



Small Millet Farming Drifting towards Progression: An Attitudinal Study

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Authors' contributions

This work was carried out in collaboration among all authors. Author PJ designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors PP and SD managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

As farmers have started to grow millets in recent times, farming is taking a slow drift towards progression. Past studies justifies this with various reasons viz., reduced water table, labour shortage, progressive market for millets and so on. Is it really because of this reason farming is taking a drift or is it because of farmers themselves. To understand this, the current study was conducted in Vellore and Tiruvannamalai districts where millet is being extensively cultivated. A 3-point Likert Summated Scale containing pre-tested statements was developed and used to measure the perceived factors favouring millet farming in the current scenario. The total sample size was 120 and most of respondents belonged to small and marginal farming category. The results revealed that, 85.00 percent of the respondents' in Tiruvannamalai district and 80.00 percent of the respondents in Vellore district agreed towards, supportive role of millets in marginal farmer's life followed by 55.00 percent of the respondents in Tiruvannamalai and 70.00 percent of the respondents in Vellore agreeing to lack of awareness on environmental sustainability and nutritional health benefits of millets. Factors that have contributed towards favourable attitude

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towards millet farming were use of communication tools & participation in trainings for information utilization and utilization of media sources to gain knowledge over cultivation and market trends.

Keywords: Millet farming; attitude scale; Likert's method; Vellore; Tiruvannamalai.

1. INTRODUCTION

In the recent years concern for millets has been on the rise within Indian society and this has, together with substantive work done in the past, yielded a considerable body of evidence consisting of field experiences and academic literature from non-governmental and other sources showing the existence of valid linkages between millets, poverty reduction, malnutrition alleviation and rural development [1]. The power of agricultural productivity in reducing rural poverty by 0.65% when there is 1% productivity increase millets [2]. One of the historically underemphasized areas within agriculture is rainfed agriculture. Despite India's significant investments in irrigation, around 60% of total area remains rainfed (approx. 50% for Tamil Nadu), responsible for about 40% of national food supply [3]. Statistics says that, in India, 44% of the cultivable land area was occupied by millets between 1966 and 2006. Due to the intervention of Green Revolution and changing food habits of the population, these millets started to decline and lost importance both in farming and in consumption. Despite its importance, some of the areas requiring attention, some of the main underlying barriers that is still a limited factor are lack of reach of improved methods of production and technologies lack of improved varieties, lack of organized seed distribution mechanism to supply good quality seeds for small millet crops in accordance with farmers preferences, lack of appropriate post-harvest processing technologies for small millets except finger millets, competition from other market friendly remunerative crops, lack of public procurement and marketing support and lack of available information primarily about small millets, which reduces the ability to introduce policy measures [4].

Lack of support from the government on crop loans and crop insurance are also one among the reasons for significant decline of millets in Indian Agriculture. To recommend strong policies to the policy makers upon refocusing their attention towards millet farming system and create a conducive environment for millet based farmers, more research in this area has to be

promoted. Because, strong policy and financial intervention can only support the millets from becoming extinct. Policy makers should also consider that, if India needs to secure its food and farming for our future generations, they must recognize millets and take relevant steps to diffuse its importance to the farmers and common public. As the statistics about millets and its current scenario goes like this on one hand, Institutions like Tamil Nadu Agriculture University had moved one step ahead to promote millet research by establishing Centre of Excellence in Millets (CEM) at Athiyandal Thiruvannamalai District of Tamil Nadu. The institute has been functioning since 2014 and it was felt that it would be a prime time to focus on the attitude of farmers on changing trends towards millet farming. Conceptually, attitude is seen as a mental position which serve an independent factor influencing the behaviour change in human society. It thus, has the ability of predicting the behaviour when it is not a problem to the person and it has social acceptance to its expression in action [5]. While, Banaji, et al. [6] viewed attitude as a mental and neutral state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations which is often related. Indeed, attitude is crucial if the agricultural farmers assume sincerely that, the adoption of innovation is going to be useful for the group or community. Therefore, a higher understanding of farmer's attitudes towards new technology being introduced is crucial for understanding the implementation behaviour of those farmers [7]. It ought to be noted that attitudes are often robust predictors of behaviour or the acceptance of concepts [8]. Indeed, Malak-Saiedi [9] suggested that, the more favorable person's attitude is towards behaviour the better is the person's performance towards that behaviour. While, having unfavorable attitude is unlikely to substantially tilt towards behaviour. In the case of this study adoption behaviour. Thus, in this study, farmer's level of attitude was used to measure his feelings on the improved technologies via the attitude constructs, using hypothetical statements developed by the researcher to account for a body of the

