# Analyzing Knowledge Gain in Women Farmers: Insights from Tuber Crop Cultivation Training


## ABSTRACT

**Aims**:This study aimed to assess the knowledge gain of women farmers participating in a training program on tuber crop cultivation in Thrissur district, Kerala. The training focused on improving their understanding of key agricultural practices related to crops such as cassava, elephant foot yam, coleus, and sweet potatoes.
**Study design**: Ex post facto design
**Place and duration of study**:The training was organized and conducted by the Center for Gender Studies in Agriculture and Farm Entrepreneurship Development, College of Agriculture, Vellanikkara, Thrissur, Kerala on 12th March 2024.
**Methodology**: A total of 50 women farmers were randomly selected from various panchayats in the Thrissur district to attend the training.A pre- and post-training evaluation was conducted using a structured questionnaire comprising 15 questions, covering topics such as variety selection, soil fertility management, pest and disease control, and post-harvest value addition, and ~~etc~~and so on. Using grapes Agri1 in R Studio 4.3.1 software, the data were analysed using statistical methods like frequency, percentage, t-test and coefficient of correlation.
**Results**: Pre- and post-training knowledge scores were calculated and analysed using simple percentage formulas to assess knowledge gain. The study revealed a significant improvement in participants' knowledge post-training. The overall average pre-training knowledge score was 9.67 out of 50 (19.34%), while the average post-training score increased to 41.53 out of 50 (83.06%). T-test was also employed to compare the mean of pre-test and post-test evaluation.The percentage of knowledge gain in the pre-training and post-training evaluation were correlated with the independent variables such as age, education, family size, category and information source utilization. The results of correlation revealed that the independent variable such as age (X1), Education (X2), Category (X3) and farm size (X4) are negatively correlated and information source (X5) was positively correlated with the dependent variable.
**Conclusion**: The training program effectively enhanced the knowledge of women farmers in key aspects of tuber crop cultivation, contributing to improved agricultural practices and the potential for increased productivity.



*Keywords:~~Tuber:~~ Tuber C~~c~~rops, ~~w~~Women F~~f~~armers, K~~k~~nowledge G~~g~~ain, Pre-T~~t~~raining and P~~p~~ost-T~~t~~raining E~~e~~valuation, F~~f~~armer T~~t~~raining.*


## 1. INTRODUCTION

In recent years, agricultural training has become essential in promoting sustainable livelihoods of smallholder farmers, particularly for women in rural communities. Tuber crops, includingcassava, coleus, yams and sweet potatoes, are crucial for food security and income generation, especially in tropical regions. In Thrissur district, Kerala, tuber crops form an integral part of agricultural systems, but many women farmers lack access to scientific farming techniques that could enhance productivity and profitability [5,6]. Training programme aimed at empowering women through agricultural education can bridge this gap. Through systematic knowledge dissemination, women farmers can improve their farming practices and enhance yields. This study assesses the knowledge gain among women collectives

participating in training on tuber crop cultivation. However, limited knowledge of improved agricultural practices often constrains productivity and profitability [7-10]. To address this, the Center for ~~g~~Gender Sstudies in Agriculture and Farm Entrepreneurship Development, Vellanikkara, College of Agriculture conducted a training program aimed at empowering women farmers with the necessary skills and knowledge to improve their farming practices.The present study was conducted to evaluate the knowledge gain of women farmers in Thrissur district who attended these training program. The specific objectives of the study were to assess the pre- and post-training knowledge levels across 15 different topics related to tuber crop cultivation and to identify areas with the most significant improvement in knowledge.

## 2. METHODOLOGY

The study was conducted as ex-post facto researchamong 50 women farmers from different panchayats in Thrissur district, who participated in a training program on tuber crop cultivation. The training covered various topics, including land preparation, variety selection, pest and disease management, post-harvest practices, weed management, soil fertility management, water management, harvesting, storage methods, planting techniques, farm mechanization, organic farming practices, marketing strategies, integrated farming systems, climate resilience practices and others. The study aimed to evaluate the knowledge gained by 50 women farmers who attended a training programme on tuber crop cultivation. The training was organized by Center for Gender Studies in Agriculture and Farm Entrepreneurship Development, Vellanikkara, College of Agriculture, Thrissur. The participants were selected randomly from various women collectives engaged in small-scale farming in Thrissur district. A structured questionnaire with 15 questions was developed to assess participant's knowledge across the topics. The same set of questions was administered in pre-training and post-training to evaluate knowledge level of women farmers. The questionnaire was scored with 1 point for each correct answer and 0 points for an incorrect or incomplete response. Simple percentage calculations were used to analyze the knowledge levels of pre- and post-training. The formulae used for evaluation are as follows:

