

Exploring Rural Farming Practices among Small Holder Farmers' in Sangareddy District, Telangana - A Field Study

K. Sarojini Chakravarthy

Department of Botany, Tara Government College (A), Sangareddy, Telangana, India

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Abstract

A field survey of 50 farmers across 41 villages in Sangareddy District, Telangana, documented current farming practices and plant-based traditional knowledge. The sample comprised 32 men and 18 women (median age 42 years) with an average landholding of 4.17 acres; agriculture was the primary source of income for 31 respondents. The major crops cultivated were cotton (26 farmers), followed by red gram (17), jowar (13), paddy (12), bengal gram (11), and maize (7). Sixty-four percent of farmers reported using indigenous knowledge in crop protection, and a similar proportion (64%) practiced agroforestry or mixed cropping. Sixty-six percent expressed interest in adopting organic farming practices. The majority of farmers (86%) reported observing changes in rainfall and temperature patterns, and 58% perceived a decline in plant diversity in their surroundings. Seventy-two percent of farmers had attended training programs conducted by Agricultural Extension Officers, NGOs, or Rythu Vedika, though only 38% expressed willingness to participate in future demonstration trials for sustainable farming practices. These findings indicate that while traditional ecological knowledge remains actively practiced alongside strong interest in sustainable agriculture, a notable gap persists between farmers' training exposure and their willingness to engage in further capacity-building activities.

Keywords: *rural farming; indigenous knowledge; agroforestry; climate change perception; sustainable agriculture; Telangana*

INTRODUCTION

Agriculture remains the primary source of livelihood for rural communities in India, particularly for small and marginal farmers who are increasingly confronted with climate variability and market pressures (Bisht et al., 2020; Government of India, 2021). Farmers operate under mounting structural constraints — from erratic rainfall and rising temperatures to shifting market conditions — that threaten both productivity and household well-being. Understanding the current situation, farming practices, and farmers' own perspectives on these pressures is therefore essential for developing interventions that are relevant, timely, and effective (Pretty, 2008).

A growing body of research has examined how climate change is reshaping agricultural production and rural livelihoods across India, linking observed shifts in rainfall and temperature to declining yields, food insecurity, and eroding farm incomes (Funk et al., 2020; Aryal et al., 2020). At the same time, studies have highlighted those coping and adaptation strategies through which farmers respond to adverse conditions, including changes in cropping patterns, water management, and diversification into non-farm work (Dhanya et al., 2022; Lone et al., 2022). Alongside these adaptive responses, the preservation of traditional and indigenous crop varieties continues to be recognized as both a cultural practice and a potential resource for resilience (Berkes et al., 2000; Gadgil et al., 1993). However, much of this literature remains fragmented across regions, and there is comparatively limited documentation of farmers' lived experiences and support needs in specific micro-regions such as Sangareddy district in Telangana.

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Beyond documenting climate impacts, there is also a recognized gap between the design of government agricultural schemes and the on-the-ground realities and needs of farmers (Reshma et al., 2024). Extension services, training programs, and institutional support are often poorly matched to farmers' actual constraints, limiting their uptake and effectiveness (Aryal et al., 2020; Mitter et al., 2024). Closing this gap requires direct engagement with farming communities to understand not only what support exists, but what farmers themselves identify as priorities for building resilience. At the same time, there is increasing interest in the potential for sustainable and organic farming practices to address both climate vulnerability and long-term soil and ecosystem health (Altieri, 2004; Kumar et al., 2025), making it important to gauge farmers' interest in, and readiness for, adopting such practices.

Against this backdrop, a sample survey was conducted across 41 villages in the rural areas of Sangareddy district, covering the mandals of Kangti, Sirgapur, Andole, Nagalgidda, and Narayankhed. The study gathered direct feedback from 50 farmers across these villages to examine socio-economic status, crop choices, climate change experiences, and future aspirations for sustainable farming (Aryal et al., 2020). By collecting first-hand insights into the ground realities faced by farmers (Sandilya and Goswami, 2025), the study aims to shed light on the direct link between climate change and crop productivity (Funk et al., 2020), reveal gaps between government programs and farmers' needs (Reshma et al., 2024), and support evidence-based recommendations for agricultural policy and extension services (Panja et al., 2024). The study further seeks to encourage sustainable farming by identifying farmers who are interested in, and open to, future training and capacity-building opportunities (Habanyati et al., 2024; Kumar et al., 2025).