phenomena. Hence, in this context, level of farmers' attitude towards improved pearl millet varieties is considered as the farmers' feelings or inclination with regards to improved pearl millet; such feeling among farmers were incline to feelings about the technology itself, contact with extension workers, cultural suitability of the technology, feelings about yield, quality of the technology, labour requirement of the technology, feeling about whether or not the technology is for rich farmers than otherwise, feeling about the yield differences between improved varieties and local. Moreover, cultivation of finger millet, little millet and foxtail millet are declining due to several reasons few of which are processing hardship, low economic gains and lack of awareness about nutritional significance. Hence in view of these facts, this study was undertaken.

2. METHODOLOGY

The research was undertaken in Tiruvannamalai and Vellore districts of Tamil Nadu. To have representative sample of millet growing areas of Tiruvannamalai and Vellore districts, three blocks from each district viz., Chengam, Thandrapattu and Jamunamuthur blocks of Tiruvannamalai district and Jolarpet, Gudiyatham and K.V. Kuppam blocks of Vellore district were purposively selected with the highest millet area and ten farmers from each village forming an overall sample size of 120 respondents were selected and interviewed with a structured interview schedule.

For the purpose of study an attitude scale was developed using Likert's summated rating method. A total of 30 respondents for item analysis and 30 for testing reliability were selected based on the production of finger millet, little millet and foxtail millet in various blocks. It was ensured that the thirty farmers selected for item analysis were removed from their respective lists before the selection of thirty farmers for testing reliability. Thus the total number of farmers respondents selected for the scale construction was 60. The relevant items covering the entire content in the measurement of changing attitude towards millet farming were collected by extensive review of literature and discussion made with experts in the concerned field. A total of 50 statements reflecting the attitude of the respondents towards changing trend towards millet farming were generated. The statements were then edited using the criteria suggested by Edwards, [10]

and finally 20 statements were retained after deleting ambiguous, irrelevant and non-conforming statements as per the above said criteria.

The relevancy of the items generated was established by sending these statements to 58 judges with appropriate instructions. The judges comprised experts in the field from agricultural universities across South India. The experts were to rate the degree of relevancy of each items in measuring the indigenous wisdom orientation of the stakeholders on a five point continuum as 'Most Relevant', 'Relevant', 'Undecided', 'Less Relevant' and 'Not Relevant' with scores 5, 4, 3, 2 and 1 respectively. Out of 58 judges, 29 responded within a time span of one month. The scores for each items were summated over all the respondents and a relevancy index was worked out using the formula

$$\text{Relevancy index} = \frac{\text{Actual score obtained for each statement}}{\text{Maximum possible score obtained by each statement}} \times 100$$

Those items, which secured a relevancy index of 49 and above were finally selected, thereby retaining 15 items to be included in the scale. Item analysis was performed for the statements selected and was standardized by testing its validity and reliability. Item analysis is a set of procedures that are applied to know the indices for truthfulness (or validity) of the items in a scale [11]. The indices used in the selected of items for the study are a) Index of Discrimination ('t'-test), suggested by Ganesh Kumar, et al. [12]. The 15 items selected based on the relevancy rating by the judges were administered to 30 farmers respondents and the responses were obtained on a five-point continuum ('Most Relevant', 'Relevant', 'Undecided', 'Less Relevant' and 'Not Relevant'). For carrying out item analysis, two types of score were used. These were the item score, referring to the score of an individual on a particular item and the total score referring to the summation of the item scores of an individual. These scores were used to arrive at the discrimination index and the item score total score correlation. The index of discrimination indicates the power of an item to discriminate the low effectiveness category of the respondents. Following the suggestion of Edwards [10], 25% of subjects with high total score and 25% of subjects with lowest total score were selected. The critical ration (t-value) of each item was calculated using the formula

