

Effectiveness of Extension Methods in Imparting Training to Farmers Growing Minor Tuber in Tamil Nadu

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ABSTRACT

Root and tuber crops are the most important food crops after cereals. They have the highest rate of dry matter production per day and are major calorie contributors. Tuber crops find an important place in the dietary habits of small and marginal farmers especially in the food security of tribal population. Considering growing importance of the tuber crops in culinary, this study aims to analyze the effectiveness of different extension methods in imparting training to the selected households about value added products from minor tuber crops. Kidaripatti village of Madurai district was selected purposively. Results showed that it could be appropriate to formulate strategies for providing training to the rural households about the value addition of the minor tuber crops. It is necessary to design awareness campaign to disseminate available minor tuber-based technology and products among them. It is also important to promote market accessibility and affordability to rural households towards the purchase of minor tuber-based crop or value-added products.

Key words: Root and tuber crops, Value addition, Food security, Training, Effectiveness

Tuber crops not only enrich the diet of the people but also possess medicinal properties to cure many ailments or check their incidence. India holds a rich genetic diversity of tropical root and tuber crops viz. Cassava, Sweet potato, Aroids, Yams and several minor tuber crops. The Indo-Burma region is the centre of origin of taro and Asiatic edible yams. The two hot spots of global biodiversity viz. North Eastern Himalayas and Western Ghats are particularly rich in wild relatives of tropical root and tuber crops [1]. Safe conservation and sustainable use of plant biodiversity is essential for meeting the present and future needs of tuber crop improvement in India. Among the tuber crops, Cassava is the most important one in the tropics and it ranks fourth, after rice, sugarcane and maize, as a source of calories for human consumption. It is a major carbohydrate food for about 500 m people in the world, and in Africa, it is the most important source of calories in the human diet [2].

The root and tuber crops become increased significant as energy, nutritional storehouse versus adaptability to changing climate [3]. The economically and socially important tropical tuber crops are Cassava (*Manihot esculenta*), Sweet potato (*Ipomoea batatas*), Yams (*Dioscorea alata*, *D. esculenta* and *D. rotundata*), Aroids which include Elephant foot yam, Taro and Tannia (*Amorphophallus*, *Colocasia* or Taro, *Xanthosoma* or Tannia) and other minor tuber crops

namely Chinese potato, Arrow root, Yam bean, Canna etc.

Sustainable food security and welfare cannot be achieved through subsistence agriculture [4]. The majority of the populations in India live in rural areas and depend on small scale agriculture for food and income. Faced with limited prospects for rural industrialization, smallholder agriculture remains the major engine of rural growth and livelihood improvement for some time. Meeting the challenge of improving rural incomes in India will require some form of transformation out of the semi-subsistence, low-input, low-productivity farming systems that currently characterizes much of rural India. Even though tuber crops have huge potential in terms of economic value and providing food security and diversity, popularisation of tuber crops and its value-added crops is still a taunting task. The conceptual framework for the paper was based on the application of qualitative response models to the theories of diffusion and adoption of innovations [5].

Considering marketing potential of tuber crop-based products, and its growing demands among the public, it is important to conduct study and ascertain awareness and adoption of value-added products from minor tubers among rural households, youth and women entrepreneur and members of Self-Help Groups. Hence, this study aims to study about effectiveness of extension methods in disseminating knowledge about tuber crop-based products and imparting necessary entrepreneurial skill through training.

MATERIALS AND METHODS

This study aims to analyze effectiveness of different extension methods in imparting training to the selected households about value added products from minor tuber

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crops. It is decided to select the villages, which is access to the agricultural college, dependability of agriculture-based livelihood, awareness and interest in knowing about the value-added products. It was decided to identify appropriate NGO, which provide exposure to the village households of minor tuber products. Through NGO, list of potential participants selected to test their knowledge level about minor tuber products using different extension communication methods. Kidaripatti village of Madurai district was selected purposively. It was chosen mainly because of access to the village from the agricultural campus, rapport created with respondents through NGO and need of providing technical training and assessment of its effects since villager predominately depends on agro based livelihoods. List of interested and potential participants was collected from the NGO and from the list, participants were selected randomly. Semi structured interview schedule was prepared in discussion with the Extension Scientist and local experts. It was pilot tested in the non-study village and necessary correction was made.

