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A Study on Market Potential, Farmers' Buying Behavior, and Satisfaction Level Towards Water Soluble Fertilizers (WSF) in Gadwal District, Telangana

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ABSTRACT: The research assesses the market potential, buying behavior, and satisfaction levels among farmers regarding Water Soluble Fertilizers (WSF) in the Gadwal district of Telangana, India. In the context of increasing demand for effective and sustainable farming inputs, WSF has emerged as a critical innovation, enhancing nutrient absorption, crop yield, and environmental sustainability. The main aim of this study is to analyze determining factors such as price, brand, availability, and efficacy in influencing farmers' purchase decisions, along with their satisfaction levels and barriers to adoption. A mixed-method approach, involving both qualitative and quantitative methods, was employed. Primary data were collected through structured questionnaires administered to farmers in the area, while secondary data were obtained from scientific journals and government publications. The research applied descriptive statistics and hypothesis testing to assess relationships between key variables. Results show that farmers' buying behavior is strongly influenced by product quality, availability, and price, with brand image and technical support playing secondary roles. Despite the benefits of WSF—such as ease of application, improved nutrient use efficiency, and compatibility with modern irrigation systems—its adoption is hindered by high initial costs, low awareness, variability in product quality, and compatibility issues with conventional farming systems. However, farmers who have adopted WSF report improved crop quality, higher yields, and overall satisfaction, reaffirming the potential of WSF as a sustainable agricultural input.

Keywords: Water Soluble Fertilizers, Farmers Satisfaction, Buying Behavior, Market Potential, Sustainable Agriculture, Precision Farming, Nutrient Use Efficiency.

INTRODUCTION

Indian agriculture is the primary source of income for more than half of the country's population, and it accounts for around 18.3 percent of the country's total economic output. In terms of the production of fruits, vegetables, wheat, cotton, sugarcane, rice, and oilseeds, India sits in second place. It is the leading producer of pulses, milk, tea, cashew, spices, & jute. In addition, "India is the second largest producer of jute". A significant role in this sector is played by the Indian seed business, which is estimated to be worth around ₹9000 crores. Hybrid seeds account for approximately 65 percent of the market, which may be attributed to increased farmer knowledge as well as the involvement of private and international firms. When it comes to increasing crop output and decreasing the number of additional inputs that are required, premium seeds are invaluable (Paghdar *et al*., 2024). The rise in fertilizer use has substantially aided the sustainable production of food crops in the nation. Water-soluble fertilizers have emerged as a crucial input for agricultural crop development, driving the sector to adapt to the evolving demands of producers and the shifting climatic conditions (Xing *et al*., 2024). Over the course of the last ten years, scientific breakthroughs have resulted in the production of fertilizers that are more effective, which has completely changed the landscape. Additionally, the sales value of the water-soluble fertilizers market has recently increased as a result of an increase in the use of technologically improved fertilizers all over the globe (Jiao *et al.*, 2016).

The success of India's Green Revolution and the subsequent efforts to attain self-sufficiency in food grain production can largely be attributed to the use of fertilizers. The increased use of fertilizers has made a significant contribution to the nation's ability to produce food crops in a sustainable manner. Over the past decade, scientific advancements have led to the development of more efficient fertilizers, significantly transforming the agricultural landscape.

Water-soluble fertilizers (WSF) are a type of fertilizer composed of multiple nutrients that dissolve completely

in water. Compared to conventional chemical fertilizers, WSFs have a higher rate of absorption and utilization by plants. These fertilizers can easily deliver precise amounts of nutrients required by crops. This method of application is ideally suited to the irrigation systems used in modern agriculture.

Fertigation-grade water-soluble fertilizers are especially beneficial for banana cultivation, even in regions where the quality of irrigation water is not entirely suitable for drip systems. Such fertilizers have proven particularly effective in enhancing banana production (Patil & Gaikwad 2022).

Farmers' markets play a vital role in bridging the gap between urban & rural regions. This is because customers are increasingly interested in purchasing organic food that is produced at home on a small scale and requires little chemical input at an affordable price. Farmers' markets serve as a rural-urban interface that encourages communication and cultural engagement between community members and farmers. This, in turn, helps to cultivate trust and loyalty among customers, which ultimately leads to increased commerce. The promotion of independent farming, the maintenance of competition, and the enhancement of the variety and quality of agricultural products are all outcomes of direct selling via farmer's markets. It has been stated by Down-to-Earth, a private news organization, that rural markets are currently not functioning as effective channels for farmers to find prices. Over the course of 47 years, the government has not been successful in putting the recommendations into action to turn rural markets into economic hubs. It is necessary for India to have 30,000 agricultural markets in order to guarantee that farmers are treated fairly (Son, 2024).

MATERIAL AND METHODS

Research methodology is the analysis and assessment of the methods used in a specific research process. It is the method's phases that consist of goals setting, data collection, and data analysis and interpretation. The methodology section is a part where the research design, processes, and techniques used in data collection and evaluation are discussed in detail. A research methodology reflects the way researchers implement their research studies in order to assure the provision of the credible and authentic information that best serves their aims. The work is made up of a background section of the study that contains a short summary of the research into data collection. The work is a summary of the methodological and categorical framework of the research, including the sampling procedures, the area under study, the number of respondents, the study structure and its theoretical framework, as well as the methods and methodology of data collection. This chapter also outlines the research aims and hypotheses, which serve as content for a research question. In connection to the formal methods, the work requires that one first think through the statistical tools and statistical methods that the research needs (Panneerselvam, 2014).