$$T = \sqrt{\frac{X_H - X_L}{\frac{S^2_H}{n_H} + \frac{S^2_L}{n_L}}}$$

Where,

X_H – Mean score on a given statement with high group

X_L - Mean score on same statement with low group

S^2_H – Variance of distribution of response of high group

S^2_L – Variance of distribution of response of low group

n_H – Number of subject in high group

n_L – Number of subject in low group

In item score-total score correlation, the correlation between the individual item score and total score is computed as a measure of the discriminatory power of the items. The scale developed was standardized by testing its reliability and validity. The reliability of the scale refers to consistency of test scores obtained by the same individual on different occasions or with different sets of equivalent forms. Split-half reliability was used in the present study using odd-even method. The scale developed was administered to 30 respondents and their responses were collected. The scores obtained for all the odd items and all even items were pooled. The two sets of scores thus obtained were correlated using Pearson's product moment correlation. The reliability of the full test was obtained using the formula

$$\text{Reliability of the full test} = \frac{2 \times \text{Reliability of the } \frac{1}{2} \text{ test}}{1 + \text{Reliability of the } \frac{1}{2} \text{ test}}$$

The formula adopted for obtaining the attitude statements Ganesh Kumar, et al. [12] are as follows,

Relevancy Weightage

$$RW = \frac{HRR + RR + NR + IR + HR}{MPS}$$

Mean Relevancy Score

$$MRS = \frac{HRR + RR + NR + IR + HR}{N}$$

Where

HRR = High Relevant Response (X5)

RR = Relevant Response (X4)

NR = Neutral Response (X3)

IR = Irrelevant Response (X2)

HR = Highly Irrelevant (X1)

MPS = Maximum Possible Score (30 x 5 = 150)

N = Number of Judges (30)

$$t = \frac{X_H - X_L}{\frac{\sqrt{\sum (\bar{X}_H - X_H)^2 + (\bar{X}_L - X_L)^2}}{n(n-1)}}$$

Where,

$$\sum (\bar{X}_H - X_H)^2 = \sum X_H^2 - \sum (X_H)^2$$

$$\sum (\bar{X}_L - X_L)^2 = \sum X_L^2 - \sum (X_L)^2$$

\sum = Summation

\bar{X}_H = the mean score on given statement of the high group

\bar{X}_L = the mean score on given statement of the low group

$\sum X_H^2$ = Sum of square of individual scores on a given statement for high group

$\sum X_L^2$ = Sum of square of individual scores on a given statement for low group

$\sum X_H$ = Summation of square on given statement for high group

$\sum X_L$ = Summation of square on given statement for low group

n = Number of respondents in each group

The final scale consisted of 10 statement in three point continuum with scores of 3, 2 and 1 for Agree, Neutral and Disagree. Mean scores were obtained for each statement and the respondents were classified according to their response to each statement using frequency distribution and percentage analysis.

3. RESULTS AND DISCUSSION

After analysing the items, the t-value and r-value of the statements, standardization of the scale and administration of the scale have been presented. The discrimination index and the item score total score correlation of the 15 items performed are presented in Table 1. It could be observed that the calculated 't' value were found to be distributed between 1.98 and 4.34. After computing the 't' value for all the items, statements equal to or greater than 1.96 at 1% level of significance were chosen for the scale.

3.1 Standardization of Scale

A scale should measure what it intends to measure and it should be consistent in its measurement. A scale thus has to be

standardized before it is administered. The present scale developed was also standardized by verifying its reliability and validity.

3.2 Reliability of the Scale

The correlation co-efficient ($r = 0.437$) for the half test was obtained. The reliability of the full test was found to be 0.493, which indicates appreciable reliability of the scale.