The specific objectives of the study are: (i) to assess the socio-economic profile and landholding patterns of farmers across the surveyed villages, including demographic characteristics, land ownership, and farm size distribution; (ii) to document the major crops cultivated in the study area and the extent to which traditional and indigenous crop varieties continue to be grown alongside modern varieties; (iii) to evaluate farmers' perceptions and lived experiences of climate change, including observed shifts in rainfall, temperature, and seasonal patterns, and their impact on crop productivity; (iv) to identify the coping and adaptation strategies employed by farmers to manage adverse agricultural conditions such as droughts, erratic rainfall, and crop failure; (v) to determine the training, extension, and institutional support needs of farmers for improving agricultural resilience and productivity; (vi) to examine the gap between existing government schemes and the actual needs of farmers, in order to inform more responsive agricultural policy and extension services; (vii) to gauge farmers' interest and readiness in adopting sustainable and organic farming practices, and to identify potential participants for future training and capacity-building interventions; and (viii) to generate evidence-based insights that can support policymakers, extension workers, and development practitioners in designing targeted interventions for the study area.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in the rural areas of Sangareddy district of Telangana state. The district covers an area of approximately 4,464 km², comprising 28 mandals organized under four revenue divisions — Zaheerabad, Narayankhed, Sangareddy, and Jogipet-Andole (Government of Telangana, 2016; Census of India, 2011). Sangareddy falls within the Central Telangana agro-climatic zone, which is characterized by a mean minimum winter temperature ranging between 16.6°C and 18.7°C and a mean maximum summer temperature ranging between 37.2°C and 38.9°C, with parts of the district recording some of the lowest winter temperatures in the state. Agriculture in the zone is predominantly rainfed, with dependable monsoon rainfall (June–October) ranging between 250 mm and 766 mm (TSDPS, 2021, Government of Telangana, 2016) making crop production highly sensitive to inter-annual variability in the onset, distribution, and intensity of the southwest monsoon.

Agriculture remains the dominant livelihood activity for the rural population of the district, with the majority of farm households depending on a mix of rainfed and irrigated cultivation. As in much of the wider Telangana region, landholdings in the rural areas are predominantly small and fragmented, and farmers frequently supplement agricultural income with allied activities such as livestock rearing and, increasingly, non-farm employment. Around 41 villages selected for this study — spread across the mandals of Kangti, Sirgapur, Andole, Nagalgidda, and

Narayankhed — reflect this broader pattern of smallholder, rainfall-dependent agriculture, and are illustrative of the challenges faced by farming communities across the district's semi-arid interior.

The study region was selected for two principal reasons. First, like much of the Telangana plateau, Sangareddy district has experienced recurrent monsoon variability and periods of deficient rainfall in recent years, placing sustained pressure on crop yields, water availability, and household food security among smallholder farmers. Second, the mandals covered in this survey are representative of the socio-economic diversity of the district's rural population, encompassing variation in landholding size, cropping patterns, and access to irrigation and institutional support, which allowed the study to capture a broad range of farmer experiences and perspectives within a relatively compact geographic area. A total of 50 farmers were chosen as the sample for the study. Data was collected using a structured questionnaire consisting of 30 questions, and the same methodology was applied uniformly across all the surveyed villages (Dhanya et al., 2022; Mitter et al., 2024).

2.2 Data Collection

Data were collected through a structured survey administered by personally visiting farmers in their respective villages across the study area. This face-to-face approach was adopted to establish a comfortable setting for participants and to obtain responses that authentically reflected their everyday farming experiences, rather than relying on indirect or self-administered data collection methods. Interviews and discussions were conducted in Telugu, the predominant local language of the region, to ensure clarity, accuracy, and ease of communication between the interviewer and respondents. The questionnaire was administered in person to each of the 50 participating farmers, and where literacy posed a barrier to independently completing it, assistance was provided by the interviewer to accurately record the farmer's responses, ensuring that no participant was excluded from the survey on account of limited literacy. Farmers' responses were recorded manually in the field during each interview and were subsequently compiled and organized to enable systematic analysis.

2.3 Data Collection Tool

A structured questionnaire comprising 30 questions was designed to capture a comprehensive profile of farmers' socio-economic conditions, agricultural practices, and perspectives on climate change and sustainable farming. Most questions were structured as multiple-choice or short descriptive items, a format chosen to accommodate varying levels of literacy and familiarity with formal survey instruments among the farming population while ensuring clarity of response and ease of subsequent analysis. The questionnaire was organized around seven thematic sections.

The first section recorded demographic information, including age, gender, education level, and village of residence. The second section captured the agricultural profile of respondents, covering landholding size, main sources of household income, and the primary and secondary crops cultivated. The third section addressed traditional farming practices, including the crop varieties grown, methods of seed selection, and storage practices, reflecting the continued relevance of indigenous agricultural knowledge in the region (Berkas et al., 2000; Gadgil et al., 1993). The fourth section documented farmers' perceptions of climate change, particularly observed shifts in rainfall and temperature patterns and their perceived impact on farming outcomes (Bharat et al., 2021; Funk et al., 2020). The fifth section recorded the coping and adaptation strategies employed by farmers during droughts, crop failures, or other adverse agricultural events (Dhanya et al., 2022; Lone et al., 2022). The sixth section gauged farmers' interest in sustainable agriculture, including their willingness to adopt organic farming practices and to participate in related training programs (Habanyati et al., 2024; Kumar et al., 2025). The seventh and final section captured farmers' prior engagement with government or non-governmental support programs, including trainings attended, and their expectations for future institutional support (Reshma et al., 2024).