RESULTS AND DISCUSSION

Awareness is the first step in the any extension programme. Awareness about the minor tubers among the households is very essential to accelerate their interest and finally into action. Hence, the attempt was made to assess awareness among the household about minor tubers listed in the (Table 1).

Table 1 Distribution of respondents based on their awareness about tubers

Category	Respondents know about tubers		Respondents not know about tubers	
	No.*	%	No.*	%
	Karunai Kilangu	38	88.37	5
Elephant Foot Yam	32	74.41	11	25.58
Taro	4	9.03	39	90.68

*Multiple response

It could be inferred from the (Table 1) that awareness is high in the case of Karunai Kilangu (88.37) and Elephant foot yam (74.41), but very poor about Taro (9.03). Awareness is mainly depending on possibility to see, hear and often taste the recipes of minor tubers. In the study villages, these minor tuber crops are neither customarily cultivated nor cooked. Since, the minor tubers are not preferred food for majority in the study area, respondents were asked to answer possibility of their knowledge about minor tubers and purchasing minor tubers in the market during their visit to market. Thus, data were collected pertaining to frequency of purchasing tubers for household's cooking and culinary practices. As minor tubers are not cultivated in the study area and they are not available in small markets or shops near the villages. Availability of the minor tubers made possible only through common vegetable markets in the city or town. Considering this fact, data were accumulated from the respondents about their frequency of visit to the market and purchasing behaviour of minor tuber [6].

Data collected concerning respondent's behaviour to visit the market and their frequency, presented in the (Table 2). One could observed from the (Table 2) that almost fifty percent of the respondents (48.83) visited the market once in a week and preferably week end. This may be due to most of the

households engaged in the organized or unorganized work in the week days. Nearly another fifty percent of the respondents were reported that depends on the need and availability of time may visit to the market. It is understandable that majority of the respondents depended on daily wage work for their livelihood. Uncertainty of availability of the daily wage work may be limiting factor to find appropriate time to go for market where the minor tubers may available. As expected, no household had the habit of visiting market daily [7].

Table 2 Classification of the households based on their frequency of market visit and purchase of minor tubers

Category	No.	Percent
Depend on need	19	44.19
Weekend	21	48.83
Twice a week	0	0.00
Daily	0	0.00
Not purchasing minor tuber	3	6.98
Total	43	100.0

As discussed elsewhere, minor tubers were brought from somewhere else to the local market and more importantly, it was seasonal. Hence, the households had the habit of visiting market occasionally may possibly missing a chance to have a look and purchase of the minor tubers. Purchasing behaviour of the households with relative to quantity of purchase at a time has implication in their dietary pattern. Data collected with refers to quantity of purchase of tuber were presented in the (Table 3).

Table 3 Classification of respondents based on their purchasing behaviour

Category	Frequency	No.	Percent
½ kg	Monthly	30	69.76
1 kg	Monthly	10	23.26
Not purchasing	Monthly	3	6.98
Total		43	100.0

It could be easy to conclude from the (Table 3) that almost all the household purchased more than 500 grams and less than 1000 grams per month. Earlier in this study we found that average family size is less than 3, considering such a small family size, purchase of half kilogram or one kilogram indicated the fact that, households had tendency to keep for long days and use as and when required. Availability, access to the market and seasonality may be reasons for this outcome.

Access to the market

Access to the resources is crucial for effective utilization. Even the financially affordable family may not in the position to purchase the desirable produce if its access is limited. As already reported in this study, petty shops in the villages were not provide access to the minor tubers, thus, rural households tend to move nearby market if they would like to consume minor tubers. In this connection, distance between market and house of the respondents plays vital role. Factors such as time availability, transport facility and frequency, affordable cost of transport, labour availability to go for market and price of the produce may also needs to be considered if the market located in a distance [8]. Assessing the importance of this variable, data regarding to the distance between the market and household were collected and given in the (Table 4).

