

ASSESSING THE ADOPTION OF IMPROVED KIWI CULTIVATION PRACTICES IN PHEK DISTRICT, NAGALAND

Sesote ü Mero¹, Deepa Thangjam² and Mary N. Odyuo³

ABSTRACT

Kiwi fruit (*Actinidia spp.*) originating from China is a deciduous vine which was introduced to the world market from New Zealand in the 1950s. Its name is derived from the native birth of the New Zealand "Kiwi". Species *deliciosa* is the most common variety found which is also known as Hayward kiwi. The study was conducted during 2023-24 and a total 120 respondents were selected for this study from six villages in Phek district of Nagaland. A complete list of farmers was prepared and then 20 progressive farmers were randomly selected from each village on the basis of probability under each kiwi land holding category. According to the study, 48.33 per cent of the respondents had marginal size land under kiwi, and the average annual income from kiwi was ₹ 1,39,392. 61.67 per cent of the respondents had 'medium' level of adoption and 38.33 per cent of the respondents had 'high' level of the adoption in kiwi cultivation. From 19 different parameters on kiwi cultivation, pruning and training method, harvesting, irrigation and land preparation method were adopted higher while plant protection measures were least adopted parameters. Therefore, it is recommended that more training programs on kiwi cultivation be conducted to enhance the adoption of improved management practices, which in turn can lead to increase productivity and income of the kiwi growers.

(Key words: Adoption level, Hayward kiwi, kiwi fruit, Nagaland, respondents)

INTRODUCTION

Kiwi fruit (*Actinidia spp.*) cultivation has gained significant traction in India, particularly in the northeastern state of Nagaland. Its cultivation has emerged as a lucrative agricultural venture in northeastern India. Agriculture in Nagaland, is characterized by traditional farming methods that often limit productivity and profitability. With the increasing demand for high-value crops like kiwi, there is an urgent need to transition from conventional practices to more advanced, efficient, and sustainable farming techniques. Improved management practices in kiwi cultivation encompass a range of activities, including proper site selection, use of quality planting material, optimal planting techniques, efficient irrigation methods, integrated pest management (IPM), and post-harvest handling. These practices not only enhance yield and quality but also ensure the sustainability of the farming systems. Phek district in Nagaland, renowned for its suitable agro-climatic conditions, offers a promising landscape for kiwi farming. This region, with its fertile soils and favourable climate, is ideally positioned to become a significant hub for kiwi production in India. However, the success of this venture

heavily relies on the adoption of improved management and cultivation practices by the local farmers. The adoption of these advanced practices, however, varies significantly among farmers due to a multitude of factors. These factors include the level of awareness and knowledge about the practices, access to resources and inputs, availability of extension services, and socio-economic conditions of the farmers. Understanding the current adoption levels of improved management practices is crucial for identifying gaps and developing strategies to promote better agricultural practices in kiwi cultivation.

Various studies have highlighted the determinants and impacts of adopting new agricultural technologies and practices. Rogers (2003) in his seminal work on the Diffusion of Innovations outlines the process through which innovations are communicated over time among participants in a social system. Rogers identified five key factors influencing adoption i.e. relative advantage, compatibility, complexity, trialability, and observability. Several studies have investigated the factors that influenced the adoption of improved agricultural practices. According to Feder *et al.* (1985), factors such as access to information, education, and extension services significantly impact the adoption

1. P.G. Student, Dept. of Rural Development and Planning, School of Agricultural Sciences, Nagaland University, Medziphema campus-797106
2. Asst. Professor, Dept. of Rural Development and Planning, School of Agricultural Sciences, Nagaland University, Medziphema campus-797106 (Corresponding author)
3. Assoc. Professor, Dept. of Agricultural Extension, School of Agricultural Sciences, Nagaland University, Medziphema campus-797106