2.4 Data Analysis

Completed responses were compiled and tabulated in Microsoft Excel, which was used for organizing, cleaning, and coding the collected data prior to analysis. Responses to demographic, agricultural profile, and closed-ended questions were summarized using descriptive statistics, including frequencies and percentages, to characterize the overall sample in terms of age, gender, education, landholding size, and cropping patterns. Responses relating to climate change perceptions, adaptation strategies, and interest in sustainable farming were similarly tabulated and expressed

as proportions of the total sample, allowing patterns and commonly reported experiences across the surveyed villages to be identified. Short descriptive responses were grouped into common thematic categories based on recurring content, enabling qualitative observations — such as farmers' specific coping mechanisms or their expectations of government and NGO support — to be summarized alongside the quantitative findings. This combined approach allowed the study to present both the numerical distribution of responses and a descriptive account of farmers' lived experiences and perspectives.



Figure 1. Field data collection from farmers in Sangareddy District.

3. RESULTS

3.1 Socio-Economic and Demographic Profile

Of the 50 farmers surveyed, 64% were male and 36% were female, with ages ranging from 25 to 61 years (mean age 41.7 years) (Fig 1). Educational attainment varied considerably: 28% of respondents had no formal schooling, while the remainder had completed primary (6%), secondary (8%), intermediate (18%), or graduate and postgraduate education (40%). Agriculture was reported as the primary source of household income for 62% of respondents, with the remainder relying on agricultural labour, salaried employment, small trade, or allied activities such as livestock rearing, tailoring, and running small shops or eateries. Landholding size among respondents averaged 4.2 acres, with most farmers (66%) operating between 1 and 5 acres (Table 1).

Table 1. Socio-demographic and farm characteristics of respondents (N = 50)

Characteristic	Category	n	%
Gender	Male	32	64.0
	Female	18	36.0
Age (years)	21–30	7	14.0
	31–40	17	34.0
	41–50	16	32.0
	51–65	10	20.0
Education	Illiterate	14	28.0
	Primary	3	6.0
	Secondary	4	8.0
	Intermediate	9	18.0
	Graduate	17	34.0
	Postgraduate	3	6.0
Landholding (acres)^a	≤1	2	4.3
	1.1–2.5	11	23.9
	2.6–5	20	43.5
	5.1–10	13	28.3
Main income source	Agriculture	31	62.0
	Agricultural/daily-wage labour	5	10.0
	Non-farm employment/business	10	20.0
	Livestock rearing	1	2.0
	Agriculture + allied work	3	6.0

^a Landholding data available for 46 of 50 respondents; mean = 4.17 acres (SD = 2.12).

3.2 Cropping Patterns and Traditional Varieties

Cotton was the most widely cultivated crop, mentioned by more than half of the respondents, followed by red gram, paddy, jowar (sorghum), bengal gram, and green gram. A smaller number of farmers also reported cultivating maize, soybean, sugarcane, sunflower, and vegetables. Traditional and locally adapted crop varieties — including local red

gram, local green gram, desi jowar, and traditional cotton and maize varieties — were still grown by a subset of respondents, while others reported having shifted entirely to commercial or hybrid seed. Only 38% of respondents reported cultivating medicinal plants or minor millets (Fig 2).

Guidance in crop selection was most commonly obtained from elders (64%), followed by farmers' own experience (28%), with very few citing input dealers or extension officers as their primary source of guidance (Fig 3, Table 2).

Table 2. Cropping pattern, input use and traditional farming practices

Variable	Category	n	%
Major crops cultivated ^b	Cotton	26	52.0
	Red gram	17	34.0
	Jowar	13	26.0
	Paddy	12	24.0
	Bengal gram	11	22.0
	Green gram	10	20.0
	Maize	7	14.0
Guidance in crop selection	Elders/family	32	64.0
	Own experience	14	28.0
	Extension officers/input dealers	2	4.0
Fertilizer use	Chemical + organic (both)	27	54.0
	Chemical only	18	36.0
	Organic manure only	4	8.0
Pest management method	Chemical pesticides	41	82.0
	Biological methods	5	10.0
	Traditional methods (neem, ash)	3	6.0
Irrigation access	Yes	35	70.0
	No (rainfed)	13	26.0
New variety/technology adopted (past 5 years)	Yes	24	48.0
	No	16	32.0

^b Percentages sum to more than 100% as farmers commonly cultivate more than one crop.

