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RESEARCH ARTICLE

FARMERS' KNOWLEDGE LEVEL AND READINESS IN ADOPTION OF DRAGON FRUIT (*Hylocereus sp.*) IN CHITWAN DISTRICT, NEPAL

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ABSTRACT

Dragon fruit is a new commodity in case of Nepal and any new commodity itself comes with a lot of challenges as well as opportunities. Before rapid commercialization of any commodity, the perception of the farmers regarding the commodity and the knowledge level of the farmers regarding the commodity must be known. Only after identifying the perception of the farmers and underlying problems of the adoption, strategies can be adopted accordingly to solve the problems and uplift the crop. Knowledge level of the farmers regarding Dragon fruit and their readiness in adoption was studied along with it hinderance factors for the adoption of the crop was also identified. Farmers under the pocket area of Dragon fruit formed by the PMAMP, Nepal were taken into the study who hadn't adopted the crop till date. Knowledge index was used to calculate the knowledge level of the farmers regarding the crop and 5-point Likert scale was used for analyzing the readiness level of the farmers towards the adoption of the crop. Majority of the farmers were found to have very poor knowledge level i.e., 66.67% of the farmers whereas 28.34% had fair knowledge level and only 5% had good knowledge level regarding various aspects of the crop. Correlating with the knowledge index was the readiness level with only 31.67% of the farmers being above the threshold readiness level. Finally, while opting out the hinderance factors of the adoption of the crop, lack of promising market, high cost of cultivation, lack of proper knowledge and training were found to be major problems ranked as first, second and third respectively. This study points out the huge requirement of improvement in the sector of market security, insurance policies, credit interventions, government subsidies, training programs and involvement of extension workers.

KEYWORDS

Dragon Fruit, Knowledge level, Readiness, Adoption

1. INTRODUCTION

Introduced in 2057 B.S, (Gurkha Millennium Multi Purpose Cooperative ltd, 2015) dragon fruit is currently gaining importance and attention of many growers in the country. With the growing awareness about the fruit and its nutritional importance, the demand of dragon fruit is also increasing in the Nepalese market. Currently it holds the market price of NRs.500-900 (as of early 2020) in different markets of Nepal. Perennial vine starting fruiting from 15 months up to 15-20 years is one of the highlights of the fruit which is being liked by the growers. This fruit can be a major step forward in strengthening the economy of the country through agriculture. Terai belt of Nepal being much suitable for the cultivation of the dragon fruit, this can be a boon for the famers who are seeking some replacement in the current farming practices.

Dragon fruit has much potential of providing high return in few years. It is the fruit of the tropics and subtropics that is most suitable for the terai region and even successfully grown in the lower hills as it can be grown up to the height of 800masl (Mizrahi, Y. and A. Nerd and P.S. Nobel., 1997).

Dragon fruit being the exotic crop, its adoption rate is not much higher. Farmers still do hesitate to adopt the dragon fruit in their farm. Study in the sector of dragon fruit is current necessity. Farmers of the country need to be well acquainted with the farming technologies that are suitable in the condition of the country. To make the dragon fruit farming sustainable, there must be the study on the perception of farmers and also the consumers regarding the fruit. This research aims to study about the farmers' awareness and knowledge level about the crop which ultimately determines the readiness of farmers to adopt the fruit. Without knowing the farmers perception towards the crop and their readiness to adopt the crop, formulation of the various policies and programs in the upliftment of the fruit cultivation may not be fruitful.

Dragon fruit can be one of the ladders to step on while moving from subsistence agriculture to commercial agriculture. But haphazard commercialization, without much study, is equally capable of producing harsh conditions. Any new commodity not native to the place is full of risk to adopt. No one can say that this exotic commodity will have no any problems in the near future. Dragon fruit in context of Nepal is an emerging crop but, its cultivation is not in the optimum level (Atreya P.N, 2020).

In the present scenario, government of Nepal is also prioritizing the cultivation of dragon fruit by creating various pocket and block areas in different districts of the terai region. But the applicants for the pocket and block program under Prime Minister Agriculture Modernization Project (PMAMP) are less than the available seats (AKC Chitwan, 2020). This shows the hesitant nature of the farmers towards adoption of the crop. So,

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the study regarding the perception of the farmers towards the crop is one of the preliminary steps towards the research of the commodity.

This study focuses on the adoption of the dragon fruit cultivation in the Chitwan district. There are many factors that govern the adoption of various new technologies and crop as well. So, this study tends to find out the underlying factors that are affecting the adoption of dragon fruit. Also, it is relevant that the awareness level of the farmers towards the crop or any agricultural activity is one of the major factors that affects the adoption of the crop by the farmers. (Acheampong et. al., 2018). Thus, the study of awareness and knowledge level of the farmers is major concern.

