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Constraints Encountered by Groundnut Growers in Adopting Recommended TNAU Groundnut Production Technologies in Villupuram District

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ABSTRACT

Background: Groundnut (*Arachis hypogaea* L.) is a vital crop for the agricultural economy in Villupuram district, Tamil Nadu. Despite the Tamil Nadu Agricultural University's (TNAU) recommended production technologies aimed at improving yield and sustainability, adoption rates among groundnut growers remain low. This study investigates the challenges faced by these farmers in adopting these technologies.

Methods: The study employs an ex-post facto research design, focusing on Melmalayanur and Vallam blocks within Villupuram district. A total of 120 groundnut growers were randomly selected from four villages. Primary data was collected using a structured interview schedule, while secondary data was sourced from relevant agricultural reports and publications. Constraints faced by farmers were analyzed using Garrett's ranking technique.

Result: The study identified key constraints impacting technology adoption, ranked by severity. Non-sremunerative prices and price fluctuations emerged as the most significant barrier, followed by high input costs and inadequate credit facilities. Other notable challenges included a lack of timely and appropriate extension services, insufficient technical know-howand pest and disease infestations. Scarcity and high wages of labor, inadequate processing machinesand delays in the availability of inputs further hindered adoption rates.

Key words: Farmer livelihoods, Groundnut constraints, Groundnut cultivation, Production technologies, Technology adoption.

INTRODUCTION

Groundnut (*Arachis hypogaea* L.), commonly known as peanut, is a crucial oilseed crop widely cultivated in India due to its high nutritional and economic value (Li *et al*., 2000). In Tamil Nadu, particularly in districts like Villupuram, groundnut farming plays a pivotal role in the agricultural economy, with many farmers relying on it as a primary source of income (Kiruthika, 2024). The Tamil Nadu Agricultural University (TNAU) recommends various production technologies to enhance the yield, qualityand sustainability of groundnut farming in the region (Elakkia *et al*., 2021).

Despite the potential benefits of these technologies, their adoption among groundnut growers in Villupuram district faces significant challenges. Recent survey statistics indicate that while Villupuram ranks prominently in groundnut cultivation within Tamil Nadu, adopting recommended TNAU technologies remains suboptimal. Factors such as limited access to credit, inadequate knowledge disseminationand perceived complexities associated with new technologies contribute to this issue (Karthickraja *et al*., 2023).

Villupuram district, located in the southern part of Tamil Nadu, has a semi-arid climate and relies on both rainfed and irrigated farming systems. Groundnut is a crucial cash crop in this district, significantly contributing to the agricultural economy and the livelihoods of smallholder farmers. Historically, groundnut cultivation has been a traditional practice; however, recent efforts have focused on enhancing productivity through scientific advancements and technology adoption.

The TNAU has developed and recommended various production technologies to improve yield and reduce crop losses. These include new varieties, integrated pest

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management practicesand soil fertility management techniques, all aimed at enhancing productivity, sustainability and profitability. Despite these advancements, the adoption rates of these technologies among groundnut growers in Villupuram district remain uneven. This study aims to identify and analyze the key constraints faced by groundnut growers in adopting TNAU-recommended production technologies and to evaluate potential solutions for overcoming these challenges. Improving technology adoption is essential for boosting groundnut productivity and ensuring economic sustainability for farmers in Villupuram district.

MATERIALS AND METHODS

Research design

The study employs an ex-post facto research design to investigate the constraints faced by groundnut growers in adopting production technologies recommended by the Tamil Nadu Agricultural University (TNAU) in the Villupuram district. This design is suitable for analyzing existing conditions and relationships without manipulating variables.

Study area

The research was conducted at the Krishi Vigyan Kendra, Tamil Nadu Agricultural University, Villupuram district, Tamil Nadu, focusing on the blocks of Melmalayanur and Vallam. Four villages were selected from these blocks: Edhappattu, Chekkidikuppam, Kilpappampadi and Kongarapattu (Table 1). Villupuram district was chosen purposively due to its significance in groundnut cultivation, ranking second in both area and production in Tamil Nadu. According to the State Department of Agriculture, Villupuram has 16,150 hectares under groundnut cultivation.

Selection of blocks and villages

Melmalayanur and Vallam blocks were selected purposively due to their prominence in groundnut cultivation. Two villages from each block were purposively chosen based on the maximum area under groundnut cultivation, as identified by scientists at the Oilseed Research Station in Tindivanam.

Sampling procedure

Groundnut growers from the selected villages were chosen as respondents. A list of growers was obtained from the office of the Assistant Director of Agriculture. From each village, 30 groundnut growers were randomly selected, resulting in a total of 120 respondents.

