RESEARCH ARTICLE

Determinants of Knowledge Level on Kiwi Cultivation Practices in Phek District of Nagaland

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ABSTRACT

The paper examines the knowledge level of kiwi growers and its determinants in Nagaland. The study was conducted among kiwi growers in Phek district of Nagaland during 2023-24 and the sample size was 120. A knowledge test index was adapted with suitable modification. More than half of the respondents were above 50 years of age, majority were illiterate, had marginal size of land under kiwi, had 'medium' farming experience and had an average annual income of Rs. 139391.67. The findings of the study concluded that majority of the respondents had 'fair or moderate' level of knowledge on kiwi cultivation and the determinants of knowledge level on kiwi cultivation were education, extension contact, training exposure & farming experience.

INTRODUCTION

Kiwi (*Actinidia deliciosa*) is popularly known as China's miracle fruit and is native to India, Japan and Chile. The largest producers of this fruit are Italy, Japan and Chile (Mishra and Shukla., 2014). Ferguson and Stanley (2003) had highlighted the agronomic practices and technological advancements that have significantly increased kiwi yields in these countries. In the Indian context, studies by Shukla et al. (2018) explored the introduction and adaptation of kiwi cultivation in the Himalayan region, identifying suitable varieties and agronomic practices that enhance productivity. Kiwi fruit cultivation has emerged as a promising agricultural venture in various parts of India, with the northeastern states of India, particularly Arunachal Pradesh and Nagaland showing significant potential due to its favourable climatic conditions and suitable topography. There are many earlier studies on knowledge level of farmers on fruit trees but these are limited to kiwi in the state. Shah et al. (2017) had reported that the respondents had medium level of knowledge regarding apple cultivation.

In Nagaland, kiwi is commercially grown in five districts *viz*. Kohima, Mokokchung, Phek, Wokha and Zunheboto. Among all the five districts in Nagaland, Phek district has gained attention for its kiwi farming, with an increasing number of farmers growing this high-value crop. While there is limited research focused exclusively on Phek district, broader studies in Nagaland provide insights into the region's agricultural dynamics. Kumar and Konyak (2024) conducted a study in Nagaland and noted

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significant constraints faced by the farmers such as climate variability, pest and diseases, storage and post-harvest facilities, marketing challenges, lack of technical knowledge, lack of infrastructure and lack of cold storage. Despite the increasing interest in kiwi farming in Phek district, there is a paucity of research on the existing knowledge base of kiwi growers in this region.

The importance of this research is underscored by the fact that kiwi cultivation, being a relatively new introduction in the agricultural landscape of Nagaland, requires specialized knowledge and skills unlike traditional crops. Moist soil and continuous irrigation are required for the cultivation of kiwi, so irrigation has become one of the first most important factor for growing kiwi plant and farmers had highest knowledge on irrigation management among different parameters in fruit cultivation (Kaur et al., 2020). Koyu et al. (2019) developed an intellectual learning scale to test knowledge level of kiwi growers of Arunachal Pradesh. Similarly, Mathew and Thomas (2020) assessed the extent of knowledge of coconut farmers, and Sureshverma et al. (2018) constructed a knowledge test to measure the knowledge on recommended groundnut production practices. To fortify kiwifruit subsector, Sharma et al. (2020) recommended to focus on strategy of improving kiwifruit productivity with conventional mechanization, improved technology adoption, price intervention, market recognition, establishment of storage and processing centres and diplomatic relations for convenient global marketing. Studies by Feder et al. (1985) and Rogers (2003) have shown that informed farmers are more likely to adopt improved agricultural practices and technologies. Therefore, evaluating the knowledge level of farmers will help identify gaps and inform the development of targeted interventions to enhance productivity and sustainability.

The objectives of this study are to assess the current knowledge level of kiwi growers in Phek district, to study the determinants affecting the knowledge level of the growers, and to recommend strategies for improving the technical know-how and practices of farmers.