3.3 Validity of the Scale

Determination of content validity essentially involves the systematic examination of the test content to determine whether it covers a representative sample of the behavior domain being measured. Care was taken to include the important items covering the universe of content with respect to current trend in farming and changing attitude of farmers towards millet cultivation thereby satisfying the content validity criterion.

3.4 Administration of the Scale

The final attitude scale of 10 statements was administered to the original sample in the study area to measure the attitude of the millet growers towards future scope in millet cultivation. The scoring procedure was done on a three point continuum viz., Agree (A), Neutral (N) and Disagree (DA) with respective scores 3, 2 & 1 for positive statements and 1, 2 & 3 for negative statements respectively.

Further to investigate deep into this aspect to ascertain the favourableness and unfavourableness towards millet farming and its scope, the respondents were classified under three category viz., Favourable, Neutral and Unfavourable attitude using mean and standard deviation. The overall mean score obtained was 2.29 and the standard deviation value was 0.24. Scores pertaining to the level of attitude of respondents were (>2.53) i.e. mean (2.29) + SD (0.24) = 2.53. Respondents whose individual mean score was greater than 2.53 were considered under favourable category and (<2.05) i.e. mean (2.29) – SD (0.24) = 2.05. Respondents whose score was within the range of 2.53 – 2.05 were considered neutral.

From the results of attitude measurement on changing trends towards millet farming for future it could be observed that 16.67 percent of the respondents had positive attitude and completely

agreed that millets are crops for future farming due to its present market potential and demand in urban markets. This is followed by 55.00 per cent of the respondents who had neither positive nor negative attitude and stayed neutral. Lack of awareness about market trend and market channel for local markets, lack of knowledge on commercialization of millets may have been the reason for being neutral. About 28.33 percent of the respondents had negative attitude and disagreed that millets cannot substitute the rice and wheat which modern men are used to it at present. Moreover, non-implementation of millets in PDS, lack of strong policies on millet promotion, supply and value chain may have been the reason that would have led the respondent to stay in negative attitude towards millet farming and its future potential. Similarly for Vellore district, the same procedure was followed and the results are in Table 3.

The overall mean score obtained was 2.43 and the standard deviation value was 0.31. Scores pertaining to the level of attitude of respondents were (>2.74) i.e. mean (2.43) + SD (0.31) = 2.74. Respondents whose individual mean score was greater than 2.74 were considered under favourable category and (<2.12) i.e. mean (2.43) – SD (0.31) = 2.12. Respondents whose score was within the range of 2.74 – 2.12 were considered neutral. The following table will provide the results of beneficiary farmer's attitude toward millet farming and future scope.

From the results of attitude measurement on changing trends towards millet farming for future it could be observed that 57.50 percent of the respondents had positive attitude and completely agreed that millets are crops for future farming due to its present market potential and demand in urban markets. These findings were supported by the previous studies conducted by D'Silva, et al. [13] Hu Y, et al. [14] Arbiol, et al. [15] which confirmed that, there was a positive relationship between attitude and the outcome variable adoption. This is followed by 31.67 per cent of the respondents who had neither positive nor negative attitude and stayed neutral. Although millets have market potential in urban markets, lack of awareness about market trend and market channel for local markets, lack of knowledge on commercialization of millets may have been the reason for being neutral. About 10.83 percent of the respondents had negative attitude and disagreed that millets cannot substitute the staple food which modern men are used to it at present.