While studying adoption process of any technology, it is found that, the categories of adopters are: innovators, early adopters, early majority, late majority, and laggard. Innovators (2.5%) – had larger farms, were more educated, more prosperous and more risk-oriented, early adopters (13.5%) – younger, more educated, tended to be community leaders, less prosperous, early majority (34%) – more conservative but open to new ideas, active in community and influence to neighbors, late majority (34%) – older, less educated, fairly conservative and less socially active, laggards (16%) – very conservative, had small farms and capital, oldest and least educated. Level of adoption of technology manifests itself in different ways in various cultures and fields and is highly subjected to the type of adopters and innovation-decision process. (Roger, 1983)

This study primarily focuses on acquiring the knowledge level present in the farmers about the dragon fruit and their adoption readiness which ultimately helps us to know the future of the crop in Nepalese condition so that further activities in the path of its development could be carried out.

2. Methods and Methodology

2.1 Study Site

The study was conducted at Chitwan district as this district is now being emphasized by the government of Nepal and Prime Minister Agriculture Modernization Project (PMAMP) for the cultivation and commercialization of the dragon fruit enterprise. The major local levels emphasized were Bharatpur Metropolitan and Ratnanagar municipality where pockets of dragon fruit were formed by PMAMP. Study was done in these pocket areas.

2.2 Sample and Sampling technique

To find out the readiness of other farmers in this sub sector, 60 farmers were selected at random. The sampling frame was obtained as the list of farmers` group, cooperatives and private farm as enlisted by PMAMP, Project Implementation Unit, Chitwan and Agriculture Knowledge Center, Chitwan. Respondents were selected using simple random sampling techniques within the pocket areas.

Research design/instruments include household survey, pre-testing of the interview questionnaire, key informant interview (KII) and Focus Group Discussion (FGD). Respondents of age above 25 years were only interviewed since the data obtained would be more realistic, reliable and complete. Respondents were interviewed with questions seeking demographic, educational, socio-cultural, behavioral, economic and other information regarding awareness, readiness and constraints in adoption of dragon fruit. Information gathered during interview schedule from the farmers were cross checked during focus group discussion. FGD included progressive farmers, new commers and staffs of AKC office. The information regarding the market condition, attitude towards the dragon fruit, awareness level was taken from the FGD and also cross checked with the information obtained from interview.

2.3 Data collection

Primary data was collected as per the specific objectives. Household Survey, field visit, focus group Discussion, key informants' interview with leaders of farmers group, co-operatives were conducted to collect primary data.

Secondary data was collected through reviewing different publication released by Department of Agriculture, Ministry of Agriculture and Livestock (MOALD), Agro-enterprise Center, Nepal Agriculture Research Council (NARC) and Agriculture Knowledge Center (AKC).

2.4 Data Analysis

The information collected from the field was first coded and entered into the computer. Data entry and analysis was done by using computer software packages like the Statistical Package for Social Science (SPSS) version 25.0 and Microsoft Excel.

Analysis of the general socio-demographic data of the farmers was done by categorizing farmers into two categories on the basis of mean of land holding area:

a. Small farmers (Total land holding area less than the mean value)

b. Large farmers (Total land holding area more than the mean value)

For entered categorical data of the farmers like gender, religion, ethnicity, primary occupation, education status, etc., chi-square test was performed and analysis was done for both the categories (small and large). Similarly, for other data, t-test was performed and analysis was done. The obtained data were presented in tabular forms and some data were presented in graphical forms like bar-graph, and pie-chart.

In addition, the knowledge level of the farmers was analyzed by using the process adopted by (Bonny, 1991), (Sushama, 1993), (D. Jaganathan, 2012) to calculate the knowledge level index. Which is given by the following formula:

$$\text{Knowledge Index} = \frac{Respondents' total\ Score}{Total\ Possible\ Score} \times 100$$

The obtained knowledge index of the respondents was then categorized into three group as poor, fair or moderate and good level of knowledge.

Knowledge index less than 50% = Poor knowledge level

Knowledge index in between 50% and 75% = Fair or Moderate knowledge level

Knowledge index more than 75% = Good knowledge level

For the knowledge level obtained, chi square test was performed and analysis was done for both the small farmers and large farmers. Whereas, for knowledge index of the respondents, t test was performed and analysis was done for both the small farmers and large farmers.

Also, the knowledge index obtained was correlated with other independent variables to find out the correlation of the knowledge level with other variables.