rates of new technologies. Farmers with better access to information and higher levels of education are more likely to adopt improved practices. Similarly, access to credit and financial resources also plays a crucial role (Adesina and Baidu-Forson, 1995). Kiwi is one of the potential temperate fruit crops which is becoming popular with few farmers in Northeast India (Singh *et al.*, 2023). Specific to horticulture, including kiwi cultivation, the adoption of improved practices has been studied in various contexts. Sharma *et al.* (2020) in their study on production, marketing and prospects of Kiwifruit in Nepal recommended to focus on strategy of improving technology adoption, price intervention, market recognition, establishment of storage and processing centre and diplomatic relation for convenient global marketing. Further, Jindal *et al.* (2021) reported that kiwi cultivation has have bright prospects in Northeast India. However, its growth is hindered by the lack of quality planting material, absence of a well-defined package of practices, limited access to modern precision farming technologies, and shortage of trained manpower. Kiwi, being a relatively new introduction to Indian horticulture, has seen varying levels of adoption. Pradhan and Joshi (2020) conducted a study on kiwi cultivation on mid hills of Himalayan Mountains and suggested if improved package of practices of Kiwi cultivation developed by Dr. Y. S. Parmar University of Horticulture and Forestry, Solan was practiced and subsidies were provided to the Kiwi growers through Himachal Pradesh Government, then successful kiwi crop cultivation and adoption by farmers would enhance. In horticultural fruits like guava, Nanda *et al.* (2011) found that age of respondents was negatively and significantly related with adoption behaviour of guava grower with regards to scientific guava cultivation. The respondents having higher education status and social participation showed higher level of adoption of scientific guava cultivation. Large size of holding also revealed higher level of adoption of scientific guava cultivation. In general, farmers in Northeast India are not aware of the technological interventions in agriculture and horticulture for instance Sharma *et al.* (2023) found that the knowledge level of recommended practices of ginger cultivation was medium in Meghalaya. In the context of Nagaland, research by Patra *et al.* (2024) pointed out that the indigenous farming communities who were following shifting cultivation are diversifying their traditional agriculture to kiwifruit cultivation as an adaptation strategy to climate change. Tiasoba and Odyuo (2024) found that high cost of fertilizer was the major constraints in their study on small tea growers in Nagaland. Research specific to Nagaland and the northeastern region of India indicates unique challenges and opportunities for the adoption of improved agricultural practices. Metünülü (2023) in his study in Nagaland found that poor marketing infrastructure, price discrimination and small landholdings were some of the constraints faced by the farmers and suggested that providing of storage facility and setting up of proper industry linkages along with proper marketing system will increase the production of kiwi.

This paper aimed to assess the adoption levels of improved management practices among kiwi farmers in Phek district of Nagaland. By doing so, it aimed to provide a comprehensive overview of the current state of kiwi farming in the region. Additionally, the research will delve into the factors influencing the adoption of these practices by farmers in implementing them. The findings of this study are expected to contribute significantly to the body of knowledge on kiwi cultivation in Nagaland and India at large. By highlighting the areas where adoption of improved practices is low, the study will be helpful in formulating targeted interventions to enhance the uptake of these practices.

MATERIALS AND METHODS

The study was conducted in the year 2023-24 in Phek district of Nagaland, a region known for its favourable agro-climatic conditions for kiwi cultivation. Phek district, with its diverse topography and climate, provides a unique setting to investigate the adoption levels of improved management practices in kiwi farming. The district is primarily agrarian, with a significant portion of the population engaged in agriculture. A descriptive research design was employed to assess the adoption level of improved management practices among kiwi growers. This approach allows for a comprehensive understanding of the current practices, challenges, and factors influencing adoption rates. A multi-stage sampling technique was used to select the respondents for the study. Phek district was selected purposively owing to the highest area under kiwi cultivation among all the districts in Nagaland which is 109.00 ha (Anonymous, 2021). Out of the eight total Rural Development (RD) blocks in Phek district *viz.*, Pfutsero, Chizami, Wezih, Chetheba, Kikruma, Sekruzu, Meluri, and Phek, three blocks with significant kiwi cultivation were purposively selected namely Pfutsero, Kikruma and Chizami RD block. From the selected blocks, two villages from each block were randomly selected *viz.*, Zapami and Porba village from Pfutsero block, Thipizu and Rihuba village from Kikruma Block and Zavame and Zelome village from Chizami Block. This resulted in a total of 6 villages for the study. From each village, 20 kiwi farmers were randomly selected, resulting in a total sample size of 120 respondents. Both primary and secondary data were collected for the study. For primary data collection, structured interviews schedule was used to collect data from the kiwi farmers. The questionnaire was designed to gather information on various aspects of kiwi cultivation, including socio-economic characteristics, mass media exposure, and adoption of improved management practices. Secondary data were obtained from various sources such as government reports, research articles, and publications from agricultural extension services. The adoption level of improved management and practices of the respondents was calculated using adoption quotient which was also used by Hoque *et al.* (2022). The formula for Adoption Quotient is given below