METHODOLOGY

The study was conducted during 2023-24 in Phek district of Nagaland. Phek district was purposively selected as it has the highest area under kiwi cultivation in Nagaland (109.00 ha) (Directorate of Economics and Statistics, Nagaland 2021). In this district, three blocks *viz.*, Pfutsero, Chizami and Kikruma were purposively selected owing to presence of more kiwi cultivators than the rest of the blocks. From the three blocks, two villages from each block were randomly selected making a total of six villages. A complete list of farmers was prepared along with the information about their land holding size. A sample of 20 farmers was selected randomly from each village to make a total sample size of 120. The data were collected through a personal interview technique using structured interview schedule. To assess the knowledge level of kiwi growers, a pretested knowledge test was adapted from Koyu et al. (2019) with suitable modification to measure the knowledge level of kiwi growers. The knowledge index has 15 sets of parameters. Therefore, the maximum possible score for each respondent was 15 and the minimum score was 0. The total score obtained by the respondents indicates the knowledge level of the respondents about the recommended practices of kiwi cultivation. Given below is the formula adopted for calculating the knowledge index of the respondents.

$$\text{Knowledge Index (KI)} = \frac{\text{Total score obtained by the respondents}}{\text{Maximum possible score}} \times 100$$

The total score obtained by the respondents indicates the knowledge level of the respondents about the recommended practices of kiwi cultivation. The obtained knowledge index of the respondents was then categorized into three groups as poor, fair or moderate and good level of knowledge. This categorization was also followed by Dhakal et al. (2021).

Category	Knowledge index
Poor knowledge level	< 50%
Fair or Moderate knowledge level	50% to 75%
Good knowledge level	> 75%

The independent variables used in the present study were Age (X_1), Sex (X_2), Family size (X_3), Family type (X_4), Education (X_5), Land under kiwi (X_6), Annual income from kiwi (X_7), Extension-contact (X_8), Training exposure (X_9) and Farming experience (X_{10}). Determinants that influence the knowledge level of kiwi growers have been identified through regression analysis. Here, knowledge level is a continuous variable, but it has a boundary i.e., from zero to hundred. The model employed in the study is given as below in equation (1):

$$Y_z = \beta_o + \beta_1 X_{1i} + \beta_2 X\beta_{2i} + \beta_3 X\beta_{3i} + \beta_4 X\beta_{4i} + \beta_5 X\beta_{5i} + \beta_6 X\beta_{6i} + \beta_7 X\beta_{7i} + \beta_8 X\beta_{8i} + \beta_9 X\beta_{9i} + \beta_{10} X\beta_{10i} + u_i$$

.... (1)

Here, Y_i = Knowledge level; X_1 to X_{10} = independent variables; β_0 =Intercept; β_1 to β_{10} = Coefficient to be estimated

FINDINGS AND DISCUSSION

Socio-economic Background of the Respondents

The socio-economic background of the respondents with respect to the variables *viz.* age, sex, family size, family type, education, land under kiwi, annual income from kiwi, social participation, extension-contact, training exposure and farming experience was assessed.

Upon examining the socio-economic profile of the respondents, it was found that the respondents belonged to middle age and old age categories. Nearly equal per cent of respondents falls under the mentioned two categories with the latter category (50.83%) being slight greater than the former. This clearly indicates that majority of the respondents were of old age which contributes to the fact that the respondents were more experienced, had better prospect in kiwi farming and income generation. The study concluded that mostly men were engaged in kiwi cultivation (85.00%). Generally, women play a major role in agriculture contributing to economic prosperity in the state and at the same time they manage all the household chores (Yano and Tsolo, 2015). Contrary to this, when it comes to specific crops, kiwi in this case, it requires lot of training and pruning activities and hence mostly men and partly women are involved in it. This was similar with the findings of Malla et al. (2017) who also found that 60 per cent respondents of kiwi cultivation were male. It was found that most of the kiwi cultivators had a family size of 4-8 (86.67%) and had nuclear family (75%). These findings were in line with Hoque et al. (2022). This can be explained from the traditional belief in the study area that more manpower means more source of income, so the respondents preferred more members in family than smaller members while choosing nuclear family type over joint family to maintain peace, harmony, space and privacy in the family.

Regarding the education of the respondents, 32.50 per cent were illiterate, 25.83 per cent had higher secondary education, 13.33 per cent were graduates, 11.67 per cent had primary education, 10.00 per cent had high school education and 6.67 per cent had higher studies above graduates. These educational levels clearly stated that the

kiwi growers had diverse educational background and farmers with higher educational levels may be more inclined to have higher knowledge on kiwi cultivation. Training programs provided to farmers can be designed and tailored accordingly based on the educational level of the farmers for more efficiency. The mean land size under kiwi was 1.4 ha. and 48.33 per cent of the respondents had marginal size of land under kiwi cultivation and there was no record of large size landowners. This indicates that most of the land under kiwi cultivation were small, fragmented lands which is a disadvantage for large scale production of kiwi. The average annual income from kiwi was Rs. 139391.67 in which 85 per cent of the respondents have an annual income between Rs. 43,414 to Rs. 2,35,37. In contradiction to this, the annual income from kiwi was between Rs. 4 - Rs. 5 lakhs in Arunachal Pradesh which is more than half compared to farmers from the study (Raja et al., 2021). Therefore, kiwi has high potential, and it is high time for the kiwi growers to learn innovative techniques, ideas, new technology, equipment and management practices to increase the returns from kiwi.