Table 1. Item analysis of the attitude scale

S. no.	Statements	'r' value	't' value
1	Millet play a supportive role in marginal agriculture*	0.362	3.00
2	Millet based food and beverages are not preferred by many across the country*	0.523	4.34
3	Millet are cheaper in market making easy access of purchase by everyone*	0.393	4.13
4	Since millets are locally cultivated, the grains are readily available for the farmers	0.100	1.40
5	Over the last few years, there is an increasing recognition of millets in their favorable nutrient consumption and benefits as health foods*	0.306	1.98
6	Public Distribution System doesn't procure or distribute millet and due to this below poverty line people doesn't have awareness on millets and are prone to malnutrition*	0.277	3.90
7	Millets are drought tolerant crop that requires minimum water. If they are promoted, the utility of land will be boosted to many folds*	0.396	2.93
8	Millets value addition is the main focus of urban market	0.123	1.35
9	Involving millet farmers in state planning will help bring better change in state's agriculture.*	0.131	2.97
10	Lack of modern technology for effective millet processing and utilization is an important reason in decline of millets*	0.356	2.00
11	Involving millet growing farmers in the state planning and execute committee and considering their views will help bring a better change in state agriculture policies	0.103	1.65
12	Value added product in millet mostly focus on urban market than rural market due to margin they fix for millet value added product*	0.148	3.18
13	Improved seed production technologies in millets through block demonstration may help create awareness on the importance of millets among farmers	0.070	1.10
14	Government should ensure access to appropriate millet seeds for farmers with financial support and subsidy for nutritious underutilized crops	0.081	1.74
15	Lack of awareness among farmers on environmental sustainability and lack of awareness among consumers on nutritional health benefits of millets reduces its demand in present scenario*	0.284	2.80

* Statements having t value >1.96 selected for final scale

Table 2. Attitude towards millets by the respondents of Tiruvannamalai District

S. no.	Statements	A		N		DA	
		Freq.	%	Freq.	%	Freq.	%
1	Millet play a supportive role in marginal agriculture*	51	85.00	9	15.00	0	0.00
2	Millet based food and beverages are not preferred by many across the country*	22	36.67	31	51.67	7	11.67
3	Millets are cheaper in market making easy access of purchase by everyone*	28	46.67	11	18.33	21	35.00
4	Over the last few years, there is an increasing recognition of millets in their favorable nutrient consumption and benefits as health foods*	23	38.33	27	45.00	10	16.67
5	Public Distribution System doesn't procure or distribute millet and due to this below poverty line people doesn't have awareness on millets and are prone to malnutrition*	13	21.67	33	55.00	14	23.33
6	Millets are drought tolerant crop that requires minimum water. If they are promoted, the utility of land will be boosted to many folds*	24	40.00	20	33.33	16	26.67
7	Involving millet farmers in state planning will help bring better change in state's agriculture.*	28	46.67	15	25.00	17	28.33
8	Lack of modern technology for effective millet processing and utilization is an important reason in decline of millets*	28	46.67	15	45.00	5	8.33
9	Value added product in millet mostly focus on urban market than rural market due to margin they fix for millet value added product*	31	51.67	27	33.33	9	15.00
10	Lack of awareness among farmers on environmental sustainability and lack of awareness among consumers on nutritional health benefits of millets reduces its demand in present scenario*	33	55.00	20	31.67	8	13.33

**Response to each statement of final scale*

Table 3. Attitude towards millets by the respondents of Vellore District

S. no.	Statements	A		N		DA	
		Freq.	%	Freq.	%	Freq.	%
1	Millet play a supportive role in marginal agriculture*	48	80.00	8	13.33	4	6.67
2	Millet based food and beverages are not preferred by many across the country*	41	68.33	12	20.00	7	11.67
3	Millets are cheaper in market making easy access of purchase by everyone*	30	50.00	16	26.67	14	23.33
4	Over the last few years, there is an increasing recognition of millets in their favorable nutrient consumption and benefits as health foods*	22	36.67	33	55.00	5	8.33
5	Public Distribution System doesn't procure or distribute millet and due to this below poverty line people doesn't have awareness on millets and are prone to malnutrition*	35	58.33	14	23.33	11	18.33
6	Millets are drought tolerant crop that requires minimum water. If they are promoted, the utility of land will be boosted to many folds*	27	45.00	30	50.00	3	5.00
7	Involving millet farmers in state planning will help bring better change in state's agriculture.*	27	45.00	26	43.33	7	11.67
8	Lack of modern technology for effective millet processing and utilization is an important reason in decline of millets*	35	58.33	20	33.33	5	8.33
9	Value added product in millet mostly focus on urban market than rural market due to margin they fix for millet value added product*	38	63.33	18	30.00	4	6.67
10	Lack of awareness among farmers on environmental sustainability and lack of awareness among consumers on nutritional health benefits of millets reduces its demand in present scenario*	42	70.00	13	21.67	5	8.33