$$\text{Adoption quotient} = \frac{\text{Total score obtained by farmer}}{\text{maximum score}} \times 100$$

The value of adoption quotient ranged from 0 to 100 and accordingly farmers were classified into four categories (Table 1).

The collected data were analysed using frequencies, percentages, means, and standard deviations to summarize the demographic characteristics and adoption levels. The questionnaire was pre-tested with a small group of kiwi farmers to identify and correct any issues. Ethical considerations were strictly adhered to throughout the study. Informed consent was obtained from all respondents before data collection, ensuring that they were aware of the study's purpose and their rights as participants. Confidentiality of the respondents' information was maintained, and the data were used solely for research purposes. While the study provided valuable insights into the adoption of improved management practices in kiwi cultivation, it is subject to certain limitations, including the

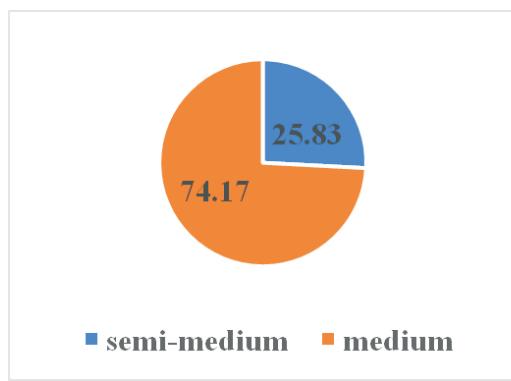


Figure 1. Distribution of land under kiwi

Income from kiwi cultivations

Figure 3 showed the distribution of annual income of the respondents from kiwi. The average annual income from kiwi was found to be ₹ 139392. It can be observed that most of the farmers (85.00%) were under the income category between ₹ 43,414-2,35,370. This finding, contradicts the

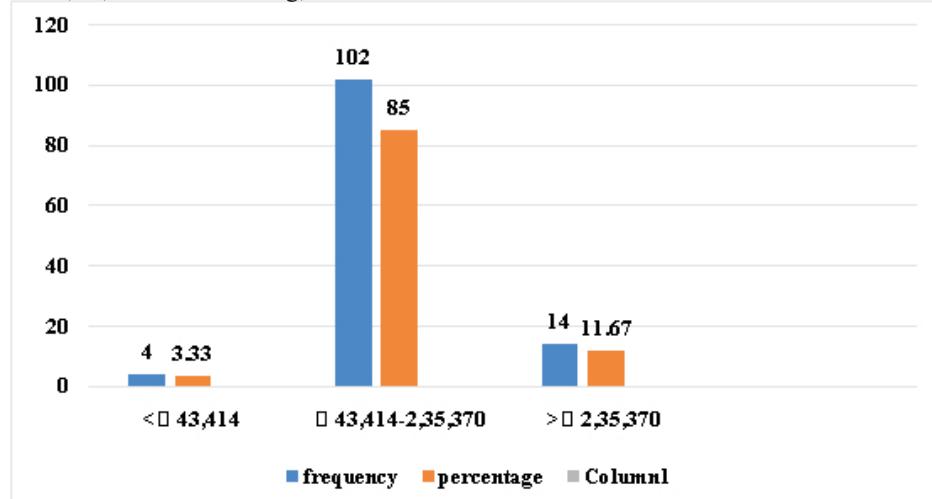


Figure 3. Distribution of annual income of the respondents from kiwi

potential for respondent bias and the generalizability of the findings to other regions.