Here, Extension contact was measured in terms of their frequency of contact with Village Level Workers (VLWs), Agricultural Technology Management Agency (ATMA), Central Agricultural University (CAU), State Agricultural University (SAU), Farm Science Centre (KVK), etc. It was found that 81.67 per cent of the respondents had medium level of extension contact which forms the majority. A strong extension-contact is also one of the reasons that helped the farmers in getting the knowledge, awareness about kiwi cultivation and availed other opportunities. Nearly 80 per cent (78.33%) of the respondents did not attend any kind of trainings and the remaining 21.67 per cent who had attended trainings were mostly regarding general agricultural and horticultural crops and not specifically on kiwi cultivation. This finding is in line with the finding of Hoque et al. (2022) in which the respondents did not receive any kind of trainings regarding watermelon farming. So, it is high time to provide the kiwi growers with trainings in the field of kiwi cultivation in order that they adopt improved cultivation and management practices. The average farming experience in kiwi farming was found to be 17.23 and about 60.83 per cent of the respondents had 12-22 years of farming experiences. This indicates that most of the farmers have medium farming experience in kiwi cultivation which suggest a balance between traditional and modern practice. This finding aligns with the findings of Giri et al. (2021). However, the relatively lower percent of highly experienced farmers evoke that kiwi cultivation can get more returns if more experienced farmers are involved which can be possible through knowledge transfer.

Knowledge Level of Kiwi Growers

The findings of the assessment knowledge index were analysed, and the observed findings are presented in Table 1.

Table 1. Distribution of Respondents based on their Knowledge Level

Sl. No.	Category	Frequency	Percentage (%)	SD	Knowledge index (Mean)
1	Poor (<50%)	38	31.67	12.85	54.78
2	Fair or moderate (50% - 75%)	79	65.83		
3	Good (>75%)	3	2.50		
	Total	120	100.00		

Table 1 gives the overall distribution of respondents based on their knowledge index. The respondents had scored 8.22 marks on an average. Overall mean knowledge index of the respondents was 54.78 per cent. It revealed that 65.83 per cent of the respondents had 'fair or moderate' level of knowledge, which is the majority, 31.67 per cent of the respondents had 'poor' level of knowledge and 2.5 per cent of the respondents had 'good' level of knowledge on kiwi cultivation. The reason for this may be explained by the fact that most of the respondents were illiterate, have medium extension contact, majority of them did not attend any kind of trainings and medium farming experience. The percentage of respondents with good knowledge level was very low and so this highlights the need for acquiring knowledge about kiwi cultivation practices, emphasizing on the training needs of the kiwi growers. The importance of kiwi cultivation in income generation and providing livelihood to the kiwi growers makes training an inevitable part of kiwi cultivation practices. The potential for kiwi cultivation can be maximised through collaborative efforts of stakeholders, policy makers and researchers and unlock the benefits of kiwi cultivation to support the kiwi growers and improve their livelihood. The findings suggest that it is necessary to fill the knowledge gap, so that the farmers can bring better production and yield in their farms.

Association of Knowledge Level of Kiwi Growers with Predictor Variables

The association of knowledge level of the kiwi growers with the independent variables is presented in Table 2.

Table 2. Correlation Coefficient of Knowledge Level of Kiwi Growers with Predictor Variables

Sl. No.	Independent variables	Coefficient of correlation (r)
1	Age	0.077^{NS}
2	Sex	0.035^{NS}
3	Family size	-0.041^{NS}
4	Family type	0.073^{NS}
5	Education	0.270^{**}
6	Land under kiwi	-0.056^{NS}
7	Annual income from kiwi	0.027^{NS}
8	Extension-contact	0.425^{**}
9	Training exposure	0.404^{**}
10	Farming experience	0.261^{**}
** $P < 0.01$; * $P < 0.05$; NS = non-significant		