Knowledge % = (Score ~~o~~Obtained / Total Oobtainable ~~s~~Score) x 100

Knowledge Gain % = [(Post-Training Score - Pre-Training Score) / Total obtainable score] x 100

Using grapesAgri1 (Gopinath *et al*., 2021) in R Studio 4.3.1 software, the data were analysed using statistical methods like frequency, percentage, t-test and coefficient of correlation.The percentage of knowledge gain in the pre-training and post-training evaluation were correlated with the independent variables. T-test was also employed to compare the mean of pre-test and post-test evaluation.

## 3. RESULTS AND DISCUSSION

On evaluation of the socio-personal characteristics by percentage calculation, as mentioned in Table 1, it was found that the majority of the trainees (60%) were between the ages of 36 and 55 years, 24 percent were young (25-35 years) and 16 percent were coming ~~uunder~~under the category of old age (>55). The educational status of the trainees revealed that among those who attended training, most of the trainees (48%) were having only primary education followed by secondary (22%), higher secondary (16%), and graduation (2%). It can be seen from the data that 56 percent of trainees coming under OBC category, 20 percent under SC, 14 percent General and 10 percent were coming under ST category. The study has also examined the family size of women farmers those attended training and it can be concluded that most of trainees were coming from medium sized family (60%), followed by 22 percent consist of large family size and remaining 18 percent were from small sized family. The information source utilization of women famers was also surveyed and the results indicate that 54 percent of trainees gathered information about tuber crop cultivation from master farmer who was the leader of the women collective and had years of expertise in the cultivation practices and 26 percent of women farmers collected information from Kudumbashree and remaining 20 percent gathered information from agricultural officers.

**Commented [B1]:** MEANING?

**Table 1. Socio-~~p~~Personal Cc~~h~~aracteristics of ~~t~~Trainees**

| SlNo. | Considerations | Frequency | Percentage |
|---|---|---|---|
| 1 | **Age** | | |
| | Young (25-35years) | 12 | 24 |
| | Middle age (36-55) | 30 | 60 |
| | Oldage (>55) | 8 | 16 |
| 2 | **Education** | | |
| | Primary | 24 | 48 |
| | Secondary | 11 | 22 |
| | HigherSecondary | 8 | 16 |
| | Graduation | 1 | 2 |
| 3 | **Category** | | |
| | General | 7 | 14 |
| | Scheduled Cc~~h~~aste (SC) | 10 | 20 |
| | Scheduled Tribe (ST) | 5 | 10 |
| | Other Backward Cc~~h~~ast (OBC) | 28 | 56 |
| 4 | **Family size** | | |
| | Small (~~upto~~up to 3 members) | 9 | 18 |
| | Medium (4-6 members) | 30 | 60 |
| | Large (7-9 members) | 11 | 22 |
| 5 | **Information source** | | |
| | Agricultural officer | 10 | 20 |
| | Master farmer | 27 | 54 |
| | Kudumbashree | 13 | 26 |

The training program assessed the knowledge of women farmers across 15 key topics related to tuber crop cultivation. Each topic was evaluated with pre-and post-training scores, and the knowledge gain was calculated to determine the effectiveness of the training. The topics were ranked based on the percentage of knowledge gained.