This chapter research methodology presents a thorough structure of the study, explaining the method and process used to attain the research goals. It starts with a description of research methodology, highlighting its role in organizing the study and verifying data credibility. The chapter proceeds by defining operational terms such as market potential, farmers' buying behavior, and satisfaction levels to develop a clear picture of the research environment. Objectives of the study are stated with reference to the study of factors determining farmers' buying behavior, determining market potential, and analyzing the level of satisfaction towards water-soluble fertilizers (WSF) in Gadwal district, Telangana. Hypotheses of the study are also given in order to validate relationships among variables like price, brand, efficiency, and accessibility in influencing the decisions of the farmers. The research employs primary and secondary methods of data collection, using structured questionnaires as primary data and reading relevant literature as secondary data. The research adopts a mixed-method approach using both qualitative and quantitative methods to offer a comprehensive analysis.

A. Operational Terms

An operational term is a comprehensive explanation of the technical terms and measurements that are employed during the data collection process. This is achieved by the standardization of the data. The collection of the data always necessitates a clear understanding of the methodology for the data collection (Johnsen *et al.*, 2016).

• **Market Potential.** Market potential is the largest possible revenue that your products or services could generate in a particular market. It is the maximum potential demand that can be drawn from the market, giving an insight into the possibilities of growth and also points out the market space that is unexplored yet (Head & Mayer 2011).

• Satisfaction Level

Satisfaction level signifies the amount or degree an individual thinks content and completes with something, whether it's a product, service, experience, or a situation. Satisfaction is the perceived level of pleasure and contentment derived from individual performance. Additionally, satisfaction together with values and competence is the incentive for job activity (Demirtas, 2010).

• **Farmer buying behavior.** Farmer buying behavior covers the habits and decision-making procedures of the farmers about acquiring goods and services. This involves attributes such as product performance, price, supplier relationships, and brand loyalty. Farmer's buying behavior may well be viewed as a type of industrial buying behavior, due to the fact that they procure the means of production that yield farm products (Sharma *et al*., 2020).

• **Water-Soluble Fertilizers.** Water-soluble fertilizers are those that dissolve in water and therefore can be absorbed by plants through their roots and leaves and are often used in hydroponics, drip irrigation, and foliar feeding. A few notes on the fertilizers being water-soluble can be given as long as the nutrients in them are readily available to be taken up by the plants. The nutrition status is indeed easily handled through the WSF fertilizers as the nutrients remain unaffected by leaching and erosion (Malhotra, 2016).

B. Objectives of the Study

To analyze the factors influencing farmers' buying behavior towards WSF in the Gadwal district, Telangana.

To examine the market potential for WSF in the Gadwal district of Telangana.

Data Collection Methods

• **Primary Data.** Primary data is information that is initially and directly gathered from its source for a specific research purpose. Researchers gather primary data by means such as surveys, interviews, observations, experiments, and direct interactions with persons or entities that are related to the study. Primary data is collected through a structured questionnaire. The questionnaire is used for the study to collect primary data from the chosen respondents (Ajayi, 2017).

• **Secondary Data.** Secondary data is information or statistics that the investigators have collected previously from sources. It could be both quantitative and qualitative. The usual way of doing it is to grab the data from public or commercial databases and datasets, meta-analyses, or peer-reviewed articles. Secondary data is the information that was collected from research articles, journals, reports, relevant books, and websites (Johnston, 2014).

Nature of Data. The study employs both quantitative and qualitative methods because quantitative methods are used to expose patterns, correlations, and general trends across a large sample. Qualitative methods are research approaches that are used in social sciences to understand the why of a phenomenon, which is a very important approach to focus on in life sciences. These involve techniques such as focus groups and in-depth interviews to explore beliefs, perceptions, and psychosocial factors that influence behavior change. On the other hand, Quantitative methods focus on the objectivity of data and involve statistical, mathematical, or numerical analysis of the information obtained by means of polls, questionnaires, and surveys, or by altering the prior statistical data using computational methods.

Research Design. The research design adopted was both descriptive and exploratory, aiming to give an in-depth understanding of the farmers' behavior. Descriptive research design refers to a type of research that systematically and accurately describes a population, situation, or phenomenon. It can address questions such as: what, where, when, and how, but not the question why. A descriptive research design is a method that can use a variety of research techniques to study one or more variables. Exploratory research design is a methodological approach that is based on a set of research questions that have not been previously investigated to any great extent. As a rule, exploratory research usually deals with both qualitative and primary data.

Research Instrument. A questionnaire refers to a collection of questions or items that are meant to bring out information from the respondents on their beliefs, backgrounds, opinions, etc. It is usually composed of a series of questions that are developed in such a manner as to provide very direct and concise information about the specific topic or topics.

Instrument Development. The questionnaire has been broken down into two sections: the first part is related to personal data, and the other part the questions refers to the aims or hypotheses for the study.

• **Based on Personal Information:** The personal data section contains inquiries into the individual being surveyed and designed to ascertain the demographic information and background attributes of the participants included in the research.

• **Based on Hypothesis:** This part contains questions designed to assess the hypothesis and aim of the research. The purpose of these questions is to gather data from respondents to fulfill the requirements of the study.

Unit of Analysis. The unit of analysis or target population refers to a large group of persons from whom researchers want to get a deeper comprehension. The target group was the farmers in this district who applied WSF.

