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FARMERS' AWARENESS AND SOCIO-ECONOMIC DETERMINANTS INFLUENCING MILLET PRODUCTION TECHNOLOGIES IN CLIMATE-RESILIENT FARMING SYSTEMS

Aryan Varshney¹, Pramod Tripathi², Netravathi G.^{1*}, Soumya Mishra³, Anjali² and Ankur Gond²

¹Department of Extension Education, Navsari Agricultural University, Navsari-396450, Gujarat, India

²Department of Agricultural Extension Education, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut-250110, Uttar Pradesh, India

³Department of Agricultural Extension Education, CCS Haryana Agricultural University, Hisar-125004, Haryana, India

*Corresponding authors E-mail: g.nethravathi@gmail.com

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ABSTRACT

Millets are recognized as climate-resilient crops with significant potential for enhancing food and nutritional security. However, the adoption of improved millet production technologies largely depends on farmers' level of awareness. The present study was conducted to assess farmers' awareness and to examine the relationship between selected socio-economic and communication variables and their awareness towards millet production technologies. The study was carried out in Bharuch and Narmada districts of Gujarat state using an ex-post facto research design. A total of 120 farmers were selected through a multistage sampling technique and data were collected using a structured and pre-tested interview schedule. The data were analysed using frequency, percentage and correlation coefficient. The results revealed that a majority of the respondents belonged to the middle age group, had education up to middle school level and possessed semi-medium land holdings. Most of the farmers were engaged in agriculture along with allied activities and had received training, with moderate levels of mass media exposure and extension contact. The findings indicated that 44.17 per cent of respondents had a medium level of awareness, followed by 26.67 per cent with low and 25.00 per cent with high levels of awareness. Overall, the awareness level was found to be moderate. Correlation analysis showed that education, land holding, annual income, training received, mass media exposure and scientific orientation had a positive and highly significant relationship with awareness, while occupation, farming experience and extension contact were positively and significantly related. Age, family size and social participation did not show any significant relationship. The study highlights the importance of strengthening extension services and improving access to information and training in order to enhance farmers' awareness and promote adoption of millet production technologies.

Keywords : Millets, Awareness, Socio-economic factors, Extension communication, Climate-resilient agriculture.

Introduction

Millets are among the oldest cultivated cereal crops, traditionally grown in arid and semi-arid regions due to their remarkable adaptability to harsh agro-climatic conditions. In recent years, they have gained renewed global attention as climate-resilient crops capable of ensuring food and nutritional security under changing environmental conditions. Unlike major cereals such as rice and wheat, millets require comparatively less water, fewer external inputs and can thrive in marginal soils, making them highly suitable

for sustainable agriculture (Choudhary *et al.*, 2023). Their resilience, combined with their rich nutritional profile, positions them as an important component in addressing challenges related to malnutrition, climate change and resource degradation.

India is the largest producer of millets globally and plays a significant role in their cultivation, consumption and export. Millets contribute substantially to the livelihoods of small and marginal farmers, particularly in rainfed and tribal regions. The export potential and increasing market demand for

millet cultivation in India is gradually gaining momentum due to increased awareness of their health benefits and ecological advantages (Banerjee *et al.*, 2024). Despite these developments, the area and production of millets have declined over time, primarily due to the expansion of high-yielding crops, changing consumption patterns and limited market incentives. One of the critical constraints in promoting millet cultivation is the inadequate awareness among farmers regarding improved production technologies. The adoption of scientific practices such as improved varieties, nutrient management and pest control measures largely depends on farmers' level of awareness and access to information. Limited awareness and inadequate access to information remain major constraints in the adoption of modern agricultural technologies (Tripathi *et al.*, 2025).