Table 3 Classification of the households based on distance of market from their house

Category	No.	Percent
< 5 KM	3	6.98
5-10 km	19	44.19
11-15 km	9	20.93
16-20 km	11	25.58
More than 20 km	1	2.33
Total	43	100.0

It could be inferred from the above table that households in the villages had tendency to use various markets depends on their convenient. Since the respondents were habituated to purchase minor tubers once in a month (as reported in this study) they prepared to go to market of their choice. Notably at least as nearly half of the respondents were reported to travel 5-10 kilometres. Another half of the respondents were travel 11-20 kilometres to reach the market where the minor tubers available. Hence, it could be understandable that, among the study area, women in the household may decide about cooking ingredients to be purchased. Often, women preferred to visit market if it is located within their reach by walk or cycling. But unfortunately, market access is very difficult as it is located minimum of 5-10 kilometres away. Household women were completely depended on their husband and wards to commute. Distance, time and travelling facility may hinder the women to access the market and therefore purchase frequency of minor tubers may not be encouraging one [9].

Market cost of minor tubers

Access and availability of the produce, provide opportunity to create interest among the respondents and allow them to make choice. It is very common that when the respondents happened to choose from the available resources or produce from the market, it is the cost that act as a deciding factor. The household usually decided to purchase cheaper one. Data pertaining to the cost of minor tuber produce were presented in the (Table 5).

It could be observed from the table 5 that when the distance between the markets is increased the cost of the minor tubers is reduced. The cost of minor tubers, which ranged from Rs. 30 to Rs. 60 per kilograms depending on the market. Demand for minor tubers may be high in the big market, which is geographically away from the villages. It is an economic principle that demand has been met through supply of resources from various places in order to actualize its potential. As we have seen in this study, awareness and demand for minor tubers in the villages is relatively low, thus market near by the villages may not showed interest to augment these produces [10].

Table 5 Cost of minor tubers

Category (Price/kg)	Distance to the market	No.	Percent
Rs. 30-40	16-20 km	19	44.19
Rs. 40-50	11-15 km	11	25.58
Rs. 50-60	6 -10 km	10	23.25
Above Rs. 60	< 5 km	3	6.98
Total		43	100.0

Income has potential to make influence in decision making of the individual households. Considering this uniqueness, income of the family included as one of the

variable and data pertaining to the annual income of the households is given in the (Table 6).

Table 6 Categorization of household depends on their annual income

Category	No.	Percent
Below 5,000	18	41.86
5,000-10,000	15	34.88
Above 10,000	10	23.26
Total	43	100.0

It could be noticed from the above table that three-fourths of the respondents (76.74%) household's annual income is below Rs. 10,000 per month. Just one-quarter of the respondent's household blessed to have an income of more than Rs. 10,000 per month. The household with regular salaried employment reported in this study may contributed to this outcome. The important inference from the above table would be majority of the household with less than Rs. 10,000 income per month may look for the choice of vegetables which are cheap and affordable. Moreover, they may hesitate to take risk and also were not in the position to invest on knowledge acquisition. Hence, training activities if any may planned considering their income status [11].

Cost of the produce may not be hinder, if household's affordability were high. Hence, data related affordability of the household has been collected and presented in the (Table 7). It could be interesting to note that less than 10 percent of the households considered minor tubers were cheap. More than two-fourths of the household were opined that minor tuber produce was costly and same amount of households said that it was affordable.