Sampling Design. The study used a stratified random sampling technique to choose a sample of 280 participants. Stratified random sampling is a probability sampling method that divides a population into different groups (strata) based on certain characteristics that are shared, and from these, random, non-overlapping subpopulations are chosen, representing all the subsets in the census.

Study Area. A study location is a place in a given region where research is done by examination and investigation of issues in the field. The study area is the specific region chosen for the investigation in question research study. The research is carried out in the Gadwal District located in Telangana.

Sample Size

Sample size is the term used to describe the number of samples or respondents within the sample population. The sample size deals with the number of things, individuals, or data points that are selected from a larger sample in statistics. Data has been collected from 280 participants.

Research Tools

(a) SPSS. SPSS is designed to perform data management, statistical analysis, and graphical presentation of data is Used for analyzing survey data

(e.g., Likert scale responses), Testing hypotheses with parametric/non-parametric tests. Comparing groups or identifying relationships between variables, Predictive modeling (e.g., regression analysis).

(b) MS Excel. Microsoft Excel is one of the most productive spreadsheet programs that is packed with a lot of data for analysis, manipulation, and visualization. It includes formulas, pivot tables, conditional formatting, and beyond that, more (Jablonsky, 2014).

Research Techniques. The study employs research approaches like Correlation, regression analysis, and standard deviation:

• **Correlation.** Correlation is a statistical relationship between two or other variables. It determines the company that the two variables bring to the table. If it happens with one variable, is there also a link between the outcomes of another variable? However, correlation does not imply causation and merely says that when both are together, most likely one will follow the other. Thus, the association of two variables only means that the changes in one happen at the same time as the changes in the other. Correlation, as a tool, is used by researchers in different fields such as psychology, economics, and science to find patterns and make predictions that are based on observed data (Asuero *et al.*, 2006).

$$r = \frac{\Sigma(x_i - \overline{x})\,(y_i - \overline{y})}{\sqrt{\Sigma(x_i - \overline{x})^{\,2}\Sigma(y_i - \overline{y})^{\,2}}}$$

• **Regression Analysis.** Regression is a statistical technique used to get an idea of the link between dependent variables and one or more independent variables, which is expressed. The main aim of regression analysis is to determine how the independent variables affect the dependent variables and to make predictions of it on this knowledge (Sarstedt *et al.*, 2019).

$$Y = a + bX + u$$

• **Standard Deviation.** The standard deviation is a measure that tells us how much the data points of a data set are scattered around the mean. When a standard deviation has a larger magnitude, the data points spread over a wider area, whereas if it has a smaller magnitude, they tend to cluster close together around the mean. The reason why it is so widely used is that it ensures the conservation of the initial measuring units during data collection. According to the standard deviation, the spread of data from the average is defined by the square root of the variance (Lee *et al.*, 2015).

$$\sigma = \sqrt{\frac{\sum(x_i - \mu)^{\,2}}{N}}$$

Ethical Considerations for Data Collection. The ethical dimensions of the data gathering for the study highlight the necessity of informed consent that respondents participate willingly in the research under complete awareness of its purposes and possible risks. Confidentiality and anonymity are also essential in the study, which prevents illegal access to individual data. Researchers also guarantee fairness and transparency, not using biased modes of investigation or manipulative results. Legal and institutional ethical standards also serve a basic purpose of protecting participants' rights while maintaining research validity and integrity.

RESULTS AND DISCUSSION

A. Demographic profile of the respondents

Table 1: Age group.

Age of the Farmer					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	26–35 years	48	17.1	17.1	17.1
	36–45 years	57	20.4	20.4	37.5
	46–55 years	75	26.8	26.8	64.3
	Above 55 years	52	18.6	18.6	82.9
	Below 25 years	48	17.1	17.1	100.0
	Total	280	100.0	100.0	

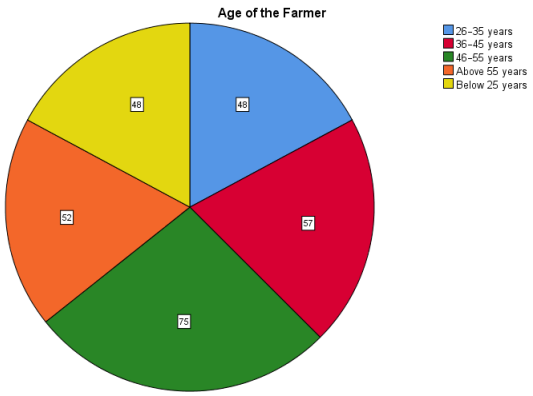

Fig. 1.

Age group presents the age-wise distribution of farmers in a sample of 280 individuals. The largest group falls within the 46–55 years age range, accounting for 26.8% of the total sample. This indicates that middle-aged individuals are the most actively engaged in farming within the surveyed population. The next most represented age groups are 36–45 years (20.4%) and above 55 years (18.6%), showing that a significant proportion of older individuals also participate in agricultural activities. Interestingly, younger farmers are also well represented: both the 26–35 years and the under 25 years age groups each constitute 17.1% of the sample. The relatively uniform distribution across age groups suggests that farming is practiced by people of all ages, though it is most prevalent among those aged 46–55. This trend is further supported by the cumulative percentage, which shows that 64.3% of the farmers are 46 years and older.

Table 2: Gender.