Data collection

Primary data were collected using a structured interview schedule, which was pre-tested and refined. The schedule focused on identifying the constraints faced by farmers in adopting TNAU-recommended technologies and gathering suggestions to overcome these challenges. Secondary data were collected from sources such as agricultural department reports, research papersand TNAU publications.

Data analysis

The data collected were analyzed using appropriate statistical techniques to identify the key constraints faced by groundnut growers in adopting TNAU-recommended production technologies. The analysis included suggestions provided by the respondents for overcoming these constraints.

Analytical tool

Constraints faced by farmers were identified through expert consultations and ranked by farmers using Garrett's Ranking Technique, which converts ranks into numerical scores. Garrett's formula for converting ranks into percentages is:

Per cent position = $100\times(R_{ij} - 0.5)/N_j$

Where,

R_{ij} = Rank given for the i^{th} constraint by the j^{th} individual. Scores were calculated and ranked to identify the most severe constraints.

Research period

The research was conducted over a period of 2 years.

RESULTS AND DISCUSSION

Constraints to groundnut production

Garrett's ranking technique has been used to analyze the factors influencing the production of groundnuts by the respondents. Under the Garrett Technique, the percentage position is calculated by using formulae. The respondents were asked to rank the twelve factors identified for this study as 1, 2, 3, 4 .....12 to know their preference in the selection of constraint. The calculated percentage position for the ranks 1, 2, 3,.....12 and their corresponding Garrett table as shown in Table 2. For factors, the total score is calculated by multiplying the number of respondents ranking that factor as 1, 2, 3 and 12.

The Table 3 and Table 4 presents the ranking of various constraints encountered by groundnut growers in Villupuram district, according to their average Garret scores. The constraints are ranked in order of their impact, from highest to lowest, based on the growers' responses.

Table 5 shows and ranked various constraints that groundnut growers in Villupuram district face in adopting the TNAU-recommended groundnut production technology.

Table 1: Distribution of respondents selected for study in Villupuram district.

District	Block	Village	No. of growers selected
Villupuram	Melmalayanur	Edhappattu	30
	Vallam	Chekkidikuppam	30
		Kilpappampadi	30
		Kongarapattu	30
	Total		120

The constraints, along with their respective ranks, are as follows:

The most significant constraint faced by groundnut growers is the issue of non-remunerative prices and fluctuations in market prices, which severely impacts farmers' income and profitability. With a mean score of 34.025, price instability creates uncertainty about returns on investment, discouraging the adoption of advanced production methods, as also reported by Veeraiah *et al*. (2019) and Priya *et al*. (2021). High input costs, with a mean score of 31.275, rank as the second major constraint. The financial burden of purchasing seeds, fertilizersand pesticides limits farmers' ability to fully adopt recommended technologies, as similarly noted by Patel *et al*. (2018).

Inadequate credit facilities are another significant barrier, with a mean score of 26.991. Farmers often struggle to secure loans or affordable credit, which hinders their ability to invest in new technologies and purchase essential inputs. The lack of accessible and timely credit options leads to lower adoption rates of TNAU technologies, aligning with the findings of Taphee *et al*. (2015). Additionally, the lack of timely and appropriate extension services, with a mean score of 26.4, restricts farmers' ability to adopt modern agricultural practices. This gap in extension support, essential for educating and guiding farmers, limits their effective use of available technologies. Pest and disease infestations pose a persistent challenge, ranked fifth with a mean score of 19.858. The lack of effective management strategies discourages farmers from adopting new technologies that require different approaches, as reported by Jalu *et al*. (2022). Another critical constraint is the non-availability of inputs in time, with a mean score of 16.291. Delays or shortages in input supply hinder the successful implementation of recommended technologies, negatively affecting productivity, as also noted by Mishra (2023).

Table 2: Percentage positions and their corresponding Garetts table values.

Rank	Percentage position		Garrett value
	100(Rij - 0.5)/Nj	Calculated value	
I	100(1-0.5)/12	4.2	84
II	100(2-0.5)/12	12.5	73
III	100(3-0.5)/12	20.8	66
IV	100(4-0.5)/12	29.2	61
V	100(5-0.5)/12	37.5	56
VI	100(6-0.5)/12	45.8	53
VII	100(7-0.5)/12	54.2	49
VIII	100(8-0.5)/12	62.5	44
IX	100(9-0.5)/12	70.8	40
X	100(10-0.5)/12	79.2	34
XI	100(11-0.5)/12	87.5	27
XII	100(12-0.5)/12	95.8	18

Table 3: Ranking constraint associated with groundnut production in Villupuram district.