Table 7 Distribution of the households based on their affordability

Category	No.	Percent
Affordable	20	46.51
Costly	20	46.51
Cheap	3	6.98
Total	43	100.0

The variable affordability had relative dimension with regards to income, social economic status and comparing with similar produce in the market. Majority of the respondent's market price of minor tubers were costly simply by comparing potato price in the market. Common people may not understand mass production of potato is the main cause for relatively lower price than minor tubers. It is clear from this study that, access, availability and affordability may act as crucial factors in deciding to include minor tubers in their culinary practices. Moreover, importance of minor tubers is not restricted with food choice alone as it would offer nutritive and medicinal properties it need to be emphasized. Hence, the important implication of the study would offer is that, motivate the farmers to cultivate minor tubers which will result in increased production and thereby made available with affordable price to the people.

Data presented in the table above clearly indicate that awareness about minor tubers is not essentially put into utilization. More than three-fourths of the households (81.39) using minor tubers in their cooking once in a month. Another one-tenth of the households (11.63) includes the minor tubers in their cooking once in a week. No respondents have been reported that they regularly (i.e., daily or weekly twice) using minor tubers in their cooking.

Table 8 Categorization households based on their cooking frequency of minor tubers

Category	No.	Percent
Once in a month	35	81.39
Once in a week	5	11.63
Rarely	1	2.33
Weekly twice	0	0.00
Daily	0	0.00
Never	2	4.65
Total	43	100.0

As already discussed elsewhere in this study, access to the market, availability of the product and its affordability acted as crucial factors in a decision making of households. In this study, it was reported that more than half of the respondents were opined that market price of minor tubers were not affordable. It was worth notice that, more than three-fourths of the respondents had less than Rs. 10,000 income per month. All these factors may contribute to this outcome [12].

Table 10 Type of dishes prepared from minor tubers

Category	Elephant Foot Yam	Percent	Karunai Kilangu	Percent	Taro	Percent
Gravy	29	67.44	25	58.13	0	0
Steamed food	7	16.27	10	23.25	0	0
Grilled/ toasted	7	16.27	3	6.97	0	0
Fry	18	41.86	26	60.46	0	0
Cooked with other vegetable	0	0	0	0	0	0
Snack	1	2.32	0	0	0	0
Other	0	0	0	0	0	0

*Multiple Response

The close look at the table 10 would offer the information that both Elephant Foot Yam and Karunai Kilangu were used to prepare gravy (67.44 and 58.13 of the Households) and followed by nearly fifty percent of the household prepared to have fry from Elephant foot yam and two-thirds of the household prepared to have fry from Karunai Kilangu. Small percent of the household were used this produce as steamed food and toasted. In the case of Taro, it is surprising that no one household reported about its usage. Another important observation one can made from the above table that no households had tendency to mix these tubers with other vegetables and also for used as a snack. So, it is very essential to impart knowledge about variety of dishes one could make from the minor tubers need to initiated in order to improve its intakes among the households.

Reasons for not using tubers

Literature speaks more and more about nutritive values of minor tubers and medical practitioners were repeatedly reiterate the importance of having include minor tubers in the regular diet. Hence, attempt was made to collect the data pertaining to the awareness of medicinal properties of minor tubers among the respondents (Table 11).

Table 11 Awareness of the respondents about medicinal values of the minor tubers

Category	No.	Percent
For curing piles	8	18.61
Treating Liver problem	5	11.63
Ameliorating the Constipation	4	9.31
Prevent Heart and diabetic problems	3	6.97
Unaware of medicinal values	23	53.48

Table 9 Reasons for using or cooking minor tubers

Category	No.	Percent
Change and variety	34	79.06
Health and medicine	14	32.55
Palatability	10	23.25
Freshly available	6	13.95
Liked	3	6.97

Dishes from minor tubers

Choice making about food preference mostly decided by the children and youngster in the household. Children and younger generations were habituated to westernized dishes. Another side, women in the household would prepare vegetables which offer to produce many types of dishes. In such cases, it is not the produce, but variety it can offer or knowledge about making dishes from the particular produce gain more important. Hence, attempt was made to collect data regarding to how the household would use purchased minor tuber and what kind of dishes they would make from minor tubers. The data collected are presented in the (Table 10).