Assessment of the farmers' readiness in adoption of dragon fruit is done by using the Likert scale as used by (Sutrisno H.P., 2010). Also, this assessment model was used by (Aydin, C.H., & Tasci, D., 2005). They argued that alternatives were designed in a way that provides easy coding and assessment for the users. Moreover, they detailed that the alternatives can easily be coded as 1, 2, 3, 4 and 5, as in a five-point Likert scale. Therefore, the mean score of 3.4 can be identified as the expected level of readiness, while other responses enable organizations to show higher or lower levels of readiness. The mean average of 3.4 was determined after identifying the critical level: 4 intervals/5 categories = 0.8. (Sutrisno H.P., 2010)

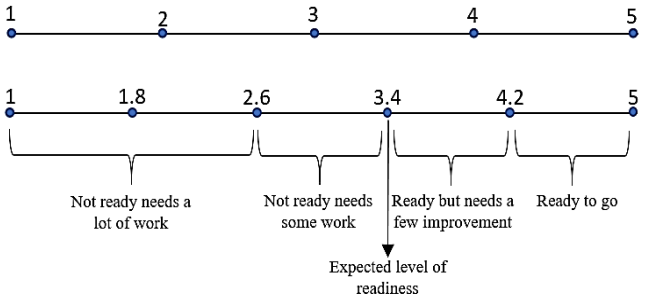

Figure 1: Readiness Assessment Model

The questionnaire was constructed including 5 statements regarding the attitude of the farmers towards the dragon fruit and factors for the adoption of the crop. The answers were categorized again into 5 categories: Strongly agree, Agree, neither agree nor disagree, Disagree and Strongly disagree. And calculated using proper ranking and coding.

For determining the internal consistency of the scale used in the survey, Cronbach's' alpha was calculated and also inter item correlation matrix was evaluated to find out whether the variables in the scales are measuring same characteristics or not.

Indexing of the hinderance factors for the adoption of dragon fruit was done by taking qualitative data into account. On the basis of obtained frequencies, weighted index was calculated for analyzing the farmer's perception regarding the severity of adoption constraints. Farmer's perception to the different hinderances regarding adoption of the crop were ranked by using five-points scale. Then the priority index was calculated by weightage average mean for the purpose of drawing conclusion. The index of importance was computed by using the formula:

$$I_{imp} = \sum \frac{Sifi}{N}$$

Where,

I_{imp} = index of importance
$\sum$ = summation
S_i = I^{th} scale value
f_i = frequency of i^{th} importance given by the respondents
N = total number of respondents

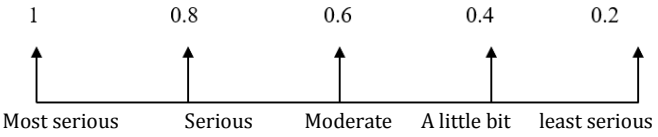

Figure 2: Ranking of scale

3. Result and Discussion

Drought stress impairs many physiological processes. The stressful There are tremendous opportunities to increase the maize production there by narrowing down the wider yield gap and horizontal expansion in winter season. The conventional maize production system needs to be converted into modern, resource use efficient and climate smart under the pretext of stagnant productivity as a result of limited area expansion, low yield potential of the existing genotypes, imported hybrid seed, declining soil fertility, and emergence of new pest species, labor and water. Therefore, the research should focus on utilizing the latest tools of plant breeding for the development of stress resilient maize genotypes, hybrid seed production effort, climate smart, and resource conserving agro-techniques like conservation agriculture.

3.1 Study site

Chitwan is located in the southwestern part of Bagmati Pradesh, about 140 km southwest of Kathmandu City. It covers an area of 2,238.39 km2 (864.25 sq mi), and in 2011 had a population of 579,984 (279,087 male and 300,897 female) people (CBS, 2012) . It is geographically linked to Nawalpur and Tanahun in the west, Gorkha and Dhading in the north, Makawanpur and Parsa in the east and has border with India in the south. In the context of federal system, it consists of 1 Metropolitan city, 5 Municipality and 1 Rural Municipality.

3.1 Socio-economic and farm characteristics

Information regarding the socio-economic and farm characteristics like age of respondents, sex, occupation, educational status, family size, land holding, cultivated land area collected from the study is discussed briefly here.

3.1.1 Land characteristics of the respondents

The land holding of the respondents was found at the range of 1 kattha to 48 kattha, averaging at 15.192 kattha.

Table 1: Land holding characteristics of Respondents

Variable	Mean	Maximum	Minimum
Land holdings (Kattha)	15.192(11.73)	48	1

Source: Field Survey, 2020

Figures in parentheses indicates Standard deviation

Based on this average (mean) of land holding area, entire respondents were divided into two categories; small farmers and large farmers.

a) Small farmers: Farmers with the land holding with an area lower than the average value i.e. land holding of less than 15.2 kattha, were categorized under small farmer's category. They were found 38 in number, out of 60 respondents.

b) Large farmers: Farmers with the land holding with an area higher than the average value i.e. land holding of more than 15.2 kattha, were categorized under large farmers' category. They were found 22 in number, out of 60 respondents.