RESULTS AND DISCUSSION

Size of land holdings

The data regarding total size of land holding and land under kiwi cultivation of the respondents are presented in Figure 1 and Figure 2 respectively. The mean of total land holding was 5.32 ha while the average size of land under kiwi cultivation was found 1.4 ha. Further, for total size of landholdings, majority (74.16%) of the respondents had medium size (4-10 ha) land followed by semi-medium size (2-4 ha). For the size of land under kiwi cultivation, 48.33 per cent of the respondents had marginal size (<1.00 ha). This showed that most of the farmers had small, fragmented lands which is a limitation for large scale cultivation of kiwi. This finding is in line with the findings from Hoque *et al.* (2022) where average size of farm under cultivation was 0.95 ha.

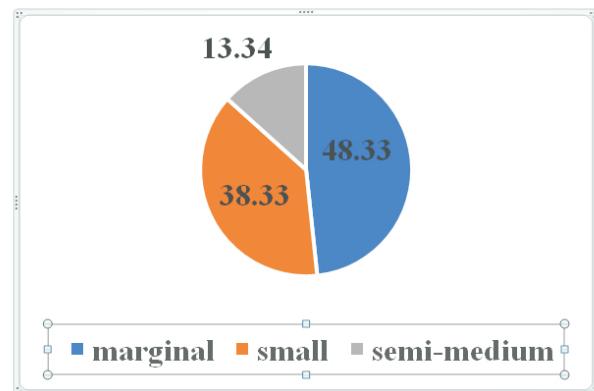


Figure 2. Distribution of total size of land holdings

finding of Jindal *et al.* (2021), who reported that farmers can earn an annual income of ₹ 4- 5 lakhs from kiwi. Therefore, assessing the gaps required to improve the productivity is a must and more efforts can be put in this line to increase the returns from kiwi.

Trainings attended by respondents

Out of the total respondents, 21.67 per cent of them attended general training programs on fruit production, skill development and post-harvest technologies (Table 2). This is in contrast with the findings of Hoque *et al.* (2022), where it was found that no farmers received training in watermelon farming in Bangladesh. Attending training programs is crucial for following a proper management practice and provides knowledge and skills on any kind of new improved technology. Even though very less per cent of farmers had undergone training programs the farmers had farmer to farmers extension contact and contact with extension personal such as Village Level Worker (VLW), Krishi Vigyan Kendra (KVK), Agricultural Technology Management Agency (ATMA), Non-Governmental Organizations (NGOs), Indian Council of Agricultural Research (ICAR), Agricultural Universities (AUs), Inputs dealers etc.

Adoption level of improved kiwi cultivation practices of the respondents

To get a detail of the farmers' adoption level on improved management practices in kiwi cultivation, a set of 19 parameters were adopted related to their cultivation practices and calculated by using adoption quotient which was also used by Hoque *et al.* (2022). The value of adoption quotient ranged from 0 to 100 and accordingly farmers were classified into four categories *viz.*, non-adopter, low adopter, medium adopter and high adopter.

From the Table 3, it is observed that 61.67 per cent of the respondents were medium adopters which is in line with the study conducted by Mehta *et al.* (2012) on extent of adoption in mango cultivation and 38.33 per cent of the respondents were high adopters. None of the respondents were from non-adopter and low adopter category. This indicates that the respondents have interest in adopting kiwi cultivation as a source of their livelihood. Therefore, through proper diffusion of technology on kiwi cultivation, more returns from kiwi can be made.