It can be seen from table 2 and figure1 that the highest knowledge gain was observed in "Post-harvest and value addition." The pre-training score was 7 (14%), and the post-training score increased to 46 (92%), resulting in a significant knowledge gain of 78%. This topic, ranked 1st, indicates that participants greatly benefited from learning about enhancing the economic value of tuber crops after harvest."Variety selection" ranked 2nd, with an impressive knowledge gain of 76%. This indicates a substantial improvement in the participants' understanding of selecting suitable crop varieties for cultivation. "Soil fertility management" ranked 3rd with a knowledge gain of 74%. This topic addressed critical practices to maintain and enhance soil health, significantly improving participants' knowledge. The topic of "Pest and disease management" saw a notable knowledge gain of 72%, and ranked 4th. This indicates that the training successfully equipped participants with knowledge to manage pests and diseases in tuber crops effectively. "Weed management" ranked 5th, with a knowledge gain of 70%. and reflects participants' enhanced understanding of controlling weeds, a key component in improving crop yield. "Organic farming practices" showed a 68% knowledge gain, ranked 6$^{th}$ and this topic helped participants understand sustainable farming methods that avoid the use of synthetic inputs. The knowledge on "Climate resilience practices" improved from 9 (18%) pre-trainingscore to 42 (84%) post-training score, yielding a 66% gain, ranking 7th. This topic focused on equipping participants with strategies to manage the effects of climate change on crop production. "Marketing strategy" ranked 8th with a knowledge gain of 64% which successfully enhanced the participants' understanding of effective ways to market and sell their produce. The "Harvesting" topic showed a 62% knowledge gain, ranking 9th. This improvement reflects the participants' better understanding of the correct techniques and timing for harvesting tuber crops. "Planting techniques" showed a 60% knowledge gain, ranking 10$^{th}$ and indicates significant improvement in the participants' knowledge of proper planting methods for tuber crops. "Land preparation" ranked 11th, with a knowledge gain of 58%. This increase shows participants gained valuable insights into preparing land effectively for crop cultivation. "Water management" ranked 12th, with a knowledge gain of 56%. This demonstrates an improvement in participants' understanding of how to manage water resources for optimal crop growth. "Storage methods" saw a 54% knowledge gain, ranked 13$^{th}$ and it helped participants learn proper techniques for storing tuber crops to reduce post-harvest losses. The topic of "Integrated farming systems" ranked 14th, with a knowledge gain of 50%. This reflects a moderate improvement in participants' knowledge of integrating different farming components for efficiency and sustainability. The lowest improvement was in "Farm mechanization," with a knowledge gain of 48%, ranking 15th.This suggests that while participants gained knowledge, further training may be needed to fully equip them with the skills for utilizing farm machinery effectively.

Paired t-test was employed to compare the mean of pre-test and post-test evaluation.Since P-value is < 0.05 the null hypothesis was rejected at 5% level of significance (here null hypothesis is: Population mean of pre-test evaluation = Population mean of post-test evaluation) (table 2)

**Table 2. Paired t-test Score**

| t-value | df | P_value | Mean_diff |
|---|---|---|---|
| -26.324 | 14 | 0 | -31.867 |

**Table 3. Knowledge Level of Trainees on Various Aspects of Tuber Crops Farming**

| Sl. No. | Particulars | Score Obtained On | | Knowledge % on | | Knowledge Gain% | Rank (Accordingto Knowledgegain) |
|---|---|---|---|---|---|---|---|
| | | Pre-trainingEvaluation (PTE) | Post TrainingEvaluation(PoTE) | Pre-trainingEvaluation (PTE) | Post TrainingEvaluation(PoTE) | | |
| 1 | Knowledge on variety selection | 8 | 46 | 16 | 92 | 76 | II |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | Soil fertility management | 11 | 48 | 22 | 96 | 74 | III |
| 3 | Integrated farming system | 15 | 40 | 30 | 80 | 50 | XIV |
| 4 | Water management | 5 | 33 | 10 | 66 | 56 | XII |
| 5 | Weed management | 10 | 45 | 20 | 90 | 70 | V |
| 6 | Farm mechanization | 11 | 35 | 22 | 70 | 48 | XV |
| 7 | Climate resilience practices | 9 | 42 | 18 | 84 | 66 | VII |
| 8 | Planting techniques | 17 | 47 | 34 | 94 | 60 | X |
| 9 | Land preparation | 12 | 41 | 24 | 82 | 58 | XI |
| 10 | Harvesting | 5 | 36 | 10 | 72 | 62 | IX |
| 11 | Marketing strategy | 7 | 39 | 14 | 78 | 64 | VIII |
| 12 | Storage method | 13 | 40 | 26 | 80 | 54 | XIII |
| 13 | Organic farming practices | 7 | 41 | 14 | 82 | 68 | VI |
| 14 | Pest and disease management | 8 | 44 | 16 | 88 | 72 | IV |
| 15 | Post-harvest and value addition | 7 | 46 | 14 | 92 | 78 | I |
| Total | | 145 | 623 | 290 | 1246 | 956 | |