**Response to each statement of final scale*

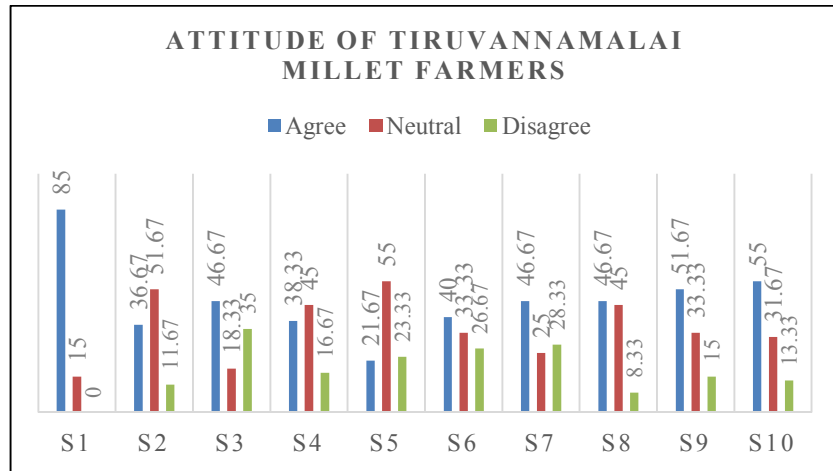


Fig. 1. Statement wise response from millet farmers of Tiruvannamalai District

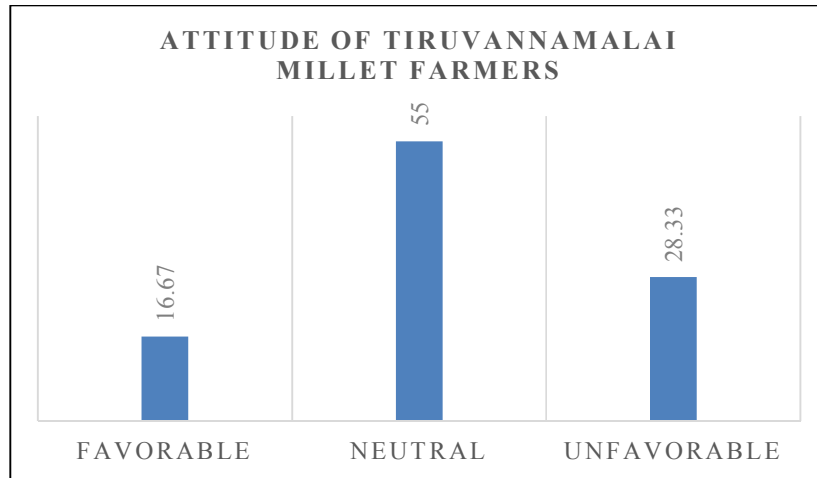


Fig. 2. Overall attitude of the beneficiaries towards millet farming in Tiruvannamalai District