On the basis of this category, various analyses were performed.

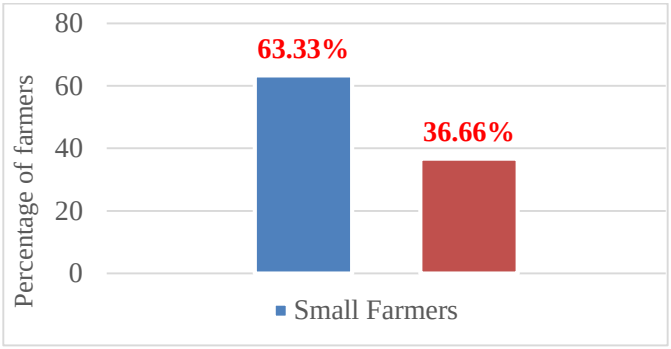

Figure 3: Distribution of farmers into two categories; large and small

Source: Field Survey, 2020

3.1.2 Categorical Variables

Distribution of gender of the respondents, family type and ethnicity is shown in the following table.

Table 2: Gender of the respondents

Socio Demographic Variable	Small Farmer (n=38)	Large Farmer (n=22)	Overall (N=60)	Chi Square Value
Gender				
Male	25(65.78)	12(54.54)	37(61.67)	0.745
Female	13(34.21)	10(45.45)	23(38.34)	
Family Type				
Joint	5(13.2)	10(45.46)	15(25)	7.751*
Nuclear	33(86.8)	12(54.54)	45(75)	
Ethnicity				
Brahmin	20(52.63)	15(68.18)	35(58.33)	2.420
Janajati	12(31.58)	3(13.64)	15(25)	
Chhetri	6(15.79)	4(18.18)	10(16.67)	

Figures in parentheses indicates the percentage to their respective columns

Source: Field Survey, 2020

Among the respondents, within the category of small farmers, male was found 56.4% with female 43.6%. Similarly, within the large farmers, male was 67.7% and female 32.3%.

Overall male was 61.4% and female were 38.6% among the respondents.

Among the small farmers, 86.8% farmers had nuclear family type, while 13.2% farmers had joint family type; whereas, among the large farmers 54.54% had nuclear family type, while 45.46% farmers had joint family type.

Also, the mean difference is found to be significant at 1% level of significance among small and large farmers family type. This shows that, in Chitwan district, tendency of nuclear family is much increasing than the joint family and is thus much dominant. Also, among the small farmers nuclear family was proportionately much dominant than in large farmers which shows the pattern of repeated division of the lands while moving

from joint family to nuclear family leading to more proportion of small farmer in nuclear family.

In the study area, Brahmins were in highest number i.e. 58.33%, followed by Janajati 25% and Chhetri 16.67%.

3.1.3 Education of the Respondents

Education is the light of life, and it is also considered as the third eye of human being. At this 21st Century, education holds the power to defeat all the other forces.

Information regarding the education of respondents was taken at the research site, in order to understand the knowledge level of farmers. Education status was categorized into eight categories; namely illiterate, primary up to class 5, lower secondary up to class 8, secondary or SLC, higher secondary or +2 or Certificate level, Bachelors level, Masters level and Above as per modified kuppuswamy scale (Joshi S.K, Acharya K., 2019) and accordingly information was collected from the respondents. Out of this only the respondents up to Masters level were found in the study area.

Table 3: Table showing the education status of the respondents

Education	Small Farmer (n=38)	Large Farmer (n=22)	Overall (N=60)	Chi Square
Illiterate	4 (10.53)	0	4(6.67)	16.805**
Primary	3(7.89)	0	3(5.0)	
Lower secondary	2(5.26)	6(27.27)	8(13.34)	
SLC	14(36.84)	3(13.64)	17(28.34)	
+ 2/Certificate	8(21.05)	11(50)	19(31.67)	
Bachelors	5(13.15)	2(9.09)	7(11.67)	
Masters	2(5.26)	0	2(3.34)	
Total	38(100)	22(100)	60(100)	

Figures in parentheses indicates the percentage to their respective columns

Source: Field Survey, 2020

Majority of the respondents had higher secondary or certificate level of education i.e. 31.67%, followed by secondary level or SLC level 28.34%, followed by lower secondary 13.34%, followed by Bachelors level 11.67%, followed by illiterate 6.67%, followed by primary level 5.0% and finally masters level 3.34%. Also, the difference in education level of small and large farmers is found to be significant ant 1% level of significance.