3.3 Input Use and Pest Management

Fertilizer use was reported as a combination of chemical and organic sources by 54% of respondents, while 36% relied exclusively on chemical fertilizers and 8% used organic manure alone (Fig 4). Pest and disease management showed a stronger skew towards chemical methods, with 82% of farmers reporting reliance on chemical pesticides, compared to smaller shares using biological (10%) or traditional (6%) pest control methods such as neem-based extracts and ash dusting.

Irrigation access was reported by 70% of respondents, predominantly through borewells, with smaller numbers citing canals, tanks, or drip irrigation; the remaining 30% relied entirely on rainfed cultivation (Fig 5).

3.4 Perceptions of Climate Change and Its Impacts

The majority of farmers (86%) reported having observed changes in climate patterns over recent years, most commonly described in terms of delayed or irregular monsoon onset, unpredictable and sudden rainfall events, reduced overall rainfall, and hotter summers. Several farmers specifically noted that sudden or unseasonal rain damaged flowering crops or delayed harvest, while others pointed to a general lengthening of dry spells and shortening of the effective monsoon season. (Fig 3, Table 3).

The reported impacts of these changes on crops and livelihoods were predominantly negative and directly tied to yield outcomes. Farmers described reduced yields across multiple crops, poor germination, flower drop, low pod-filling in pulses, delayed crop maturity, and increased vulnerability to pest and disease pressure, alongside broader consequences such as income instability, increased dependence on chemical inputs, and greater reliance on daily-wage labour to compensate for shortfalls in farm income.

Table 3. Climate change perception, impacts and adaptation strategies

Variable	Category	n	%
Climate pattern change observed	Yes	43	86.0
	No	5	10.0
Plant diversity change observed	Yes	29	58.0
	No	19	38.0
Coping/adaptation strategy used ^c	Non-farm income, labour or MGNREGA	12	24.0
	Drought-resistant/short-duration varieties	10	20.0
	Irrigation measures (drip, wells, rainwater harvesting)	10	20.0
	Intercropping/crop diversification	7	14.0
	Borrowing money/credit	4	8.0
	No active coping strategy	6	12.0

^c Percentages sum to more than 100% as farmers reported using more than one strategy.

3.5 Coping and Adaptation Strategies

Farmers reported a range of coping and adaptation strategies in response to drought and crop failure. The most frequently mentioned strategies included shifting to short-duration or drought-resistant crop varieties, adopting drip irrigation, intercropping, rainwater harvesting through storage pits, and diversifying household income through non-farm work, daily labour, or small trade. A notable share of respondents also reported participation in the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) scheme and borrowing money from informal or institutional sources as means of sustaining the household during periods of agricultural stress. A small number of farmers (12%) reported no active coping strategy beyond accepting reduced income, or indicated that they had not yet faced a failure severe enough to require one (Table 3).

3.6 Institutional Support and Willingness to Engage

A large majority of farmers (72%) reported having participated in some form of government or non-governmental training in recent years, most commonly delivered through agricultural extension officers or Rythu Vedika (farmer

forum) sessions. Willingness to participate in future demonstrations or trials was comparatively lower, with only 38% of respondents expressing clear willingness (Fig 5).

When asked what support they expected from government bodies or agricultural universities, the majority of responses centred on subsidized or free inputs — particularly seeds, fertilizers, and pesticides — along with requests for improved irrigation infrastructure, better and more stable market prices, and access to crop insurance schemes such as the Pradhan Mantri Fasal Bima Yojana (PMFBY). Very few farmers referenced training or capacity-building explicitly as a priority need, in contrast to their stated interest in organic and sustainable farming, reported by 66% of respondents (Table 4).

Table 4. Indigenous knowledge, sustainable farming interest and institutional support

Variable	Category	n	%
Indigenous knowledge used in farming	Yes	32	64.0
	No	16	32.0
Agroforestry/mixed cropping practiced	Yes	32	64.0
	No	16	32.0
Medicinal plants/minor millets cultivated	Yes	19	38.0
	No	29	58.0
Interest in organic/sustainable farming	Yes	33	66.0
	No	16	32.0
Attended govt./NGO training	Yes	36	72.0
	No	13	26.0
Willing to join future demonstration trials	Yes	19	38.0
	No	28	56.0

3.7 Indigenous Knowledge and Agroforestry Practices

Sixty-four percent of farmers reported using indigenous knowledge in their farming practices, most commonly citing the use of cow dung slurry, neem-based preparations, and mixed cropping. A similar proportion (64%) reported practising some form of agroforestry or mixed cropping, integrating trees such as neem and tamarind, or intercropping red gram with cotton. Farmers also described the continued use of wild plants for food, fodder, or medicinal purposes, including species used to treat cough and skin ailments. At the same time, 58% of respondents reported perceiving a decline in overall plant diversity in their surroundings, attributing this to the reduction of native and wild vegetable species (Fig 5, Table 3 & 4).