Awareness serves as the foundation for technology adoption, influencing farmers' attitudes, decision-making and overall farming efficiency. Previous studies have demonstrated that farmers' awareness is significantly influenced by factors such as education, extension contact, training exposure and mass media utilization (Singh *et al.*, 2020; Bhakar *et al.*, 2024). Moreover, moderate levels of awareness regarding millets and their benefits have been reported in several regions, highlighting the need for targeted extension interventions (Pathak *et al.*, 2023). In Gujarat, particularly in Bharuch and Narmada districts, millet cultivation is gaining importance due to its suitability in rainfed and tribal farming systems. However, the extent of farmers' awareness regarding improved millet production technologies remains uncertain. Understanding this aspect is crucial for designing effective extension strategies and enhancing adoption levels. Therefore, the present study was undertaken to assess the awareness of farmers towards millet production technologies and to examine the socio-economic factors influencing their awareness levels in the selected districts.

Materials and Methods

The present study was carried out in Bharuch and Narmada districts of Gujarat state. These districts were selected purposively as millet cultivation is practiced under diverse farming conditions and farmers are exposed to various extension activities related to crop production technologies. An ex-post facto research

design was adopted, as the variables under study had already occurred and were beyond the control of the researcher. This design was considered appropriate for studying the relationship between farmers' socio-economic characteristics and their awareness towards millet production technologies.

A multistage sampling procedure was followed. In the first stage, Bharuch and Narmada districts were selected purposively. In the second stage, two talukas from each district were selected, namely Jambusar and Vagra from Bharuch district and Dediapada and Sagbara from Narmada district. In the third stage, three villages from each selected taluka were selected randomly, making a total of twelve villages. From each village, ten farmers were selected through simple random sampling. Thus, a total of 120 respondents constituted the sample for the study.

The study considered socio-economic and communication characteristics of farmers such as age, education, family size, size of land holding, occupation, farming experience, annual income, social participation, training received, mass media exposure, extension contact and scientific orientation as independent variables, while farmers' awareness towards millet production technologies was treated as the dependent variable. Primary data were collected through a structured and pre-tested interview schedule developed based on relevant literature and expert consultation. The schedule was translated into the local language to ensure better understanding during personal interviews. Similar approaches for assessing technological gaps and farmers' awareness have been adopted in earlier studies (Bhandari, 2021).

Farmers' awareness was measured using a set of statements related to millet production technologies. Responses were obtained on a three-point continuum and the total awareness score for each respondent was computed by summing the individual item scores. For classification of respondents, the arbitrary method was adopted due to uniform score distribution. The total score range (difference between maximum and minimum possible scores) was divided into equal class intervals and respondents were grouped into categories such as low, medium and high awareness. The reliability of the awareness scale was tested using Cronbach's alpha coefficient and was found to be 0.78, indicating acceptable internal consistency.

The collected data were compiled, tabulated and analysed using appropriate statistical tools. The significance of correlation coefficients was tested at 0.05 and 0.01 probability levels. Frequency and

percentage were used to describe the distribution of respondents. The arithmetic mean was calculated as:

$$\bar{X} = \frac{\sum X_i}{n}$$

The standard deviation was computed as:

$$\sigma = \sqrt{\frac{\sum (X_i - \bar{X})^2}{n}}$$

The relationship between socio-economic variables and awareness was determined using the **correlation coefficient (r)** and its significance was

tested using the *t-test*: $t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$

Results and Discussion

Socio-economic and communication characteristics of respondents

The distribution of respondents according to selected socio-economic and communication variables is presented in Table-1. The findings show that nearly half of the respondents (49.17%) belonged to the middle age group, while 25.83% and 25.00% were from old and young age groups, respectively. This indicates that a large proportion of farmers were in their economically active stage. With regard to education, 28.33% of respondents had education up to middle school, followed by primary (21.67%) and college level (18.33%). Only a small proportion (4.17%) were illiterate, suggesting a moderate level of literacy among farmers. Family size analysis revealed that 33.33% of respondents had medium-sized families, followed by small (30.84%) and large (20.83%) families. In terms of land holding, 32.50% of respondents had semi-medium land, followed by small (25.83%) and medium (23.33%) land holdings, indicating the dominance of small and semi-medium farmers.