3.1.4 Primary source of income of the household

People adopt different occupations in order to sustain their livelihood. People adopt different occupations like agriculture, trade, business, foreign employment, etc. in order to run their day to day life. The Primary source of income of the respondents at research site was found as,

Table 4: Primary source of income of the respondents

Source of Income	Small Farmer (n=38)	Large Farmer (n=22)	Overall (N=60)	Chi Square
Shop/Agriculture	20(52.63)	11(50.0)	31(51.67)	4.751
Semi Profession	8(21.05)	7(31.82)	15(25.0)	
Remittance	4(10.53)	4(18.18)	8(13.34)	
Semi-skilled worker	6(15.79)	0	6(10.0)	
Total	38(100)	22(100)	60(100)	

Figures in parentheses indicates the percentage to their respective columns

Source: Field Survey, 2020

The study revealed that Agriculture was primary occupation among greater respondents i.e. 51.67% of respondents follow agriculture as their main occupation; which was followed by semi profession (like nurses, teacher, librarian, journalism, social-work) i.e. 25%, followed by remittance i.e. 13.34% and finally followed by semi-skilled worker i.e. 10%.

3.1.5 Family size of the respondents

Family size generally refers to the number of members within the family. The maximum value of family size was reported to be 9 with minimum of 2, and averaging at 4.93.

Table 5: Family size of the respondents

Variables	Small farmers(n=38)	Large farmers(n=22)	Overall(N= 60)	Mean difference	t-value
Family size	4.34	5.95	4.93 (1.593)	-1.61	-3.791**

Figures in parentheses indicates the Standard Deviation **significant at 1% level of significance.

Source: Field Survey, 2020

The average family size was 4.93, which was higher than the national average family size (4.88) in census 2011 (CBS, 2012). Here, the family size of the small farmers and large farmers was found to be significantly different at 1% level of significant, small farmers having the small family size with the mean difference of 1.61.

3.1.6 Working age population

People within the age group 15-59 are referred to as working age group population/active population.

From the survey, the average active population size was found 3.51

So, working population percentage= (average active population /average family size) * 100 %

= (3.51/4.93) *100%

=71.19%

Thus, working age population was found to be 71.19%, which was higher than the national average i.e. 57% (CBS, 2012).

3.1.7 Dependency ratio

The population between the age group of 15-59 is considered as economically active population. Rests of the population below and above this range are considered as dependent population.

The value of this ratio generally indicates how many populations are dependent upon a single (1) active population within a family or a community.

Dependency ratio= No. of dependent population/No. of active population

= (No. of total population – No. of active population)/No. of active population

Table 6: Dependency ratio among the respondent's family

Variables	Small farmers(n=38)	Large farmers(n =22)	Overall(N =60)	Mean difference	t-value
Dependency ratio	0.2342	0.2527	0.2410(0.205)	-0.01852	-0.325

Figures in parentheses indicate the Standard Deviation.

Source: Field Survey, 2020

The dependency ratio was found more i.e. 0.2527 in large farmers than in the small farmers' i.e.0.2342; with the overall dependency ratio at the area of study being 0.2410.

3.2 Awareness and Knowledge level of farmers regarding dragon fruit

3.2.1 General Awareness

Dragon fruit being the new exotic commodity in Nepal, many of the farmers have still not even heard about the crop. Many of the farmers have just heard about it and some have seen and tasted the fruit.

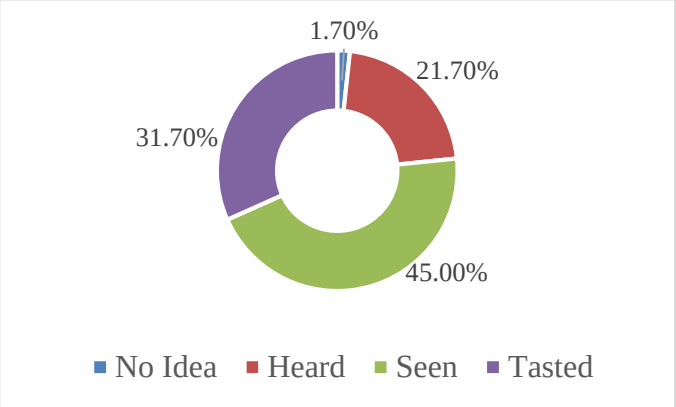

Figure 4: General awareness of farmers regarding dragon fruit

Source: Field Survey 2020

Most of the farmers are aware of the dragon fruit and also have seen the fruit and the cultivation through different medias or in field. Overall, 45% of the farmers have seen dragon fruit. Also, farmers having tasted the dragon fruit are also good in numbers i.e. 31.7%. Followed by the farmers those have just heard about dragon fruit but neither have tasted nor seen the fruit i.e. 21.7%. Also, out of the 60 respondents, one farmer had no any idea regarding the dragon fruit which gives out the percentage of just 1.7%.