Gender					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Female	156	55.7	55.7	55.7
	Male	124	44.3	44.3	100.0
	Total	280	100.0	100.0	

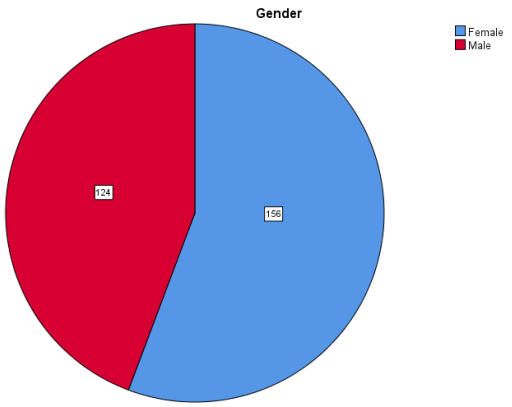

Fig. 2. Gender.

Table 2 illustrates the gender breakdown of a sample of 280. It indicates that there are predominantly female farmers, who form 55.7% of the sample, followed by males at 44.3%. This shows that women are slightly more involved in farming activities in this population. The cumulative percent identifies that the farming population is more than half female. This result could be a manifestation of shifting gender relations in farming, or could even suggest that farming duties are becoming more and more shared or assumed by women in this case.

Table 3: Educational Qualification.

Educational Qualification					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Graduate and above	65	23.2	23.2	23.2
	Higher Secondary	58	20.7	20.7	43.9
	Illiterate	45	16.1	16.1	60.0
	Primary School	62	22.1	22.1	82.1
	Secondary School	50	17.9	17.9	100.0
	Total	280	100.0	100.0	

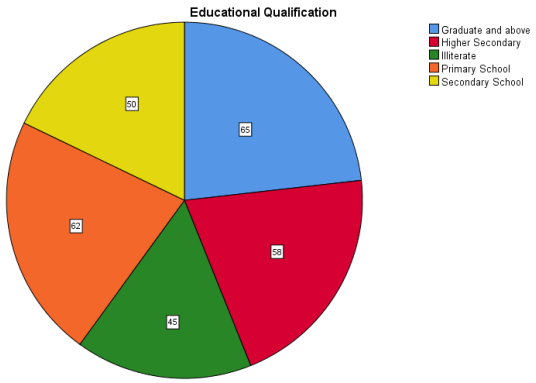

Fig. 3. Educational Qualification.

Table 3 shows the level of education of a sample of 280. The highest proportion of farmers, 23.2%, have achieved education at the graduate level or above, reflecting a relatively high degree of formal education among some of the farming community. This is followed closely by those educated only up to primary level (22.1%) and higher secondary (20.7%). A considerable 17.9% have undergone secondary school, while 16.1% are illiterate. The pattern indicates that although many farmers have higher education, a large number still have minimal or no schooling. The cumulative percentage shows that 60% of the respondents' education varies from illiteracy to higher secondary level, which is an indication of a varied educational background of farmers, including highly educated and less formally educated persons involved in farming.

Table 4: Type of Farming.

Type of Farming					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Commercial farming	85	30.4	30.4	30.4
	Mixed farming	107	38.2	38.2	68.6
	Subsistence farming	88	31.4	31.4	100.0
	Total	280	100.0	100.0	

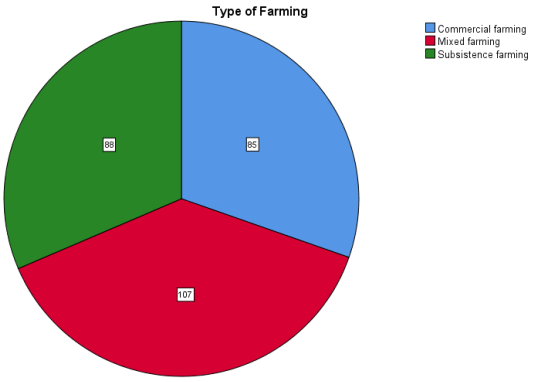

Fig. 4. Type of Farming.

Table 4 indicates the distribution of farmers according to the category of farming practiced by them. The most prevalent is mixed farming, which involves 38.2% of the farmers practicing both crop and livestock farming. Subsistence farming, in which production is mainly for household use, represents 31.4% of the sample, suggesting that many farmers use farming mainly for their survival needs rather than market sale. Commercial farming, oriented towards market production, accounts for 30.4% of the respondents. The fairly even spread across the three categories implies a varied farming landscape, with farmers engaged in different scales and objectives of production. The dominance of mixed farming could also indicate a risk reduction and resource allocation strategy among farmers.

Table 5: Farm Size (in acres).

Farm Size (in acres)					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	2–5 acres	61	21.8	21.8	21.8
	6–10 acres	73	26.1	26.1	47.9
	Less than 2 acres	77	27.5	27.5	75.4
	More than 10 acres	69	24.6	24.6	100.0
	Total	280	100.0	100.0	

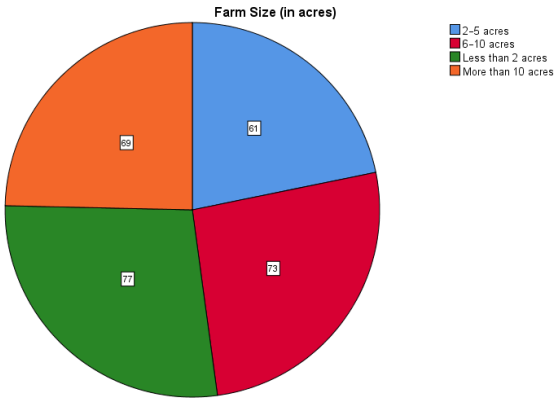

Fig. 5. Farm Size (in acres).