Table 4 discussed on recommended adoption practices in kiwi farming. The adoption practices in kiwi cultivation were divided into 7 domains namely land preparation, plant propagation, fertilizer application, irrigation, plant protection chemicals application, training and pruning and harvesting

In land preparation domain, it was found that 65

per cent and 45.83 per cent of respondents had adopted proper recommended preparation of soil and pit size. In plant propagation, 62.5 per cent of respondents adopted recommended type of propagation *i.e.* cutting, 59.17 per cent practiced sowing period in the month of January, 54.17 per cent adopted recommended seed variety and 51.67 per cent adopted recommended spacing. In fertilizer application, 52.5 per cent of respondents adopted recommended ratio of NPK, 35.83 per cent adopted recommended micro-nutrients (Chlorine and Boron) application. 48.33 per cent adopted organic manures application in their kiwi farm. In irrigation practices, 66.67 per cent of respondents practiced recommended time of irrigation and 51.67 per cent adopted recommended method of irrigation *i.e.* drip irrigation which was similar with the study done by Mehta *et al.* (2012) in irrigation adoption extent. In plant protection and chemical application, 33.33 per cent of respondents adopted chemical application on pest and insects (blitox, ashes, neem oil). Similarly, where more than half of the respondents did not adopt any control method in kiwi cultivation (Giri *et al.*, 2021) while 32.5 per cent also adopted biochemical and chemical application (Trichoderma viride and carbendazim). In training and pruning, 74.17 per cent of respondents followed recommended practices of training system and 77.5 per cent followed recommended practices of pruning system. In harvesting practices, 79.17 per cent of respondents adopted recommended time of harvesting, followed by 70.83 per cent getting the recommended yield of kiwi fruits, 73.33 per cent harvested the recommended grading size and 38.33 per cent of the respondents had adopted the recommended harvesting storage temperature.

This study assessed the farmers adoption level of improved management practices in kiwi cultivation. Results revealed that highest per cent of respondents adopted the recommended pruning and training methods, followed by harvesting, irrigation and land preparation method while plant protection measures were least adopted parameter. It was found that the majority of respondents were medium adopters' level on management and cultivation practices on kiwi. The present study demands more extension contact and training exposure to improve knowledge and skills of farmers and ultimately to increase the adoption level of the kiwi growers. It is can also be recommended for policy planning to emphasis on areas like irrigation, storage, usage of improved varieties for improving the cultivation practices and yield of kiwifruit.

Table 1. Classification of adopter categories

Sl. No.	Value of adoption quotient	Category
1	0	Non- adopter
2	0.1-3.33	Low adopters
3	33.34-66.66	Medium adopters
4	66.67-100.00	High adopters

Table 2. Trainings profile of the respondents

Variables	Categories	Respondents		Mean	SD	N=120
		Frequency	Percentage			
Training exposure	Training not attended	94	78.33	-	-	
	Training attended	26	21.67			

Table 3. Distribution of respondents based on adoption quotient **N=120**

Sl. No.	Value of adoption quotient	Category	Result	Percentage
1	33.34-66.66	Medium adopters	74	61.67
2	66.67-100.00	High adopters	46	38.33

Table 4. Distribution of respondents based on recommended practices in kiwi cultivation**N=120**

Sl. No.	Particulars	Frequency of respondents adopting recommended practices	Percentage
1	Land preparation	Preparation of soil (steep terrace land)	78
		Pit size (60 cm x 60 cm x 60 cm)	55
2	Plant propagation	Type of propagation (cutting)	75
		Sowing period (January)	71
3	Fertilizer application	Seed Variety (Allison, Bruno, hayward, Monty, Abbot)	65
		Spacing (5 cm x 5 cm)	62
4	Irrigation	NPK (10:10:10)	63
		Micronutrients (Chlorine and Boron)	43
5	Plant protection chemicals application	Organic Manures (15-20 kg)	58
		Time (September-October)	80
6	Training and pruning	Method (Drip irrigation)	62
		Pest and Insects (Roger and Furadon)	40
7	Harvesting	Disease (Bordeaux mixture/ Ridomil)	39
		Training system followed (T-bar, Kniffen and Pergola system)	89
		Pruning (avoid over-crowdiness and intercultural operation)	93
		Time of harvesting(October-December)	95
		Yield (50-100 kg vine ⁻¹)	85
		Grading (70 g and above - Grade A and 40-70 g Grade B)	88
		Storage (-0.6 to 0°C)	46
			38.33

REFERENCES

Adesina, A. A. and J. Baidu-Forson, 1995. Farmers' perceptions and adoption of new agricultural technology: Evidence from analysis in Burkina Faso and Guinea, West Africa, Agric. Econ. **13** (1): 1-9.