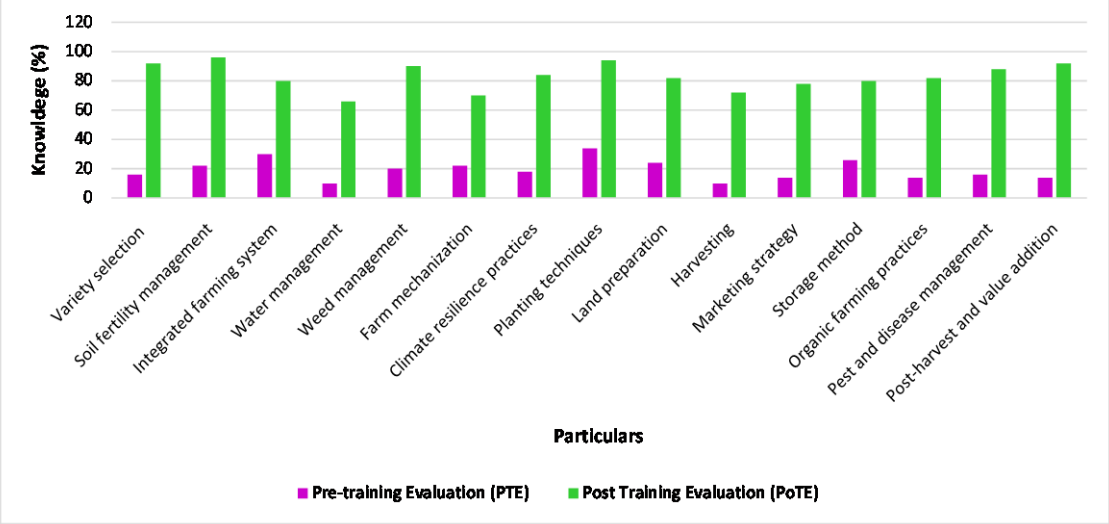



**Figure 1. Diagrammatic Rrepresentation of Knowledge lLevel of tTrainees on vVarious aAspects of Tuber Ccrops Ffarming**

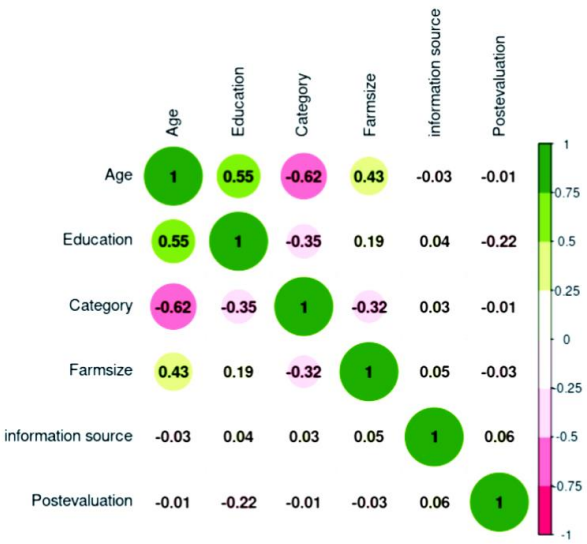
Overall, the average knowledge gain across all topics was 63.73%, demonstrating the effectiveness of the training in enhancing participants' understanding of key aspects of tuber crop cultivation. The highest gains were seen in areas related to value addition and variety selection, while topics such as farm mechanization and integrated farming systems may need additional emphasis in future training programs. The knowledge levels of the participants before and after the training program were assessed across various topics, as summarized in Table 3. The overall average pre-training knowledge level score was 9.67 out of 50 (19.34%), while the average post-training knowledge level score increased significantly to

41.53 out of 50 (83.06%). This improvement reflects the training program's effectiveness in enhancing the participants' understanding of tuber crop cultivation practices.

Table 4 and figure 2 represents the relationship between independent variables such as age, education, category, farm size and information source and the dependent variable percentage of knowledge gain in post-evaluation of training.