3.2.2 Means of Acquiring Knowledge

Respondents had different source of acquiring knowledge through which they came to know about dragon fruit and its cultivation practices. These sources were: Extension worker, Media, Groups and Cooperatives and Field Visit.

Table 7: Distribution of respondents on the basis of means of acquiring knowledge

Different Means	Frequency	Percentage
Groups and Cooperatives	27	45
Media	21	35
Extension Worker	7	11.67
Field Visit	5	8.34
Total	60	100

Source: Field Survey 2020

Among the respondents, majority of the farmers acquired the knowledge regarding the dragon fruit from the talks in the groups and cooperatives only (i.e. 45%) which is closely followed by the use of media (i.e. 35%). While the role of extension worker was found to be low may be because of the nature of the commodity being new to the area.

Among all farmers, there is an increasing trend of utilization of the different sources of media in the present days and also according to the study by (Piya, 2012) this increasing trend of utilization of different media is in tremendous numbers in last few years which is very positive for the agricultural information dissemination.

3.2.3 Knowledge level of the farmers regarding Dragon fruit

To adopt dragon fruit as an enterprise, farmer should have knowledge regarding the crop. Without adequate level of knowledge and awareness no one can succeed in any enterprise. Thus, assessing knowledge level of the farmers is one of the most important to know the attitude and beliefs of the farmers towards the new crop; dragon fruit.

For the assessment of the knowledge level several questions were asked to the farmers and their responses were recorded to interpret the result. From the responses, knowledge index was calculated and categorized in three categories as poor (less than 50% knowledge index), fair (50-75% of knowledge index) and good (more than 75% of the knowledge index).

Table 6: Knowledge level of the respondents

General awareness level	Small Farmer (n=38)	Large Farmer (n=22)	Overall (N=60)	Chi Square
Poor	27(71.05)	17(77.28)	40(66.67)	1.104
Moderate or Fair	9(23.68)	8(36.38)	17(28.34)	
Good	2(5.27)	1(4.55)	3(5)	
Total	38(100)	22(100)	60(100)	

Figures in parentheses indicates the percentage to their respective columns

Source: Field Survey, 2020

The table shows that most of the farmers have very little knowledge level regarding the dragon fruit. Overall, 66.67% of the total farmers come under the poor knowledge level. Among small farmers, 71.05% of the farmers have poor level of knowledge. Whereas, 23.68% of the small farmers have moderate or fair level of knowledge and only 5.27% of the small farmers have good level of knowledge regarding the dragon fruit. Among large farmers, 77.28% of the farmers have very poor knowledge and 36.38% of the large farmers have moderate level of knowledge and finally only 4.55% of the large farmers have good knowledge level. This data shows that there is no any proper knowledge level among the farmers and even if the farmers are being ready for the adoption of the dragon fruit, it is on the basis of what they have heard and along the flow of the wind. (Sandika, A. L., Wijesinghe, N. T, 2012) in case study in Sri Lanka also found the knowledge level of majority of the farmers starting the cultivation of the dragon fruit to be poor i.e. knowledge index of less than 50%.

Table 7: Knowledge level of the farmers regarding dragon fruit.

Variable	Small farmers (n=38)	Large farmers (n=22)	Overall (N=70)	Mean difference	t-value
Knowledge Index	34.6737(26.05)	40.3682(20.64)	36.7617(24.19)	-5.6945	0.877

Figures in parentheses indicate the Standard Deviation.

Source: Field Survey, 2020

Knowledge level of large farmers is seen to be slightly greater than that of small farmers i.e. average knowledge level of the large farmers was 40.37% whereas that of small farmers was 34.67%.

Table 10: Relationship between independent variables and knowledge level of the farmers.

Profile Characteristics	Correlation Coefficient
Age	-0.116
Education	0.594**
Family Members	-0.003
Dependency Ratio	0.073
Land Holding	0.145
Annual Income	0.198

** significant at 1% level of significance.

Source: Field Survey, 2020

The relationship between the other independent variables were seen with the knowledge level of the farmers. Only the relationship of the education level was found to be significant with the knowledge level. This shows that those farmers with the higher level of education knows much better about the dragon fruit cultivation and those with the low level of education knows less about the dragon fruit cultivation. Thus, education level plays a vital role in enhancing the knowledge level of the farmers regarding the cultivation practices.