Table 5 gives an overview of the distribution of farmers according to the size of their farmland. The most frequent farm size is less than 2 acres, with 27.5% of the farmers in this category, indicating that small-scale farming is a widespread practice among the surveyed population. These are preceded by 6–10 acres (26.1%) and over 10 acres (24.6%), which means that there is a significant number of medium and large-scale farmers present as well. Farmers on 2–5 acres account for 21.8%. Generally, the figures reflect a reasonably even distribution across various sizes of farms, although a small majority (75.4%) of farmers farm on holdings of 10 acres or less. This trend indicates a largely small- to medium-scale farming setup in the sample that could affect the kind of crops cultivated, capacity for production, and resource or market access.

Table 6: Annual Income from Farming (approximate).

Annual Income from Farming (approximate)					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Above Rs2,00,000	69	24.6	24.6	24.6
	Less than Rs50,000	71	25.4	25.4	50.0
	Rs1,00,001–Rs2,00,000	61	21.8	21.8	71.8
	Rs50,000–Rs1,00,000	79	28.2	28.2	100.0
	Total	280	100.0	100.0	

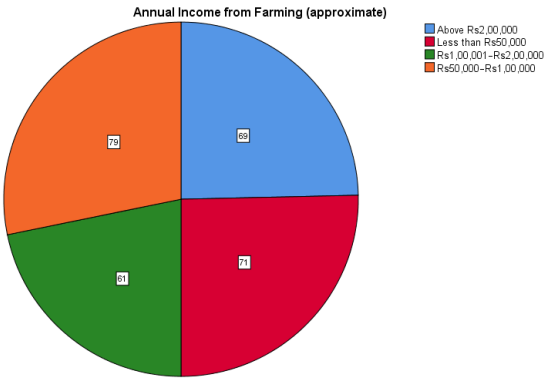

Fig. 6. Annual Income from Farming (approximate).

Table 6 presents the approximate annual income of farmers from agricultural activities. The largest proportion of farmers (28.2%) falls within the income group of Rs 50,000 to Rs 1,00,000 annually, indicating that a significant segment of the farming population earns a modest income. Close behind, 25.4% of farmers earn below Rs 50,000 per year, suggesting that more than half (53.6%) of the farmers earn less than Rs 1,00,000 annually. This may indicate financial vulnerability or a subsistence-level livelihood. On the higher end, 24.6% of farmers earn more than Rs 2,00,000 per year, while 21.8% fall within the income bracket of Rs 1,00,001 to Rs 2,00,000. Overall, the income distribution reveals economic heterogeneity among farmers—while a substantial portion earns relatively modest incomes, a significant minority enjoys higher earnings. This disparity may be attributed to differences in farm size, the practice of commercial farming, or better access to markets and resources.

Table 7: Crop Type Grown.

Crop Type Grown					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Cotton	65	23.2	23.2	23.2
	Groundnut	71	25.4	25.4	48.6
	Paddy	62	22.1	22.1	70.7
	Vegetables	82	29.3	29.3	100.0
	Total	280	100.0	100.0	

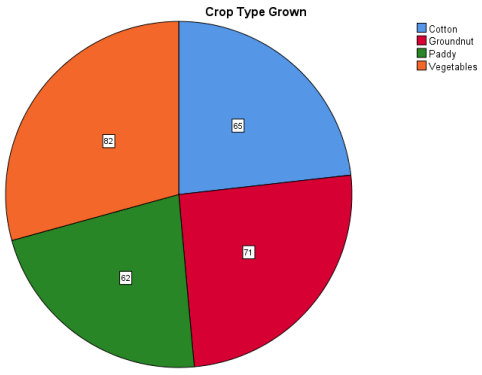

Fig. 7. Crop Type Grown.

Table 7 shows the distribution of farmers based on the dominant type of crop cultivated. The most commonly grown crop is vegetables, with 29.3% of farmers engaged in vegetable cultivation. This is followed by groundnut (25.4%), cotton (23.2%), and paddy (22.1%). The relatively even distribution indicates a diverse cropping pattern among the farmers. However, the dominance of vegetable cultivation may suggest a preference for shorter crop cycles, higher market returns, or better adaptability to local agro-climatic conditions. Overall, the data reflect a balanced yet slightly vegetable-dominant agricultural scenario within the sample.

Table 8: Irrigation Source.

Irrigation Source					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Borewell	82	29.3	29.3	29.3
	Canal	79	28.2	28.2	57.5
	Rain-fed	58	20.7	20.7	78.2
	Sprinkler	61	21.8	21.8	100.0
	Total	280	100.0	100.0	

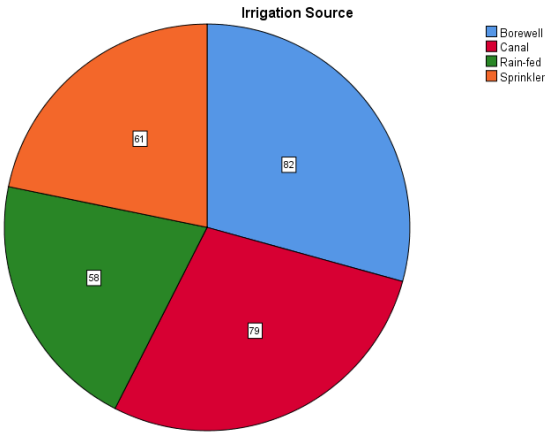

Fig. 8. Irrigation Source.