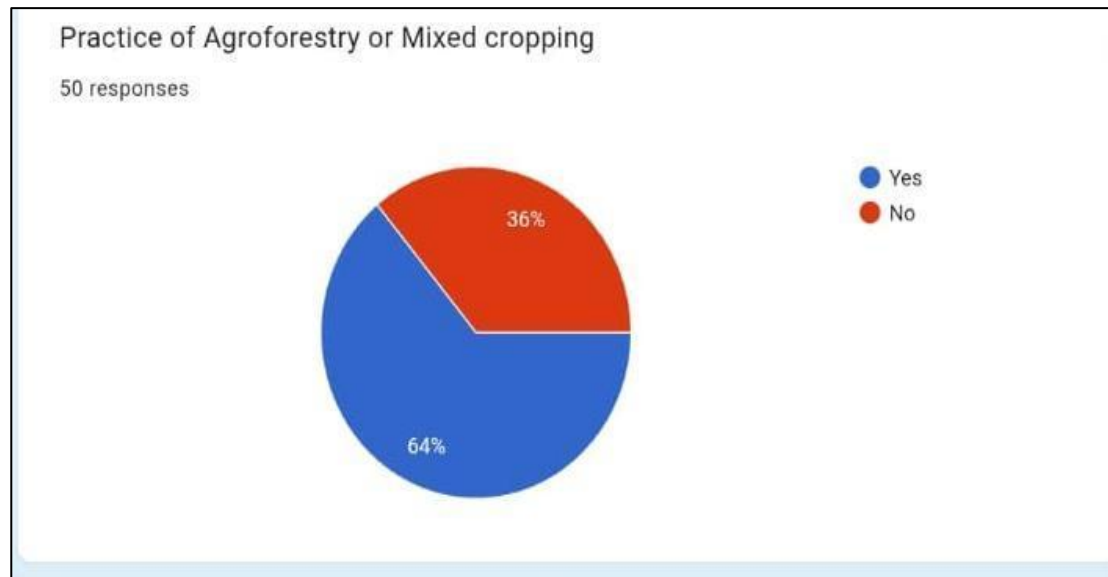


Figure 2. Practice of agroforestry or mixed cropping among surveyed farmers (n = 50)

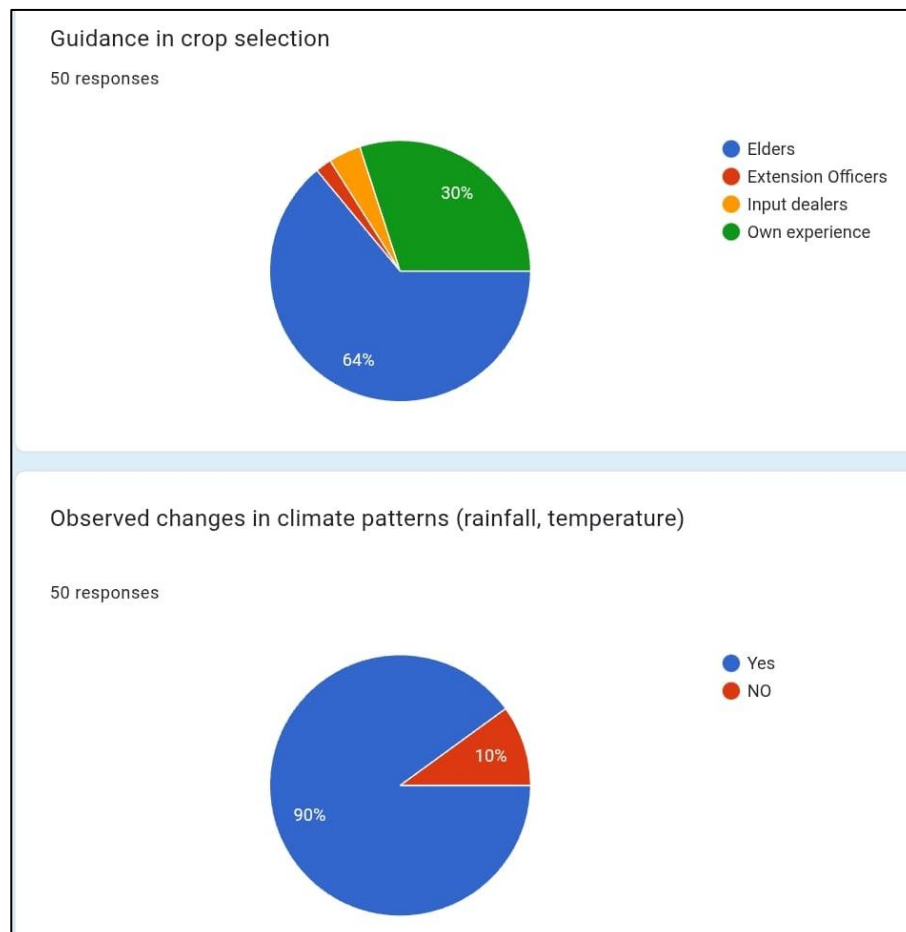


Figure 3. Sources of guidance in crop selection and farmers' observed changes in climate patterns