A considerable proportion of respondents (36.67%) were engaged in agriculture along with animal husbandry, while 25.83% were engaged in agriculture with horticulture. Farming experience was found to be medium among 46.67% of respondents and high among 31.67%, reflecting substantial experience in farming activities. Similar patterns of farming experience influencing adoption of improved practices were reported by Jadhao (2019). With respect to annual income, 29.17% of respondents belonged to the income group of Rs. 1,50,001 to Rs. 2,00,000, followed by 25.83% in the Rs. 1,00,001 to Rs. 1,50,000 category. In case of social participation, 42.50% of respondents had membership in one organization, while 35.00% were members of more than one organization. A majority

(70.83%) of respondents had received training related to agriculture. Further, 65.83% of respondents had medium level of mass media exposure, while 62.50% had medium level of extension contact. Scientific orientation was found to be medium among 41.67% of respondents.

Table 1: Distribution of respondents according to socio-economic and communication characteristics (n = 120)

Sr. No.	Variables	Categories	Frequ-ency	Percen-tage
1	Age	Young (up to 35 years)	30	25.00
		Middle (36–50 years)	59	49.17
		Old (above 50 years)	31	25.83
2	Education	Illiterate	5	4.17
		Functionally literate	13	10.83
		Primary school	26	21.67
		Middle school	34	28.33
		High school	20	16.67
		College/Post graduation	22	18.33
3	Family size	Very small (1–2 members)	8	6.67
		Small (3–4 members)	37	30.84
		Medium (5–6 members)	40	33.33
		Large (7–8 members)	25	20.83
		Very large (>8 members)	10	8.33
4	Land holding	Marginal (0–1 ha)	15	12.50
		Small (1–2 ha)	31	25.83
		Semi-medium (2–4 ha)	39	32.50
		Medium (4–10 ha)	28	23.33
		Large (>10 ha)	7	5.83
5	Occupation	Agriculture only	22	18.33
		Agriculture + Horticulture	31	25.83
		Agriculture + Animal husbandry	44	36.67
		Agriculture + Horticulture + AH	16	13.33
		Agriculture + Service/Business	7	5.83
6	Farming experience	Low (up to 11 years)	26	21.67
		Medium (12–32 years)	56	46.67
		High (>32 years)	38	31.66
7	Annual income	Up to Rs. 50,000	5	4.17
		Rs. 50,001– Rs. 1,00,000	29	24.17
		Rs. 1,00,001– Rs. 1,50,000	31	25.83
		Rs. 1,50,001– Rs. 2,00,000	35	29.17
		Above Rs. 2,00,000	20	16.67
8	Social participation	No membership	21	17.50
		One organization	51	42.50
		More than one organization	42	35.00
		Office bearer	6	5.00
9	Training received	Trained	85	70.83
		Untrained	35	29.17
10	Mass media exposure	Low	16	13.33
		Medium	79	65.83
		High	25	20.83
11	Extension contact	Low	18	15.00
		Medium	75	62.50
		High	27	22.50
12	Scientific orientation	Very low	15	12.50
		Low	14	11.67
		Medium	50	41.67
		High	33	27.50
		Very high	8	6.67

Awareness of farmers towards millet production technologies

Level of awareness of respondents, measured through a structured scale and categorized using the arbitrary method, is presented in Table-2. The results revealed that 44.17% of respondents had medium level of awareness, followed by 26.67% with low awareness and 25.00% with high awareness. Only 4.17% of respondents were found in the very high awareness category, while none were observed in the very low category.

Overall, the majority of respondents (73.32%) fell under medium to high awareness categories, indicating that farmers possessed a moderate level of knowledge regarding millet production technologies.

Table 2 : Distribution of respondents according to awareness level (n = 120)

Sr. No.	Category	Score range	Frequency	Percentage
1	Low	16.01 – 32.00	32	26.67
2	Medium	32.01 – 48.00	53	44.17
3	High	48.01 – 64.00	30	25.00
4	Very high	64.01 – 80.00	5	4.16

Relationship between socio-economic variables and awareness

The relationship between selected socio-economic and communication variables and farmers' awareness was analysed using correlation coefficient, as described in the methodology. The significance of correlation coefficients was determined using the t-test. The calculated t-values for variables such as education, land holding, annual income, training received, mass media exposure and scientific orientation were significant at 0.01 level, while occupation, farming experience and extension contact were significant at 0.05 level. The results are presented in Table-3.