Table 2 has showed that there is positive but non-significant correlation between the age (r = 0.77), sex (r = 0.035), family type (r = 0.073), and annual income from kiwi (r = 0.027) of the respondents with the knowledge level of the kiwi growers. While there is negative but non-significant correlation between the family size (r = -0.041^{NS}), and land under kiwi (r = -0.056^{NS}) with the knowledge level of the kiwi growers. However, it was found that positive and highly significant correlation between education (r = 0.270), extension-contact (r = 0.425), training

exposure (r =0.404) and farming experience (r = 0.261) with the knowledge level of the kiwi growers. The findings align with the findings of Dhakal et al. (2021) . These findings showed that those farmers with the higher level of education know much better about the kiwi fruit cultivation and so, education level plays a vital role in enhancing the knowledge level of the respondents regarding the cultivation practices of kiwi. Similarly, each of these variables *viz.* extension-contact, training exposure, and farming experience have considerable influence on the knowledge level of recommended kiwi cultivation practices of the respondents and hence the results. This implies that the higher the training exposure, extension contact and farming experience, the higher the farmers orientation of increased knowledge level.

Relationship Between the Knowledge Level of Kiwi Growers and the Predictor Variables

For assessing the relationship between the knowledge level of kiwi growers and the independent variables a regression analysis was performed and the results are presented in Table 3.

Table 3. Regression Co-efficient analysis of Knowledge Level of Kiwi Growers with Predictor Variables

Sl. No.	Independent Variables	Coefficients	SE(b)	P value
1	Age	0.114	0.112	0.311
2	Sex	2.069	2.861	0.471
3	Family size	0.752	0.779	0.336
4	Family type	2.030	3.762	0.591
5	Education	1.710**	0.592	0.004
6	Land under kiwi	-0.528	1.685	0.754
7	Annual income from kiwi	0.000	0.000	0.688
8	Extension-contact	1.614**	0.377	0.000
9	Training exposure	10.097**	2.338	0.000
10	Farming experience	0.507**	0.194	0.010
Multiple R-value: 0.632; R-square value: 0.400; Adjusted R-square: 0.345				

Table 4. Analysis of Variance

Source of variation	DF	Sum of squares	Mean squares	F-calculated	Significance
Regression	10	7859.581	785.958	7.259	1.04E^{-08}
Residual	109	11801.160	108.268		
Total	119	19660.741			

The R squared value which is 0.400 indicates that these variables together account for 40.00% of the variation in the knowledge level of kiwi growers.

Among these ten variables, education, extension-contact, trainings exposure and farming experience displayed significant results at 0.01 level of significance. For education, the

positive coefficient 1.710 suggests that for every one unit change in education the knowledge level is expected to increase by 1.710 units, assuming all the other factors remain constant and so, higher education levels are linked to a better knowledge level. This highlights the importance of investing in education for improving the knowledge level of the kiwi growers. Similarly, the variable 'extension contact' has a significant positive coefficient of 1.614 indicating that more contact with extension contact increases the knowledge level of the kiwi growers. The variable, training exposure has a significant positive coefficient of 10.097 which implies that for every unit of training attended by the respondents, there is 10.097 units increases in the knowledge level of the kiwi growers, assuming all the other factors remain constant. Finally, the variable, farming experience showed a coefficient positive and significant of 0.507. This highlight the fact that when a farmer has more farming experience, his knowledge level also increases. This is in line with the findings of Thongkaew et al. (2019). The results can guide policymakers, educators, and agricultural professionals in developing strategies to improve kiwi cultivation practices by disseminating recommended improved practices through knowledge on improved kiwi cultivation practices.

CONCLUSION

The study concluded by offering insights into the socio-economic characteristics of the kiwi growers in Phek district of Nagaland. The findings showed the diverse background of the respondents based on their age, sex, education, annual income from kiwi, land under kiwi cultivation, training exposure, and farming experience. The findings offer valuable insights in the diffusion recommended kiwi cultivation practices by assessing the knowledge level of the kiwi growers. Most of the kiwi growers had fair to moderate knowledge regarding recommended

cultivation of kiwi in the study area. Hence, it can be concluded that the knowledge level of the kiwi growers was directly proportionate to their education, training exposure, extension contact and farming experience. It can be recommended that prioritizing education, exposure to extension-contact and imparting training particularly on kiwi to improve knowledge level on kiwi cultivation and tackle necessary problems is the need of the hour. The alignment of the current findings with previous studies enhances the credibility of our findings, holding significant implications for kiwi farming sector. This also implies for appropriate policies and interventions in the respective sector through need based training programmes, and schemes in order to increase the yield and returns from kiwi cultivation. This will ultimately improve the socio-economic condition of the kiwi growers and enhance their livelihood.

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