It could be observed from the (Table 11) that more than half of the respondents (53.48%) expressed that they are not aware of medicinal values of the minor tubers. Lack of adequate research and extension activities about the benefits of the minor tubers among the public may be the main reason. Another nearly one fifth of the respondents (18.61%) were opined that they were aware about the fact that minor tubers may heal piles. It may be due to the reason that for curing piles people generally preferred to opt for Sidda or Ayurvedic rather than allopathy. Allopathy practices advocate the operation or laser treatment for piles whereas sidda or ayurvedic prescribe certain procedures called “pathiyam” to be strictly adhere which involves eat and do not eat off list for 21 days. So, these practices may create awareness among the public about minor tubers. Remarkably, because of this curative nature, the respondents were reluctant to cook or eat minor tubers as they think that these were for “pile’s patients” foods [13].

In spite of all these benefits, intake of minor tubers was low as indicated by this study. Thus, data were collected from the household about reason for not opting minor tubers in their regular food choice. Reasons reported by the respondents are depicted in the (Table 11).

Table 12 Reason for not using tubers

Category	No.	Percent
Acridity	28	65.11
Difficulty in removing skin	14	32.55
No problem	5	11.62
Total	43	100.00

It could be observed from the (Table 12) that 90 percent of the households found difficulties in one way or another like

acridity (65.11%) and 32.55 percent of the household reported that removing skin from tubers as a problem. Appropriate knowledge through training or by conducting awareness campaign for the rural household may result in reducing difficulties in facing problems reported by them.

As discussed earlier, majority of the respondents were found difficult in using minor tubers. Before imparting training or conducting awareness program, it is good to know about the existing practices carried out by the respondents and scientific validation behind these practices. Hence data related to traditional practices which may alleviate the problems of using tubers were collected and presented in the (Table 13).

Table 13 Preventive measures to Alienate problems of using minor tuber

Category	No.	Percent
Washing	15	37.50
Soaking in tamarind water	11	27.50
Soaking in water used for cleaning rice	8	20.00
Drying	6	15.00
Total	43	100.00

It is interesting to know that to remove the effect of acridity in the minor tubers; all the respondents followed one or other method to reduce that effect. More than one third of the respondents (37.50%) practiced simple washing before handing. Slightly higher than of one fourth of the population (27.50) were soaked the minor tubers into the tamarind water for few minutes and used it. Another one fifth of the respondents (20%) were adopted soaking of minor tubers in the water which was used for cleaning the rice before cooking (*kazhu neer*). A small portion of the respondents (15%) were dried the minor tubers in the room temperature for few days before used for cooking. Importantly, one or other way, respondents were aware and had traditional wisdom to handle the problem of “acridity”. Hence, it could be relatively easy to inculcate the respondents with abundant traditional knowledge.

Considering immense health and healing potentials of minor tubers and so-called lifestyle, diseases became very common among the population. Hence, it is right time to promote minor tuber-based product to the people for food

Table 16 Knowledge level of respondents about value addition in minor tubers

Statement	Respondent answered correctly		Not answered correctly	
	Respondent answered correctly	Percent	Not answered correctly	Percent
Minor tubers are free from gluten	42	97.67	1	2.33
Elephant foot yam contain carbohydrate	41	95.34	2	4.66
Taro tuber contain Vit E which is good for heart problem	41	95.34	2	4.66
Karunai kilangu is good for biles	40	93.02	3	6.98
Minor tuber releases slow liberation of glucose which is helpful for diabetics	40	93.02	3	6.98
Value added minor tuber can be used for income generation	38	88.37	5	11.63
Tuber flour can be replaced by carbohydrates	38	88.37	5	11.63
Dietary fiber in tubers is reduces the serum cholesterol, prevents colon cancer and maintains good intestinal health as well as provides prophylactic action for cardio-vascular diseases and obesity	37	86.04	6	13.96
To remove acridity in tubers, soak in tamarind water	36	83.72	7	16.28
The nutritional disorders are due to insufficient intake of protein, vitamin A, vitamin C and calcium which could be easily alleviated by adequate supply and consumption of roots and tubers	33	76.74	10	23.26