Constraints	Rank given by the respondents.											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Pig/Rodent attack and other biotic factors	93	1	5	1	3	4	4	2	2	2	2	1
Market and infrastructure	78	17	5	3	4	2	3	2	1	2	2	1
Unpredictable weather patterns	87	5	4	5	2	3	1	3	1	4	2	3
Scarcity and high wages of labor	69	17	5	6	3	6	4	2	2	1	1	4
Inadequate groundnut processing machines	84	2	1	1	7	1	6	1	8	4	2	3
Non-availability of inputs in time	64	19	7	6	8	3	3	5	1	2	1	1
Lack of training	36	25	20	5	3	6	8	12	1	1	1	2
Pest and disease infestation	65	3	8	3	3	10	4	5	6	3	4	6
Lack of technical know-how	55	1	1	2	6	3	2	12	15	8	5	10
High input costs	33	9	17	13	7	5	3	4	7	8	6	8
Non-remunerative prices/Price fluctuations	27	11	15	12	12	7	8	6	6	5	6	5
Inadequate credit	29	20	7	2	12	11	7	8	6	6	5	7

Table 4: The Garret value calculation and ranking of problems encountered by farmers when adopting TNAU-recommended groundnut production technology.

Constraints	Rank											Total
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Pig/rodent attack and other biotic factors	7812	73	330	61	168	212	196	88	80	68	54	18	1275
Market and infrastructure	6552	1241	330	183	224	106	147	88	40	68	54	18	1258
Unpredictable weather patterns	7308	365	264	305	112	159	49	132	40	136	54	54	1305
Scarcity and high wages of labor	5796	1241	330	366	168	318	196	88	80	34	27	72	1679
Inadequate Groundnut Processing Machines	7056	146	66	61	392	53	294	44	320	136	54	54	1474
Non-availability of inputs in time	5376	1387	462	366	448	159	147	220	40	68	27	18	1955
Lack of training about recommended groundnut production technology	3024	1825	1320	305	168	318	392	528	40	34	27	36	3168
Pest and disease Infestation	5460	219	528	183	168	530	196	220	240	102	108	108	2383
Lack of technical know-how	4620	73	66	122	336	159	98	528	600	272	135	180	2496
High input costs	2772	657	1122	793	392	265	147	176	280	272	162	144	3753
Non-remunerative prices / Price fluctuations	2268	803	990	732	672	371	392	264	240	170	162	90	4083
Inadequate credit	2436	1460	462	122	672	583	343	352	240	204	135	126	3239

Labor scarcity and high wages, ranked seventh with a mean score of 13.991, further complicate the adoption of labor-intensive technologies, especially during peak agricultural seasons when the demand for labor is high. The inadequate availability of groundnut processing machines, with a mean score of 12.283, impacts post-harvest handling and value addition, limiting farmers' ability to maximize returns on their produce. Additionally, unpredictable weather patterns, ranked ninth with a mean score of 10.875, present another challenge. Climate variability and extreme weather events reduce yields and make farmers hesitant to invest in technologies that may not be resilient to changing environmental conditions. Lastly, the lack of proper storage facilities, with a mean score of 10.483, contributes to post-harvest losses, reducing the quality of groundnut produce and discouraging the adoption of advanced technologies.

These findings suggest that a multifaceted approach is required to address the economic, technicaland infrastructural constraints faced by groundnut farmers in the Villupuram district. This approach will be essential for promoting the widespread adoption of TNAU-recommended groundnut production technologies.

Suggestions to overcome the constraints

Table 6 provided by respondents highlight key challenges faced by farmers and the support needed to improve the adoption of TNAU-recommended groundnut production technologies. The most significant suggestion, ranked highest by 90% of the respondents, was the need for subsidized inputs, including seeds, fertilizersand pesticides. This indicates that high input costs are a major barrier to adopting new technologies. Addressing this issue through subsidies could lead to improved adoption rates and better crop management practices, consistent with findings by Raviya *et al*. (2016).

Credit availability, emphasized by 81.67% of the respondents, was the second most important suggestion. Farmers stressed the need for easy and timely access to affordable credit, as financial constraints hinder their ability to invest in essential inputs and technologies for production improvement. This finding is also supported by Raviya *et al*. (2016). The third-ranked suggestion, indicated by 71.67% of respondents, was the need for remunerative pricing for produce. Farmers emphasized that fair market prices are crucial for their decision-making and would incentivize the adoption of new technologies, even those requiring higher initial investments, a finding again consistent with Raviya *et al*. (2016).

Extension services support, ranked fourth with 70% of the respondents in agreement, underscored the need for continuous guidance and technical assistance to help farmers effectively implement and sustain the recommended technologies. As Sahu *et al*. (2023) reported, extension services can bridge the gap between research and practical application. Similarly, 65% of respondents highlighted the importance of training programs, ranked

fifth, which can enhance farmers' skills and understanding of improved production technologies, in line with findings from Jalu *et al*. (2022).