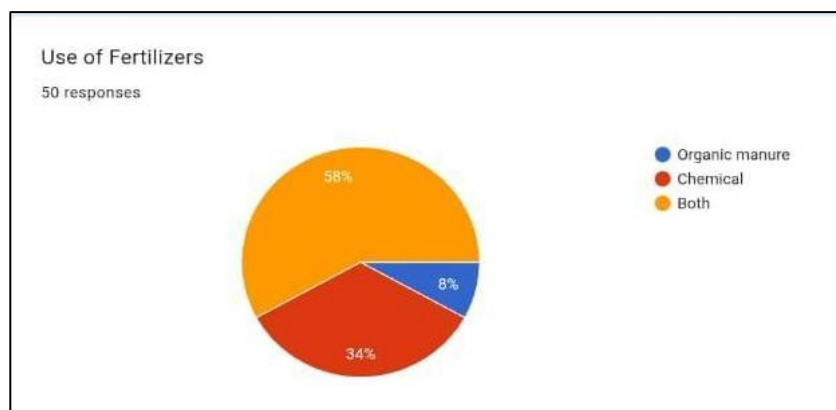


Figure 4. Use of fertilizers (organic, chemical, or both) among surveyed farmers

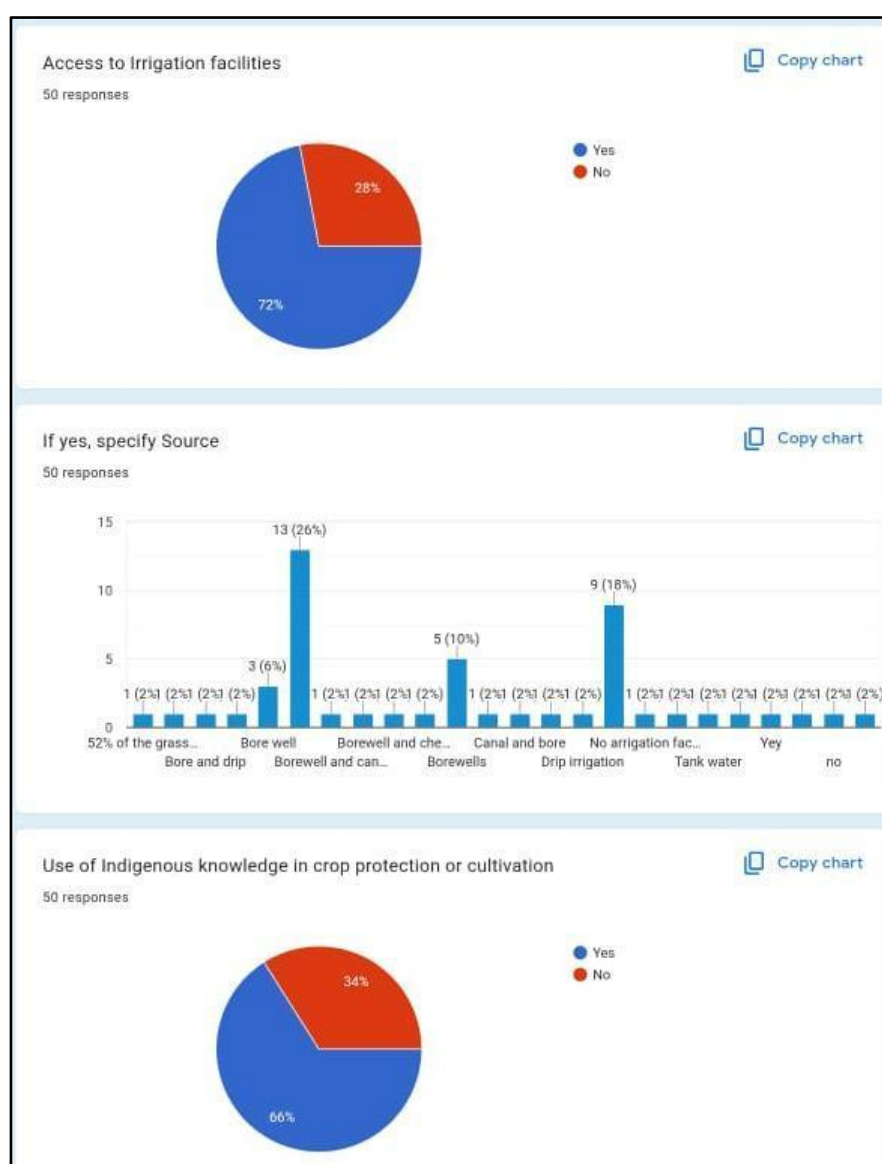


Figure 5. Field verification of boundary agroforestry vegetation, and farmers' access to irrigation, irrigation sources, and use of indigenous knowledge in crop protection

4. DISCUSSION

The results of this survey highlight the complex interplay between socio-economic factors, agricultural practices, and the growing influence of climate variability on rural farming communities in Sangareddy district (Aryal et al., 2020; Funk et al., 2020). This section interprets the key findings in relation to the existing literature and considers their implications for policy and extension practice.

