and they apply other inputs in appropriate time.

Association between respondents position in a family and adoption level

Table 6 shows that association between respondent position in a family and adoption level are statistically non-significant. It means there is no association between respondent position and adoption level.

Respondents Position	Adoption level		Total	Chi square value
	Low and medium adopter	Highly adopter		
Head	9 (8.4)	14 (14.6)	23 (23.0)	
Member	13 (13.6)	24 (23.4)	37 (37.0)	0.97
Total	22 (22.0)	38 (38.0)	60 (60.0)	

Table 6: Association between respondents position and adoption level is described below:

Figures in parentheses indicates expected frequency

Non Significant at 0.05 level of significance

Problems related to potato cultivation

There are various problems that are encountered by respondents during potato cultivation.

Among them the major problem was problem of irrigation followed by disease and insect pest, wild animals, quality seeds, technical support, marketing, agricultural loan, insecticides/pesticides, chemical fertilizer and storage respectively.

Problems	Index	Rank
Quality seed	0.62	IV
Technical support	0.60	V
Chemical fertilizer	0.23	IX
Insecticides/pesticides	0.26	VIII
Irrigation	0.97	I
Agricultural loan	0.42	VII
Disease and insect pest	0.83	II
Storage	0.15	X
Marketing	0.57	VI
Wild animals	0.74	III

Table 7: Various problems faced by respondents during cultivation.

Conclusion

Based on the study it can be concluded that, all the respondents were adopting improved varieties of potato. Among them majority of respondents were using cardinal variety due to its higher yield and good taste. Majority of them had used recommended seed rate and recommended spacing in potato cultivation. Most of them irrigate through pipe irrigation in the form of sprinkler. Late blight was the major disease in the research area followed by scab and red ant was the major insect in the area followed by white grub. Only 28.3% of the farmers were adopting haulm pulling practices.

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Education level, training received, membership in organizations and family income had significant relationship with adoption level. Similarly, age of the respondents, sex of the respondents and respondent position in family had non-significant relationship with adoption level. The major production problem facing by the farmers of the research area was problem of irrigation followed by problem of disease and insect pests. It was found that there was less problem in storing potato.

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