The need for community storage and procurement centers was expressed by 60% of the respondents, ranking sixth. Farmers pointed to challenges in storage and marketing of produce, suggesting that community centers could reduce individual risks and improve market access, consistent with the findings of Vineetha *et al*. (2018). Reliable weather forecasting services, ranked seventh by 53.33% of respondents, was seen as essential for informed decision-making in planting, irrigationand harvesting. Accurate weather information could mitigate risks related to unpredictable weather patterns, as also noted by Oyekale (2015).

Crop insurance, ranked eighth with 46.67% of respondents supporting it, was seen as a critical safety net to protect farmers against crop failures due to climatic risks. This finding is supported by Jalu *et al*. (2022), who highlighted the vulnerability of farmers to environmental uncertainties. Additionally, 38.33% of respondents ranked farmer cooperatives ninth, emphasizing the role of collective action in reducing input costs and ensuring timely access to necessary inputs through bulk purchasing, a finding consistent with Ramaru *et al*. (2004).

Finally, government subsidies and grants, ranked tenth by 34.17% of the respondents, were seen as necessary for purchasing machinery that could enhance post-harvest processing and add value to the produce. This finding aligns with Pipit *et al*. (2021), who emphasized the need for financial

Table 5: Ranking of constraints faced by groundnut growers in villupuram district based on garret score.

Constraints	Garret score	Mean score	Rank
Pig/Rodent attack and other biotic factors	1275	10.625	XII
Lack of storage facility	1258	10.483	XI
Unpredictable weather patterns	1305	10.875	X
Scarcity and high wages of labor	1679	13.991	VIII
Inadequate groundnut processing machines	1474	12.283	IX
Non-availability of Inputs in Time	1955	16.291	VII
Lack of timely and appropriate extension services	3168	26.4	IV
Pest and disease Infestation	2383	19.858	VI
Lack of technical know-how	2496	20.8	V
High input costs	3753	31.275	II
Non-remunerative prices/price fluctuations	4083	34.025	I
Inadequate credit	3239	26.991	III

Table 6: Suggestions from the respondents to overcome constraints faced by them in the adoption of TNAU-recommended groundnut production technology.

Suggestions	Frequency	Percentage (%)	Rank
Inputs should be made available at the subsidized rate	108	90.00	I
Easy and timely credit availability at low interest rates should be provided	98	81.67	II
Remunerative prices should be made available to the groundnut growers for their products	86	71.67	III
Provide continuous support from extension services to guide farmers	84	70.00	IV
More number of trainings should be provided for better understanding of improved production technologies	78	65.00	V
Establish community storage centers/ establishment of procurement center	72	60.00	VI
Provide access to reliable weather forecasting services	64	53.33	VII
Farmers should be protected by crop insurance	59	49.17	VIII
Develop farmer cooperatives to bulk purchase if crops fail inputs and ensure timely distribution	46	38.33	IX
Advocate for government subsidies and grants to help farmers purchase processing machines	41	34.17	X

support to improve post-harvest operations. Overall, these suggestions reflect the financial, technicaland infrastructural support required by farmers to successfully adopt TNAU-recommended groundnut production technologies and improve their productivity and livelihoods.

CONCLUSION

The study titled "Constraints Encountered by Groundnut Farmers in Adopting Recommended TNAU Groundnut Production Technologies in Villupuram District" has identified several critical barriers affecting the adoption of advanced production technologies. The most significant constraint found is the issue of non-remunerative prices and price fluctuations, which severely impact farmers' income and discourage investment in new technologies. Additionally, high input costs and inadequate credit facilities are major obstacles that complicate the adoption process. Other significant impediments include the lack of timely and appropriate extension services, insufficient technical know-howand pest and disease infestations.

These findings underscore the necessity for targeted interventions to address these constraints and enhance technology adoption rates. Specifically, addressing price instability and improving access to affordable credit could offer immediate relief to farmers. Concurrently, strengthening extension services and providing more technical training can build long-term capacity. Future research should focus on evaluating the effectiveness of specific interventions designed to mitigate these constraints and assess their impact on technology adoption. Moreover, exploring the influence of local market dynamics and weather patterns on adoption decisions could provide deeper insights into the multifaceted nature of these challenges, facilitating more effective strategies to support groundnut farmers.

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Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarily represent the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Ethical considerations

Ethical considerations were observed by obtaining written informed consent from all respondents after explaining the study's purpose and ensuring the confidentiality of their responses. All collected data were kept confidential and used solely for research purposes, with no personal identifiers included in the analysis or dissemination of results.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. No funding or sponsorship influenced the design of the study, data collection, analysis, decision to publish, or preparation of the manuscript.

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