4.1 Socio-Economic Characteristics

The surveyed farming population was predominantly male (64%), though female farmers made up a meaningful minority (36%) of respondents. Education levels ranged widely, from farmers with no formal schooling (28%) to those holding graduate and postgraduate qualifications, indicating that while a segment of the farming population has access to formal education, day-to-day agricultural decision-making continues to rely heavily on experiential and intergenerational knowledge rather than formal training — a pattern reflected in the finding that most farmers turned to elders, rather than extension officers or input dealers, for guidance in crop selection (Berkes et al., 2000; Gadgil et al., 1993). Landholding sizes were generally small to medium, averaging 4.2 acres and clustering between 1 and 5 acres for most respondents. This landholding structure is consistent with the broader pattern of smallholder dominance across rural India (Bisht et al., 2020) and is likely to directly shape farmers' crop choices, capacity for income diversification, and ability to invest in modern technologies such as drip irrigation or protected cultivation, since smaller and more resource-constrained holdings typically carry a narrower margin for risk-taking.

4.2 Cropping Patterns and Traditional Practices

Farmers in the study area cultivate a diverse mix of crops, with cotton and red gram dominant in the Kharif season and jowar, bengal gram, and green gram common in Rabi, alongside smaller-scale cultivation of paddy, maize, soybean, sugarcane, and vegetables. Traditional varieties — including local red gram, desi jowar, and traditional cotton and maize varieties — continue to be grown by a subset of respondents, reflecting cultural preferences, local agro-ecological adaptability, and taste preferences that sustain their place in the cropping system despite the availability of higher-yielding alternatives (Berkes et al., 2000; Ghosh-Jerath et al., 2021). However, this survey also found clear evidence of the gradual decline of traditional cropping practices: several farmers reported having replaced saved traditional seed with commercial or hybrid varieties each season, and only 38% of respondents still cultivated medicinal plants or minor millets, both once staple components of the traditional cropping system in the region. This decline is consistent with global evidence that traditional and indigenous crops are increasingly displaced by market pressures and the comparatively lower profitability of traditional varieties relative to hybrid seed under prevailing market conditions (FAO, 2019).

4.3 Climate Change Perceptions and Impacts

A large majority of respondents (86%) reported having observed changes in rainfall patterns, delayed monsoon onset, and rising summer temperatures, with impacts described in terms of reduced yields, poor germination, flower drop, delayed crop maturity, and increased vulnerability to pests and disease — outcomes that in turn translated into income loss and, for some households, greater dependence on daily-wage labour. These farmer-reported observations closely align with scientific evidence documenting the effects of climate change on agriculture in semi-arid regions of India (Aryal et al., 2020; Lone et al., 2022), and with prior findings that monsoon irregularity, rather than changes in total annual rainfall alone, is often the dimension of climate change most consequential for smallholder farmers (Funk et al., 2020).

At the same time, the character of farmers' responses — largely descriptive and experiential (e.g., "delayed rainfall," "hotter summers," "sudden rainfall damaging crops") rather than framed in terms of underlying causes or long-term trends — suggests that farmers' awareness of climate change is grounded primarily in direct, lived observation rather than in formal scientific understanding of the phenomenon (Bharat et al., 2021; Sandilya and Goswami, 2025). This is not a limitation to be corrected so much as a complementary form of knowledge: integrating such experiential, indigenous observations with formal scientific and meteorological data has been shown to strengthen the adaptive capacity of vulnerable farming communities, offering a promising pathway for climate risk communication and adaptation planning that neither dismisses farmer knowledge nor relies on it exclusively (Sarkar and Modak, 2024).

4.4 Adaptation and Coping Strategies

Farmers in the study area reported a range of coping mechanisms in response to climatic stress, including shifting to short-duration or drought-resistant crop varieties, adopting drip irrigation, intercropping, rainwater harvesting, adjusting sowing and irrigation schedules, and reducing input costs where possible (Dhanya et al., 2022; Lone et al., 2022). A number of farmers also relied on non-farm income sources, daily labour, or participation in MGNREGA to offset agricultural income shortfalls. However, a smaller but notable share of respondents reported having no active coping strategy beyond accepting reduced income or borrowing money to sustain the household, leaving these farmers comparatively more exposed to the effects of extreme or prolonged adverse weather events. This unevenness in adaptive capacity — rather than a uniform absence or presence of coping behaviour across the sample — points to the need for targeted, rather than generic, training and resource provision, directed particularly at the subset of farmers currently least equipped to respond to climatic shocks (Panja et al., 2024; Mitter et al., 2024).