Table 8 captures the main irrigation sources utilized by the sample farmers. Borewells represent the most popular source, consisting of 29.3% of the farmers, followed by canals at 28.2%. This confirms a high dependency on groundwater and surface water facilities. Rain-fed agriculture is followed by 20.7% of the farmers, indicating that a significant percentage of agriculture remains rain-dependent, exposing such farmers to climate variability. Sprinkler irrigation, employed by 21.8%, indicates some level of dependency on water-efficient irrigation techniques. As a whole, the statistics indicate a diverse utilization of irrigation sources, with a large part using traditional means and a smaller but significant percentage trending towards advanced methods such as sprinklers.

Table 9: Years of Farming Experience.

Years of Farming Experience					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11–20 years	68	24.3	24.3	24.3
	6–10 years	69	24.6	24.6	48.9
	Less than 5 years	75	26.8	26.8	75.7
	More than 20 years	68	24.3	24.3	100.0
	Total	280	100.0	100.0	

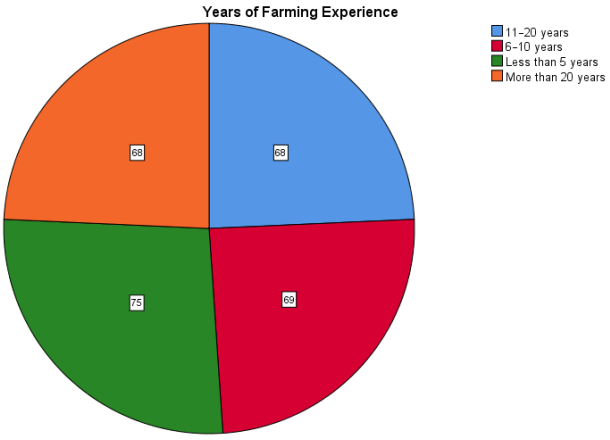

Fig. 9. Years of Farming Experience.

Table 9 presents the distribution of the farmers according to the number of years of experience in farming. The most dominant group, 26.8%, has up to 5 years of experience, which highlights a high proportion of relatively new farmers. Farmers with 6–10 years of experience constitute 24.6%, and both the 11–20 years and over 20 years groups constitute 24.3% of the sample. This close-to-equal distribution indicates a good balance of young, mid-career, and highly experienced farmers in the community. The information indicates that even though a large share of the farming community is experienced, there is also a considerable number of younger farmers, which can indicate generational changes, changing employment patterns, or growing interest in farming among younger groups.

Table 10: Membership in Farmer Organizations (FPOs or SHGs).

Membership in Farmer Organizations (FPOs or SHGs)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	147	52.5	52.5	52.5
	Yes	133	47.5	47.5	100.0
	Total	280	100.0	100.0	

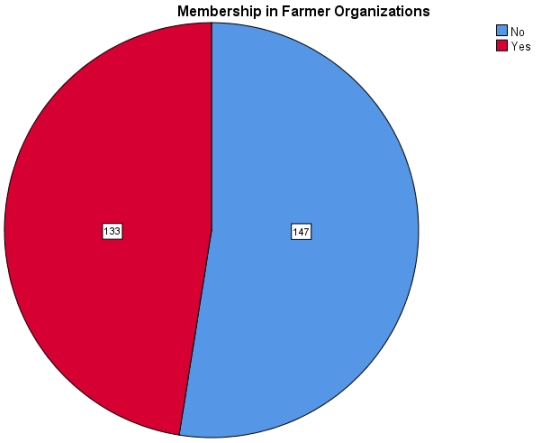

Fig. 10. Membership in Farmer Organizations (FPOs or SHGs).

Table 10 illustrates the proportion of farmers according to whether they are members of farmer organizations or not. 52.5% of farmers are not members of farmer organizations, while 47.5% are members. This suggests that although a slightly larger percentage of farmers are not part of formal groups, almost half of the sample is involved in farmer organizations. This indicates a high degree of community involvement, possibly with regard to resource access, sharing of knowledge, or political advocacy for the agricultural sector. These organizations would presumably have an influential role in representing farmers' interests, even if membership is not widespread in this group.

B. Results based on objectives & hypothesis

Objective: 1 - To analyze the factors influencing farmers' buying behavior towards WSF in Gadwal district, Telangana.

Hypothesis:

H0A: There is no significant relationship between the factors (such as price, brand, effectiveness, and availability) and farmers' buying behavior towards WSF in the Gadwal district.

H1A: There is a significant relationship between the factors (such as price, brand, effectiveness, and availability) and farmers' buying behavior toward WSF in the Gadwal district.

Table 11: Descriptive Statistics.

Descriptive Statistics			
	Mean	Std. Deviation	N
Price	16.3000	4.71967	280
Brand	16.3107	3.52562	280
Availability	17.8500	3.86775	280
Farmers buying behavior	17.5321	4.51350	280

Table 11 also shows descriptive statistics for drivers of farmers' purchasing behavior, namely price, brand, availability, and buying behavior. The mean values of the factors are reasonably close to each other, with the price being 16.30, brand 16.31, availability 17.85, and buying behavior of farmers 17.53. Standard deviations reflect a moderate level of variability in response across the sample. For instance, the price factor is most variable with a standard deviation of 4.72, indicating differences in the prices farmers face. Brand preferences are less variable (standard deviation of 3.53), while availability and buying behavior factors have moderate variability with standard deviations of 3.87 and 4.51, respectively. This implies that although there are overall trends in farmers' buying behavior, personal perceptions of price, brand, availability, and purchasing habits may differ to some extent, indicative of diversity within the farming community's experiences and tastes.