3.3 Readiness Assessment of Farmers

The primary purpose of this study was to assess the readiness level of the farmers towards the cultivation of the crop or say adoption of the corps. As dragon fruit is in new avenue of adoption and commercialization, the adoption pattern is also an important factor to be noticed for determining the future of the crop in Nepalese condition. For this, attitude of the farmers towards this new exotic crop is to be found out. How do farmers think of the crop? Is the crop adoptable in the context of Nepalese condition? is one of the major topics of this study.

Farmers readiness towards adoption of new technology or enterprise is evaluated using Likert scale comprising of 5 questionnaires. And categorized answer groups as strongly agree, agree, neither agree nor disagree, disagree and strongly disagree. The Likert scale is categorized in 5 categories with the difference of 0.8. The average value of 3.4 is said to be minimum expected level of readiness and those with value higher than this are categorized as ready for adoption and those below are not ready for adoption.

To determine the reliability of the Likert scale, Cronbach's alpha is determined.

Table 8: Reliability statistics of the scale used in the survey.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.873	0.877	5

The Cronbach's alpha of the Likert scale is found to be 0.873, which indicates high level of internal consistency of the scale in this survey.

Table 9: Inter item correlation matrix of the variables used in the scale of measurement.

	Q1	Q2	Q3	Q4	Q5
Q1	1.000	0.672	0.661	0.599	0.657
Q2	0.672	1.000	0.625	0.656	0.492
Q3	0.661	0.625	1.000	0.773	0.359
Q4	0.599	0.656	0.773	1.000	0.379
Q5	0.657	0.492	0.359	0.379	1.000

This inter item correlation matrix shows that no any value is negative which ensures that all the variables in the scale are measuring the same characteristics.

Table 10: Readiness level of the farmers for adoption of dragon fruit.

Category	**Number of Farmers**	
below 1.8 (not ready, need a lot of work)	4 (6.7)	41 (68.34)
1.8 to 2.6 (not ready, need a lot of work)	17 (28.3)	
2.6 to 3.4 (not ready, need some work)	20 (33.3)	
3.4 to 4.2 (ready but needs few improvement)	15 (25.0)	19 (31.67)
4.2 above (ready to go)	4 (6.7)	
Total	60 (100)	

Figure in parenthesis indicates respective percentage of respective columns.

Source: Field Survey, 2020

Most of the farmers are found not ready for the adoption of the crops i.e. broadly speaking 68.34 % of the farmers are not ready for adoption. Out of this 33.3% of the farmers need some work for improving readiness whereas 35% of the farmers need a lot of improvements for making them ready for adoption of the dragon fruit. 25% of the farmers are ready or say can adopt the crop but still they need improvements whereas only 6.7% of the farmers are completely ready for the adoption of the crop.

This shows that, the readiness level of the farmers in context of Chitwan district is quite low. Only 6.7% of the farmers are completely ready and don't need any reinforcement for the adoption of the crop whereas 25% of the farmers being ready still needs improvements for adoption of the enterprise. There are many hindering factors that affect the level of readiness of the farmers and for the effective commercialization of the product those hindering factors should be identified and taken care of leading to increment in the adoption of the crop.

Table 11: Correlation of readiness level with the knowledge index

Parameter	Correlation Coefficient	P- Value
Readiness Level	0.636	<0.01**

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Field Survey, 2020

The relationship between readiness level and knowledge level is found to be significant at 1% level of significance. This shows that, with the increment in the knowledge level of the farmers, readiness level of the farmers towards adoption also increases. This signifies positive correlation between the knowledge level and readiness level of the farmers. This result also goes with sync with the findings of (Truong Thi Ngoc Chi, 2002), where they concluded that the adoption of new technologies by the farmers are mostly positively influenced by the knowledge level of the farmers.

3.4 Hinderance Factors for adoption of Dragon fruit as primary enterprise

Being an exotic crop, dragon fruit adoption in Nepal is still not in high scale. Though the cultivation of the crop is more profitable than other crops, farmers still have hesitations for the cultivation of the crop in commercial scale. Having climatic and soil condition best suitable for the optimum production of the crop in terai regions of Nepal is one of the top comparative advantage for the production of the dragon fruit. But the adoption pattern of the dragon fruit is not seen as optimum level than expected or say than possible. So, there must be some hinderance factors for the adoption of the crop. During preliminary field visits and focus group discussions major 5 problems were highlighted which have major impact in the adoption of the crop. The problems were: High cost of cultivation, Lack of seedlings and other inputs, Lack of promising markets, Lack of support from the government and Lack of proper knowledge and training. These 5 problems were ranked on the basis of the survey done with the farmers including 60 respondents and found out as follows:

Forced ranking technique was used to find out the index of importance and the problems were ranked from 1 to 5.

Table 12: Ranking of the hinderance factors for adoption of dragon fruit by farmers.