**Table 4. Relationship Bbetween Iindependent Vvariables and kKnowledge gGain in postPost-evaluation of Ttraining**

| Variables | (r) |
|---|---|
| Age (X1) | -0.01 |
| Education (X2) | -0.212 |
| Category (X3) | -0.009 |
| Farm size (X4) | -0.032 |
| Information source (X5) | 0.063* |




* Significant at 1 % level of probability

**Figure 2. Correlogram depicting the relationship between independent and dependent variables**

The results of correlation revealed that the independent variable such as age (X1), Education (X2), Category (X3) and farm size (X4) are negatively correlated with the dependent variable. This result was in

line with the results of study conducted by Sharma *et al*. (2013) on analysing the impact of training programme on knowledge and adoption of preservation technologies in fruits and vegetables among farm women. They found that age and family sizewere found to have negative but significant correlation with gain in knowledge of traineefarmwomen as regard to FVP training.So, it can be understood from the results that as the age of trainees increases there is a steady decline in the knowledge gain and similarly there is no relation between the family size and category of women trainees and knowledge gain from the training. It can also be concluded from the results that there is a negative and non-significant correlation between the independent variable education and knowledge gain. Which means, as the trainees are more educated or if they are having prior knowledge about the cultivation practices of tuber crops there is no or less change in knowledge can be seen in those trainees. Because, the training is not adding any additional knowledge to those women trainees. These results were found similar to the results from a study conducted by Patel *et a*l. (2023) who assessed the knowledge level of farmers towards organic farming practices in Dewas district of Madhya Pradesh and found that the age of trainees was negatively and non-significantly related to the knowledge change.

Correlation between the independent variable information source (X5) utilization and knowledge gain among the women trainees has resulted in a positive and significant relationship. Which further revealed the gathering of information by women trainees from the master farmers who are very much experienced and well knowledgeable in the field of tuber crop cultivation. These results are on par with the results of research conducted by Kumar *et al.* (2024) on analysing the impact of organic farming training on the knowledge of farm women in Jodhpur.

## 4. CONCLUSION

Well-planned training programs that focus on the needs of women farmers in tuber crop cultivation can significantly enhance their knowledge and skills. These training sessions help farmers adopt better farming practices. This not only improves the productivity and sustainability of their farming activities but also contributes to the economic well-being of smallholder farmers. Ultimately, such advancements play a vital role in bridging the knowledge gap and boosting overall tuber crop production in the region, fostering food security and rural development.



## REFERENCES


1. Gopinath, P.P.; Parsad, R.; Joseph, B., and Adarsh, V.S. (2021). Grapes agri1: Collection of shiny apps for data analysis in agriculture. *J. Open Source Softw.*, 6(63): 3437, https://doi.org/10.21105/joss.03437
2. Sharma, P., Singh, G. P., & Jha, S. K. (2013). Impact of training programme on knowledge and adoption of preservation technologies among farm women-A comparative study. *Indian Research Journal Extension Education,* 13(1), 96-100.
3. Patel, A., Rai, D. P., and Patel, N. (2023). Study on knowledge level of farmers towards organic farming practices in Dewas district. *The Pharma Innovation Journal*, SP-12(9): 165-168.
4. Kumar, S., Nagal, G., Kar, P., & Lal, B. (2024). Impact of Organic Farming Training on the Knowledge of Farm Women: A Pre-Post Analysis. *Indian Research Journal Extension Education,* 24(2):73-79.
5. Oumer AM, Tiruneh WG, Tizale CY. Empowering smallholder women farmers through participatory seed potato management: Lessons from Welmera District, Ethiopia. *Journal of Sustainable Development*. 2014;7; 7(5):93-110.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6. Kuma B, Limenih B. Women Farmers in practices: Opportunities and challenges in accessing potato production technologies in Welmera Ethiopia. *Asian Journal of Agricultural extension, economics and sociology*. 2015;6(3):149-57.
7. Zannou A, Richards P, Struik PC. Knowledge on yam variety development: insights from farmers? and researchers? practices. *Knowledge Management for Development Journal*. 2006;2(3):30-9.
8. Mudege NN, Torres S. Gender mainstreaming in root tuber and banana crops seed systems interventions: identification of lessons learnt and gaps. RTB Working Paper. 2017.
9. Rahman MS, Khatun M, Rahman ML, Haque SR. Assessment of training needs on crop production for farmers in some selected areas of Bangladesh. Bangladesh *Journal of Agricultural Research*. 2018 Dec 4;43(4):669-90.
10. Valle JF, Arnaud E, Marimo P, van Etten J. Enabling cumulative learning in user-oriented research for root, tuber and banana crop breeding. Experimental Agriculture. 2022 Jan~~;58:e58~~; 58:e58.

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