Table 12: Correlations.

Correlations					
		Price	Brand	Availability	Farmers buying behavior
Price	Pearson Correlation	1	.524**	.236**	.163**
	Sig. (2-tailed)		.000	.000	.006
	N	280	280	280	280
Brand	Pearson Correlation	.524**	1	.318**	.356**
	Sig. (2-tailed)	.000		.000	.000
	N	280	280	280	280
Availability	Pearson Correlation	.236**	.318**	1	.497**
	Sig. (2-tailed)	.000	.000		.000
	N	280	280	280	280
Farmers buying behavior	Pearson Correlation	.163**	.356**	.497**	1
	Sig. (2-tailed)	.006	.000	.000	
	N	280	280	280	280
**. Correlation is significant at the 0.01 level (2-tailed).					

Table 12 identifies strong correlations between price, brand, availability, and farmers' purchase behavior. The correlation between brand and price is moderately positive (r = 0.524), suggesting that as prices increase, farmers tend to show a greater preference for certain brands. The correlation between price and availability is weak (r = 0.236), indicating that while the two variables are somewhat related, availability does not significantly influence price. Similarly, price has only a moderate influence on farmers' buying behavior (r = 0.163), implying that price contributes to purchase decisions, but to a lesser extent compared to other factors. The correlation between brand and availability is also modest (r = 0.318), suggesting that increased product availability may lead farmers to prefer specific brands. The relationship between brand and farmers' buying behavior (r = 0.356) indicates that brand preference or loyalty plays a role in influencing purchase decisions. The strongest correlation is observed between availability and farmers' buying behavior (r = 0.497), signifying that product availability is a major determinant in farmers' purchasing decisions—products that are more readily available are more likely to be purchased. Overall, the data suggest that while price and brand are important, availability emerges as the most influential factor in shaping farmers' buying behavior.

Objective: 2 - To examine the market potential for WSF in the Gadwal district of Telangana.

Hypothesis:

H0B: There is no significant difference between the market size for WSF in the Gadwal district and the current market estimates.

H2B: There is a significant difference between the market size for WSF in the Gadwal district and the current market estimates.

Table 13: Model Summary.

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.393[a]	.155	.152	3.50570
a. Predictors: (Constant), farmers' buying behavior				

Table 13 indicates regression analysis between the dependent and independent variables, as well as the predictors. R value at 0.393 indicates there is a positive correlation between the dependent variable and the independent variable at a moderate level. R Square at 0.155 reveals that the variance in the dependent variable is predicted by the model to the tune of about 15.5%. The Adjusted R Square of 0.152, considering the number of predictors, is close to the R Square value, showing that the model is not too complex, even though there is only a single predictor. The standard error of the estimate is 3.50570, suggesting that the predicted values are usually about 3.51 units different from the actual values. Generally, this implies that although the model does account for some variance, there are still other forces operating on farmers' purchasing behavior that are not accounted for in this analysis.

Table 14: ANOVA.

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	625.837	1	625.837	50.923	.000[b]
	Residual	3416.606	278	12.290		
	Total	4042.443	279			
a. Dependent Variable: Marketing strategies						
b. Predictors: (Constant), farmers' buying behavior						

The ANOVA Table 14 also shows that the regression model is statistically significant with an F-statistic value of 50.923 and p-value 0.000, which is below the 0.05 level of significance. This indicates that farmers' purchase behavior is a good predictor of marketing approaches. The regression sum of squares is 625.837, accounting for some of the dependent variable's variation, and the residual sum of squares (3416.606) accounts for unexplained variation. The residual and regression degrees of freedom are 1 and 278, respectively.

Table 15: Coefficients.

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	10.847	.842		12.886	.000
	Farmers buying behavior	.332	.047	.393	7.136	.000
a. Dependent Variable: Marketing strategies						

Coefficients Table 15 illustrates how buying behavior on the part of farmers and marketing approaches are interconnected. The constant unstandardized coefficient is 10.847, with the standard error at 0.842, which indicates the standard value of the dependent variable for zero buying behavior by farmers. The unstandardized coefficient of farmers' buying behavior is 0.332, with a standard error of 0.047, indicating that every one-unit increase in farmers' buying behavior, marketing strategies rise by 0.332 units. The standardized coefficient (Beta) of farmers' buying behavior is 0.393, denoting a moderate positive effect on marketing strategies. The t-values of both the constant (12.886) and farmers' purchase behavior (7.136) are statistically significant, with p-values of 0.000, indicating both coefficients are strong predictors of marketing strategies.

DISCUSSIONS

The data presented in the current study portrays a rich and nuanced picture of the farming population in Gadwal district, Telangana, particularly in terms of their behavior, preferences, and satisfaction with Water-Soluble Fertilizers (WSF). The demographic analysis shows that the 46–55 years age group is the highest percentage of farmers (26.8%), followed by 36–45 years (20.4%), and above 55 years (18.6%). These statistics imply that middle-aged and elderly people overwhelm the agricultural labor force, which is in line with previous research by Abay *et al.* (2021), whose contention was that farming participation is still high among older ages owing to youth migration and lesser involvement in farming. However, the significant presence of younger farmers aged below 35 years, representing 34.2% of the sample, could be indicative of changing trends and renewed interest among the younger generation in agricultural entrepreneurship and innovation.