Problems	1	0.8	0.6	0.4	0.2	Index value	Rank
High cost of cultivation	26	20	7	1	5	0.79	II
Lack of seedlings and other inputs	0	1	7	40	11	0.38	IV
Lack of promising market	26	19	13	1	0	0.82	I
Lack of support from the government	2	2	10	7	38	0.33	V
Lack of proper knowledge and training	6	16	22	10	5	0.62	III

Source: Field Survey, 2020

This shows that the lack of promising market and high cost of cultivation are the major hinderance factors for the adoption of the dragon fruit as an enterprise. Farmers are confused about the possibility of availability of the promising market to insure the proper price of the product of the farm. What if the produced fruit did not get the desired market and price expected? Many farmers are in this fear of the market so could not adopt the crop or having hesitations. Also, high cost of cultivation comes as second hinderance for adoption of the crop. The cultivation of dragon fruit is much costly than any other crops. The cultivation of the crop requires about Rs. 30-35 lakhs per hectare of land. So, farmers of Nepalese condition don't even dare to invest such high amount in the cultivation of the crop of which market structure and consumers are also not well defined. There is the need for targeting credit interventions to farm

households who are credit constrained for improving access to credit and the adoption of agricultural technologies (Mohamed, K.S. and Temu, Andrew E , 2008). And hence, high cost of cultivation comes as second hinderance factor of adoption. (Shadi-Talab, 1997) also indicated in his study that perception of market system and credit availability and accessibility as factors affecting the adoption of new agricultural technologies.

Third rank is occupied by the problem stating lack of proper knowledge and training. As already mentioned, and discussed, the new crop in context of Nepal; Dragon fruit is still not widely distributed. Being limited to few farmers there are no such training activities regarding the cultivation of the crop. Those farmers who desire the cultivation of the crop still cannot get trained about its cultivation. The role of government also comes to be prominent in the case of providing knowledge and training to the farmers wanting to come in this new endeavor. Without having the proper knowledge and training, no one would take the risk of cultivating a completely new crop. Inadequacies in extension intervention, technical training and information were the main constraints that compromised the information and knowledge network (Kodikarage Silva and Tom Broekel, 2017). Thus, provision of knowledge and training is also one of the major hinderance factors.

Availability of the inputs and primarily the quality seedlings are also one of the concerns of the farmers. In Nepal, the quality of the seedlings is not monitored by any agencies and thus there is no any guarantee of the quality assurance of the seedlings of the dragon fruit. The quality of the seedlings directly impacts the quality of the produce and farmers are not confident about the inputs they get. Many of the farmers who have started the cultivation of the crop have imported the cuttings of the plant from India, Thailand and Vietnam. This eventually increased the cost of cultivation to more extent. Adoption of new technologies and practice is affected greatly by availability of farm capital and other inputs; it is also affected by education, training, advice and information which form the basis of farmers' knowledge (Organisation for Economic Co-operation and Development (OECD), 2000).

Lack of support from the government is ranked as least important problem in adoption of the dragon fruit. In inquiring about this result from the survey, many farmers stated that they have long forgotten to expect any support from the government. This statement is the result of the long instability of the government in Nepal and its political history. Increased corruption in government sectors and long and tiresome process of getting any support and subsidy from the government also have led to this state of mind. Also, with the recent implementation of the federal system of governance, many of the processes have been made easier and the reach of the farmers to the government has increased which may have caused this problem to be ranked as least important.

4. Conclusion

Farmers of Chitwan district were found to have interest in the cultivation of the dragon fruit but the awareness level and knowledge level of the majority of the farmers was found to be poor (below 50% of the knowledge index). i.e., 66.67% of the overall farmers had poor knowledge level regarding the dragon fruit. Farmers having good knowledge level and education level were keen in adopting the crop as an enterprise. The proportion of the farmer ready to adopt the crop was also low in percentage i.e., 31.67% among which perfectly ready were only 6.7% of the total farmers. Thus, if dragon fruit cultivation is to be promoted and commercialized in large scale, government and other authorities should pay due attention towards increasing the awareness and knowledge level of the farmers regarding the cultivation of dragon fruit through different training programs and medias.

Risky nature of the market of the new commodity played a major role in hindering the adoption process of the crop as there would be the uncertainty in getting the proper price of the product. Close to this, high cost of cultivation was found to be second most important factor hindering the adoption. So, for making the dragon fruit as easy crop to adopt, the market price, channel, place must be confirmed beforehand. Also, the potentiality of export of the fruit must be well studied and put forward by the concerned authorities and government. Price regulations of the seedlings and other inputs can be done to take down the high cost of cultivation of the crop. With some amendments in the present scenario, dragon fruit can be established as a profitable enterprise in Chitwan district, Nepal.

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