It could be observed from the above (Table 16) that majority of the households had very good knowledge about the medicinal and culinary properties of the minor tubers. It

consumption. Unfortunately, due to various reason like access, availability and affordability, almost 80 percent of the respondents preferred tubers just only for a change and purchase frequency was about one per month. More than 50 percent of the respondents were not aware about minor tuber’s medicinal properties. Thus, it is right time to create awareness about the uses and benefits of the minor tubers on health and wellbeing. Before the arrangement of awareness campaign about the benefits of minor tubers, it is important to test their knowledge level and one can plan for awareness campaign based on the results. So, through the literature, medicinal values and its various benefits were collected. These were administered among the respondents before the start of training [14].

Table 14 Level of awareness among the respondents about the products of minor tubers

Innovation	Aware (%)	Unaware (%)	Total (%)
Flour	11.20	88.80	100
Suji	09.85	90.15	100
Grits	08.05	91.95	100

The (Table 14) clearly showed that respondents lack awareness about the products of minor tubers such as Flour (88.80%), Sooji (90.15%) and Grits (91.95%). They were habituated to use or cook minor tubers as raw vegetables. During our interaction with the respondents, we showed the products prepared out of flour, sooji and grits of minor tubers and demonstrated that value added products one can derive from these minor tubers. Respondents were surprised to know about the products and showed their eagerness to avail and use these products [15].

Table 15 Source of information

Category	No.	Percent
Relation	9	20.93
Neighbour	3	6.97
Parents	3	6.97
Doctors	1	2.33
Books	1	2.33
Information not known	26	60.47

could be evident from the above table that from statement number 6 to 1, knowledge percentage, i.e., household provided the right answer would range from 93.02 percent to

97.67 percent. Another four statements from 7 to 10 were aimed to test the knowledge level of the household about minimizing the difficulties while using minor tubers. These questions were received comparatively less 'correct answer'. It might be because, perception of the common people completely differs from person to person. Statement like value added minor tubers can be used for income generation is eliciting one opportunity lies on minor tubers. Depends on the perception and previous experience made them or propel them to give such answer. It is interesting to note that over all knowledge about minor tubers and its usages is relatively high among the respondents [16].

CONCLUSIONS

This research work has analyzed knowledge and training need of the respondent's households in Tamil Nadu in order to assess the trends and future projections for Research and Trainings to provide a clearer vision of the contribution that these crops can make to the food systems of developing country like India in coming years. The paper has also stressed the important differences among these crops and the multiple roles they play in today's food systems. Households in the villages had tendency to use various markets depends on their convenient. Since the respondents were habituated to purchase minor tubers once in a month, they prepared to go to market of their choice. Notably at least villagers need to travel 5-10 kilometers, as nearly half of the respondents were reported to

do it. When the distance between the markets is increased, the cost of the minor tubers is reduced. The cost of minor tubers ranged from Rs. 30 to Rs. 60 per kg depending on the market. Demand for minor tubers may be high in the big market, which may present away from the villages. Less than 10 percent of the households considered minor tubers as cheap. More than two-fourths of the household were opined that minor tuber produce were costly and same amount of households were said that it was affordable. Elephant Foot Yam and *Karunai Kilangu* were used to prepare gravy (67.44% and 58.13% of the Households) followed by nearly fifty percent of the household prepared to have fry from Elephant foot yam and two-thirds of the household prepared to have fry from *Karunai Kilangu*. Small percent of household were used these produces as steamed food and toasted. About 90 percent of the households found difficulties in one or other like acidity (65.11%) and 32.55 percent of the household reported that removing skin from tubers as a problem. Based on the results we were arrived it could be appropriate to formulate strategies for providing training for rural households about the value addition of the minor tuber crops. It is necessary to design awareness campaign to disseminate available minor tuber-based technology and products among the rural household. It is recommended that minor tuber-based research may be undertaken to promote cultivation of minor tubers. It is also important to promote market accessibility and affordability to rural households to sell and purchase minor tuber-based crop or value-added products.

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