An interesting trend can be seen in gender representation. 55.7% of the overall sample are female farmers, a number that reflects the growing contribution of females in agriculture. Such population changes can potentially have an effect on extension services and product positioning, as women farmers might prefer or be subject to different constraints than men.

The education level of the respondents shows that 23.2% have graduated or above, while another 20.7% have higher secondary education. This is compared to national statistics referenced by Adeyanju *et al*. (2021), which reported significantly lower tertiary levels of education for rural agricultural populations. The sample in this research seems to be fairly well-educated. This level of education is expected to impact the willingness of farmers to embrace such new agricultural inputs as WSF. Such findings indicate a good climate for technological diffusion in this area.

CONCLUSIONS

Findings based on the demographic profile of the respondents

- The demographic characteristics of the respondents are representative of varied age, education, and experience in farming, which together determine their mindset towards the adoption of Water-Soluble Fertilizers (WSF) in Gadwal. The dominance of middle-aged and newly active farmers is reflective of stability and generational change in the farming scenario, which allows room for the integration of technology.
- The participating group has a slightly higher female than male composition, reflecting changing gender roles within farm communities. The gender pattern is indicative of the need for an inclusive agricultural intervention design that accommodates the views and needs of women and men.
- A reasonably high level of educational achievement—especially among graduates—indicates an educated population of farmers that can absorb and adopt enhanced farming inputs such as WSF. This educational diversity enhances knowledge-led adoption and necessitates targeted information dissemination and training.
- The combination of commercial, subsistence, and mixed farming systems shows a multifunctional farming system in Gadwal. Dominance of mixed farming demonstrates risk management and resource diversification by farmers, affecting their input decision-making and economic resilience.
- Farm sizes are primarily below 10 acres, which indicates a prevalence of small and marginal farmers. This pattern of landholding sets the context where affordability, efficiency in inputs, and access heavily determine the market potential for WSF among small farmers.
- Income distribution indicates that a considerable number of farmers have incomes less than ₹1,00,000 per annum, reflecting limited financial ability. Such levels of income require cost-efficient, high-return inputs such as WSF and government support to enable sustainable adoption.
- Crop diversity is even, with a preference towards vegetable production. This reflects a trend towards market-oriented and short-duration crops, which is consistent with the planned application of WSF for intensive production cycles.
- Irrigation practices are mainly conventional, with borewells and canals being most prevalent. The existence of sprinkler systems, however, indicates a new trend towards water-saving measures accompanying WSF use.
- Therefore, if access, education, and systemic market restrictions are addressed, the research highlights the potential of water-soluble fertilizers as a revolutionary agricultural input in Gadwal. This points to a calculated

course for enhancing farming methods and raising farmer incomes in the area.

Results based on objectives

Findings based on objective 1: The research determined some of the major influences that impact farmers when they make purchasing decisions of water-soluble fertilizers. Of these, ease of access and product availability emerged as top of mind in the decision process. Farmers also have a high inclination toward using known brands, often influenced by past use experience or word of mouth from other members within their community. Cost is still an element, but of less importance than trust and convenience. These results confirm that farmers in the area are concerned about products that are readily accessible and reliably effective. The findings highlight the influence of effective distribution networks and brand interaction programs on the adoption of WSF.

Finding based on objective 2: The study reveals that there is increasing potential for water-soluble fertilizers in the domestic market. Farmers are increasingly seeing the benefits of using such fertilizers, particularly those who are more commercially oriented or have larger or diversified farms. The readiness to adopt new agricultural inputs seems to be affected by education, farming practices, and overall exposure to modern techniques. While adoption continues to grow, the results are encouraging, with potential for growth if obstacles such as affordability and accessibility are successfully overcome. The research highlights the importance of raising awareness and special marketing to continue building WSF's market share.

FUTURE SCOPE

- The primary impediment to enhancing the adoption of water-soluble fertilizers (WSF) is limited awareness and technical understanding among farmers. To overcome this, a multi-faceted approach involving government entities, non-governmental organizations, and private stakeholders must be initiated.
- Hands-on training programs, field demonstrations, and regular agricultural extension services should be initiated to instruct farmers about best usage practices, correct application levels, and the overall environmental benefits of WSF.
- The cost of WSF remains a significant issue, especially for smallholder farmers. To mitigate this, more effective financial support in the form of well-planned subsidy programs, credit facilities, and dedicated funding for fertigation-related infrastructure would be necessary.
- These measures would lower the entry barriers and make the technology accessible to farmers with limited budgets.
- Product quality and availability challenges also hinder the adoption of water-soluble fertilizers (WSF). Stronger regulations are needed to ensure that farmers have access to reliable and effective agricultural inputs.
- Priorities for this should be clearer guidelines, enhanced observation of labeling and product integrity, and consistent monitoring of suppliers. Simultaneously, building stronger regional supply chains and investing in efficient distribution systems can guarantee timely and reliable access to quality fertilizers.
- The success of WSF usually hinges on its compatibility with local soils and crops. Creating specialized fertilizer blends specific to certain crops and regions, through cooperation between fertilizer manufacturers and agricultural research centers, can solve this problem. These specialized solutions can improve crop yield and build farmer confidence in WSF.

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