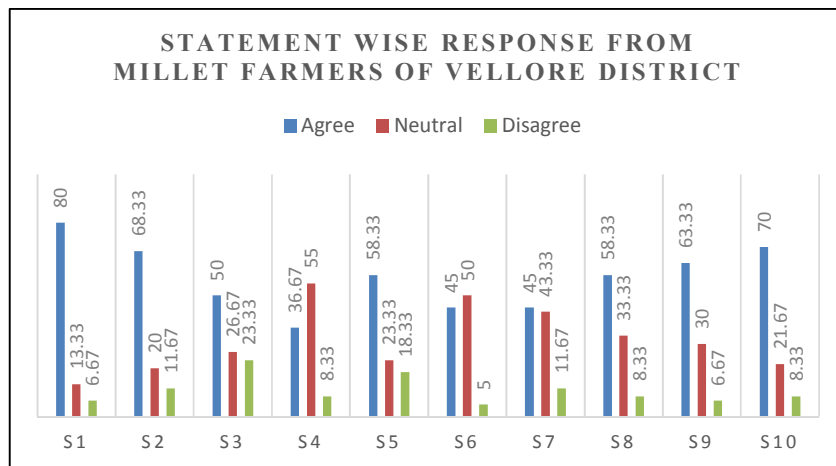


Fig. 3. Statement wise response from millet farmers of Vellore District

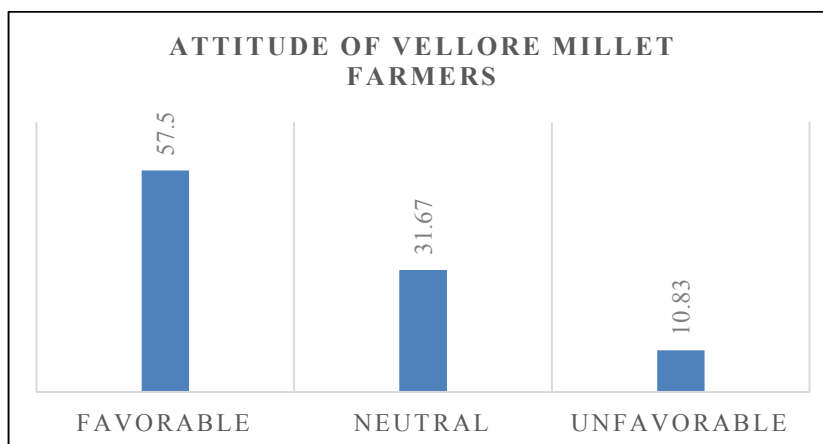


Fig. 4. Overall attitude of the beneficiaries towards millet farming in Vellore District

4. CONCLUSION

The scale developed to measure the attitude of millet farmers had quantified the orientation level of farmers towards changing trend in farming and the results clearly comprehend the current trend and changing attitude of farmers towards millet cultivation. From the outcome of result, it was found that, those who had more experience in utilizing daily market information and analyzing present market trends had positive attitude towards millets cultivation. To understand the scope of millet farming and its value addition for better market, Tiruvannamalai small millet farmers had also availed the benefit of training programmes organized in Centre of Excellence in Millets (CEM), Athiyandal. Communication channel via, on-farm and off-farm training, telephonic conversation, etc played a vital role in changing trends towards millet farming. This was well reflected during the study as majority of the respondents considered for the study were active participants of any millet training conducted by Centre of Excellence in Millets (CEM), Tamil Nadu Agricultural University. The farmers with good establishment of communication with the department and scientist of CEM, Athiyandal would have understand and gained the importance of millets and its scope in present market. Thus, communication channel supported the development of favorable attitude towards millet farming. The other variables namely educational status, information utilization through TV channels and awareness on scope for millets had its own significant contribution to the dependent variable. Education, information utilization and strengthened awareness acted as complementary effects of the dependent variable. Inclusion of millets in Public Distribution

System will minimize the demand of the consumers. The demand of millet is ever increasing due to consumer's health preferences, the demand must be met with the supply. In order to improve supply of small millets, strong and sustained policy can be the only solution to overcome the present scenario. It is agreed that the farmers possessed certain traits like education up to secondary level, optimal information utilization through TV channels and sufficient awareness on scope of millets through sources had shown positive attitude towards millet farming. Thus the farmers who have possessed such qualities are confident enough to assess himself through SWOT and outweighed the issues, which stood as a roadmaps to develop a favorable attitude towards the millet farming.

Based on the findings, farmers should be encouraged towards developing positive attitude in the cultivation and adoption of improved small millet varieties released by Tamil Nadu Agricultural University by intensifying their efforts towards awareness programme thereby eroding their socio cultural belief on their preference to traditional local varieties over the improved varieties of finger millet, little millet and foxtail millet which has potential of making difference of 35-40 per cent yield if adopted by farmers. Farmers should also be encouraged by government and other relevant agencies using policies and strategies in collaborating with extension agents by organizing relevant motivating programmes for subsequent adoption. This will not only help to win trust of the farmers on government programmes but also help guarantee optimal productivity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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