Table 3 : Relationship between socio-economic variables and awareness of millet production technologies (n = 120)

Sr. No.	Independent Variables	Correlation coefficient (r)	t-value	Significance
1	Age	0.101	1.11	NS
2	Education	0.340	3.94	**
3	Family size	0.068	0.74	NS
4	Land holding	0.239	2.67	**
5	Occupation	0.181	2.00	*
6	Farming experience	0.190	2.10	*
7	Annual income	0.478	5.91	**
8	Social participation	0.110	1.21	NS
9	Training received	0.344	4.00	**
10	Mass media exposure	0.240	2.69	**
11	Extension contact	0.233	2.61	*
12	Scientific orientation	0.277	3.16	**

NS = Non-significant, * = Significant at 0.05 level,
** = Significant at 0.01 level

Analysis indicated that education, land holding, annual income, training received, mass media exposure and scientific orientation had a positive and highly significant relationship with awareness. Occupation, farming experience and extension contact showed a positive and significant relationship, whereas age, family size and social participation were found to be non-significant. The results clearly indicate that communication-related variables and access to information sources significantly influence farmers' awareness, which is supported by earlier findings (Mishra *et al.*, 2025). These results suggest that farmers with better education, higher income and greater exposure to information sources tend to have higher awareness of millet production technologies.

The findings of the study revealed that farmers possessed a moderate level of awareness regarding millet production technologies, indicating partial exposure to improved practices. This moderate level of awareness may be attributed to limited access to systematic extension services and insufficient dissemination of technical information at the grassroots level. The significant positive relationship between education and awareness suggests that educated farmers are more capable of understanding and utilizing agricultural information effectively. This finding is in conformity with the results of Singh *et al.* and Bhakar *et al.*, who reported that education enhances farmers' capacity to acquire and process information related to improved agricultural technologies.

Similarly, the strong influence of annual income and land holding on awareness indicates that economically better-off farmers have greater access to information sources, training opportunities and agricultural inputs. Higher income enables farmers to invest in information-seeking behaviour and adopt modern practices, thereby increasing their awareness level. Communication-related variables such as training received, mass media exposure and extension contact were found to have a significant positive relationship with awareness. This clearly indicates the crucial role of extension systems in knowledge dissemination. Farmers who are exposed to training programmes and mass media channels are more likely to be informed about improved millet production technologies. These findings are supported by earlier studies, which emphasized the role of communication channels in enhancing farmers' knowledge and adoption behaviour. Scientific orientation also showed a significant relationship with awareness, suggesting that farmers with a progressive mindset and openness towards innovation are more inclined to acquire

knowledge about improved technologies. On the other hand, variables such as age, family size and social participation were found to be non-significant, indicating that these factors do not directly influence awareness levels in the study area. Overall, the results highlight that awareness is primarily influenced by educational, economic and communication factors rather than demographic characteristics. Therefore, strengthening extension services, improving access to training and enhancing the use of mass media are essential strategies to increase farmers' awareness and promote the adoption of millet production technologies.

Conclusion

This study shows that farmers in the selected districts possess a moderate level of awareness regarding millet production technologies. While a reasonable proportion of respondents demonstrated familiarity with improved practices, there remains a clear gap in achieving a higher level of awareness across the farming community. The analysis indicates that factors such as education, income, training exposure, mass media access and scientific orientation play a meaningful role in shaping farmers' awareness. In contrast, variables like age, family size and social participation did not appear to influence awareness significantly. This suggests that access to information and learning opportunities matters more than basic demographic characteristics in determining how well farmers understand improved technologies.

Findings underline the need to strengthen extension efforts with a more focused and practical approach. Regular training programmes, better use of mass media and closer interaction between farmers and extension personnel can help bridge the existing knowledge gap. Improving these aspects can contribute not only to higher awareness but also to better adoption of millet technologies in climate-resilient farming systems. Overall, enhancing farmers' access to timely and relevant information will be key to promoting millet cultivation as a sustainable and resilient agricultural option in the region.

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