4.5 Sustainable Farming Interest and Institutional Support

Farmers expressed considerable interest in organic and sustainable farming methods, with 66% of respondents indicating willingness to adopt such practices, particularly where supported by training, input subsidies, and reliable market linkages (Habanyati et al., 2024; Kumar et al., 2025). A large majority (72%) had already participated in some form of government- or NGO-led training, most commonly focused on pest control and soil health, delivered through agricultural extension officers or Rythu Vedika sessions (Reshma et al., 2024). Despite this relatively high level of prior engagement, willingness to participate in future demonstrations or field trials was considerably lower (38%), and when asked directly what support they expected, farmers overwhelmingly prioritized subsidized inputs, irrigation infrastructure, and stable market prices over further training. This suggests a gap between the content that training programmes have thus far delivered and farmers' more pressing, cost- and infrastructure-related needs — such as affordable, quality seed and reliable irrigation — a gap consistent with findings elsewhere on the mismatch between extension programming and farmer priorities in Indian agriculture (Karthik et al., 2024). Rather than reflecting disengagement from sustainable farming as a goal, this pattern more plausibly reflects farmers' assessment that input costs and market access, not knowledge alone, are the binding constraints on adopting the sustainable practices they express interest in.

4.6 Indigenous Knowledge and Agroforestry

Despite the visible shift toward chemical-intensive and market-oriented production described above, indigenous ecological knowledge remains active among a majority of respondents: 64% reported using indigenous knowledge in their farming practices — most commonly citing cow dung slurry, neem-based preparations, and mixed cropping — and a similar share practised some form of agroforestry, integrating trees such as neem and tamarind or intercropping pulses with cotton. At the same time, 58% of farmers perceived a decline in overall plant diversity in their surroundings, particularly the disappearance of native and wild leafy vegetables. Together, these findings suggest that indigenous knowledge and agrobiodiversity in the study area are being selectively maintained rather than wholly abandoned or fully intact — a pattern of partial erosion under agricultural modernization that mirrors concerns raised more broadly in the literature on traditional ecological knowledge (Berkas et al., 2000; Gadgil et al., 1993).

4.7 Policy and Development Implications

Taken together, these findings suggest that improving farmers' access to climate-resilient seed varieties, reliable irrigation infrastructure, structured organic farming training, and stable market linkages could substantially strengthen livelihoods and adaptive capacity in the study area (Aryal et al., 2020; Panja et al., 2024). The observed gap between farmers' strong stated interest in sustainable and organic practices and the narrower, input-cost-driven nature of their expressed support needs indicates that future interventions are more likely to succeed if they explicitly address cost and market-access barriers alongside — rather than instead of — capacity-building efforts. Achieving this will require strengthened collaboration between government agencies, agricultural universities, and non-governmental organizations to translate available scientific and institutional knowledge into practical, locally adapted, and scalable solutions for smallholder farmers (Altieri, 2004; Pretty, 2008).

5. CONCLUSION

The survey of 50 farmers from various villages of Sangareddy district provides valuable insights into the current state of agriculture in the region. The findings reveal that farmers continue to draw on rich traditional knowledge and maintain diverse cropping systems, with a majority reporting the use of indigenous practices and agroforestry (Berkes et al., 2000; Gadgil et al., 1993), even as traditional crop varieties are being gradually displaced by commercial seed. At the same time, the large majority of respondents (86%) reported experiencing tangible climate variability — chiefly irregular rainfall and rising temperatures — which has directly affected crop yields, quality, and overall livelihoods (Bharat et al., 2021; Funk et al., 2020).

Farmers have adopted a range of coping strategies, including drought-resistant and short-duration crop varieties, drip irrigation, and income diversification through non-farm work and employment schemes such as MGNREGA (Dhanya et al., 2022; Lone et al., 2022), though a smaller subset of the sample reported no active coping mechanism, indicating uneven adaptive capacity across the farming community. Notably, while a majority of farmers had already participated in government or NGO training, far fewer expressed willingness to engage in future demonstrations, and when asked directly, farmers prioritized subsidized inputs, irrigation, and market access over further training — suggesting that the primary constraint on adopting the sustainable and organic practices many farmers (66%) expressed interest in is not awareness, but cost and infrastructure (Habanyati et al., 2024; Panja et al., 2024; Kumar et al., 2025).

These findings point to a clear opportunity for policymakers, agricultural institutions, and NGOs to move beyond generic training delivery toward targeted, needs-based support — combining affordable quality inputs, reliable irrigation, and market linkages with continued capacity-building (Pretty, 2008; Karthik et al., 2024). Ultimately, a coordinated approach involving farmers, scientists, and government agencies remains essential to ensure sustainable agricultural growth and rural livelihood security in the face of ongoing environmental challenges (Altieri, 2004; Aryal et al., 2020).

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