Anonymous, 2021. Directorate of Economics and Statistics. Nagaland statistical book. Directorate of economics and statistics. Nagaland, Kohima. Pp. 45.

Feder, G., R.E. Just and D. Zilberman, 1985. Adoption of agricultural innovations in developing countries: A survey, Econ. Dev. and Cult. Change, **33** (2) : 255-298.

Giri, M., G. Rawat and A. Sharma, 2021. Constraints faced by the kiwi fruit farmers in Ilam Municipality and Sandakpur rural municipality of Ilam district,Food and Agribus. Manag.**2** (2): 54-61.

Hoque, M. N., S. M. Saha, S. Imran, A. Hannan, M. M. H. Seen, S. S. Thamid and F. Tuz-zohra, 2022. Farmers' agrochemicals usage and willingness to adopt organic inputs: Watermelon farming in Bangladesh, Environ. Chall. **7**:1-24.

Jindal, K. K., D.P. Sharma and L. Sharma, 2021. Hi-tech kiwi fruit production techniques in North West and North East Himalayan states – potential for transformation from subsistence farming to sustainable horticulture towards improving livelihoods of farmers, Int. J. Trop. Agric. **39** (3) : 277-283

Mehta, M. B. and M. Sonawane, 2012. Characteristic and adoption behaviour of mango growers in Valsad district of Gujarat, Agric. Update, **1**: 37-41.

Metünülü, 2023. Case study on KhulazuBasa village kiwi fruit plantation and marketing. Unpublished thesis, St. Joseph's College Jakhama (Autonomous), Nagaland. Retrieved from <https://stjosephjakhama.ac.in/storage/naac/991712741071.pdf>Accessed on 7th August, 2024.

Nanda, A., B. Mandal and G. Majumder, 2011. Adoption behaviour of guava growers in relation to scientific cultivation of guava, J. Crop andWeed, **7** (2): 116-119.

Patra, N.K., T. Rilung, L. Das and P. Kumar, 2024. Assessing climate change and its impact on kiwi (*Actinidia deliciosa* Chev) production in the Eastern Himalayan Region of India through a combined approach of people perception and meteorological data, Theoret. and Appl. Climatol. **155**: 2347-2364.

Prandhan, A. and M. Joshi, 2020. Kiwi cultivation on mid hills of Himalayan Mountains: A highly remunerative exotic fruit crop for the small and marginal orchard growers. Abhinav

Krishi,<https://abhinavakrishi.com/blog/2020/06/28/Kiwi-cultivation-on-mid-hills-of-himalayan-mountains-a-highly-remunerative-exotic-fruit-crop-for-the-small-and-marginal-orchard-growers/>. Accessed on 28th May 2023.

Rogers, E. M. 2003. Diffusion of Innovations (5th ed.). New York: Free Press.

Sharma, A., S. Thapa and M. P. Khatiwada, 2020. Production, marketing and future prospects of kiwifruit in Nepal, *Int. J. Appl. Sci. and Biotechnol.* **8** (2): 179-186.

Sharma, V., M.N. Odyuo and J. Longkumer, 2023. Knowledge gap of recommended practices of ginger growers in West Garo Hills district, Meghalaya, *J. Soils and Crops*, **33** (2) : 340-343.

Singh, S. K., C. P. Suresh and T. K. Hazarika, 2023. Mainstreaming of Potential Fruit Crops in Northeast India, *Indian Hortic.* **68** (6) : 25-29.

Tiasoba, and M. N. Odyuo, 2024. Constraints of small tea growers in Nagaland, India, *J. Soils and Crops*, **34** (1) : 223-226.

Rec. on 02.04.2025 & Acc. on 17.04.2025