Original Research Article

The Role of Agri-Startups in Facilitating Technology Transfer: A Study of Farmer Perspectives in Madurai and Dindigul Districts, Tamil Nadu

ABSTRACT

'Agristart-up innovation has the potential to transform the future of agriculture. It's an excellent opportunity to boost their self-esteem'. This study investigates the pivotal role of Agri-Startups in facilitating technology transfer to farmers in the Madurai and Dindigul districts of Tamil Nadu, India. The research examines the multifaceted contributions of these startups across financial, technological, and marketing domains, as well as farmers' perspectives on their impact. A sample of 150 farmers associated with five local Agri-Startups was surveyed using a structured questionnaire. The study reveals that Agri-Startups play a significant role in attracting investment for agricultural innovation (72.7% agreement), developing new technologies (81.3% agreement), and identifying market opportunities (72% agreement). However, farmers' overall agreement with the startups' role in technology transfer varied, with (44%) showing low agreement, (43.33%) medium agreement, and only (12.7%) high agreement. This research contributes valuable insights into the emerging Agri-Startup ecosystem in rural India and its potential to transform agricultural practices through technology transfer. The findings highlight both the strengths of these startups and areas for improvement in their engagement with farmers, offering a foundation for enhancing the effectiveness of Agri-Startups in driving agricultural innovation and adoption.

Keywords: Startup ecosystems, Entrepreneurship, Agribusiness, Technology adoption, Knowledge transfer, Farmers' perspectives.

1. INTRODUCTION

Agri-startups have become important players in this changing field, bridging the gap between innovative ideas and real-world applications. These businesses are not only creating new technologies, but they are also essential in getting these advancements to farmers.The need for efficient, sustainable farming methods and the rapid advancement of technology are driving a massive transformation in the agricultural sector. Especially in developing nations, the convergence of agriculture and technology through startups is becoming a critical factor in

increasing agricultural sustainability and production [1]. With a $10.6 billion worldwide investment in 2022, despite a decline in funding, Agri-tech startups continue to draw a significant 13% less than in 2011 [2]. This industry has grown by an astounding 20 times in venture capital investments during the last ten years, indicating the increased significance of tackling food security in the face of a growing global population and climate-related challenges [3]. According to the economic survey 2021-22, the majority of India's 83 unicorns, have a combined worth of over $277.70 billion people and generate more than 50% of the country's Gross Domestic Product (GDP), are in the service industry, according to the economic report 2021-2022 [4] . To solve many of the major problems facing the agriculture industry, Agri-Startups have arisen as a "wind of change". With the use of cutting-edge concepts and contemporary technology, these startups aim to transform the agricultural environment in India. Startup companies, also known as Startups or Agri-startups, are entrepreneurial endeavours that are usually recently established, expanding quickly, and seeking to fill a market gap by creating or providing an exceptional and novel product, service, or method. Things have begun to change in India with the rise of Start-ups. There is no denying that Startups have revolutionized the agricultural sector and pushed for growth [5]. It's also important to note that the advent of free market economies around the world has led to the formation of a new entrepreneurial spirit known as "Agripreneurship" and an increase in the necessity for individuals to take responsibility for managing their enterprises [6].TheAgripreneurship programme is essential for producing managers and entrepreneurs to serve the global agriculture industry [7].

When an entity satisfies the requirements listed below, it will be considered as a "STARTUP":

- ✓ The startup has to file for registration as a limited liability partnership or private company.
- ✓ The startup cannot be the result of reorganisation.
- ✓ The Startup can't be more than ten years old.
- ✓ The start-up's annual revenue cannot exceed Rs. 100 crores [8].

The purpose of this research is to investigate the complex function that Agri-startups play in helping farmers in southern districts, Tamil Nadu acquire new technologies. Through an examination of their roles in marketing, technology, finance, and farmer perspectives, this study aims to offer a thorough grasp of how Agri-startups are influencing the agricultural environment. Considering the information mentioned above, the present study was initiated with the following specific objectives.

1.2 Objectives

- ✓ To examine the role of Agri-Startups in facilitating the transfer of technology

2. MATERIAL AND METHODS

The study was conducted in Madurai and Dindigul district of Tamil Nadu by Agri-Startups, became the most developed in the agriculture industry. The sampling method employed for this study was proportionate to the number of farmers in each Agri-Startups. As a result, a total of 150 farmers were selected as respondents using a purposive random sampling technique. These areas were selected based on their significant contribution to farmers' adoption of technology transfer by those startups. A total of five blocks were randomly selected for the study. Five Agri-Startups were identified and selected within the Madurai and Dindigul districts. These five Agri-Startups operate in collaboration with farmers from various blocks within the district, including Nilakottai and Vedasandur from the Dindigul district, and Vadipatti,Usilampatti, and Alanganallur, three blocks from the Madurai district. These Agri-Startups were specifically focused on their role in facilitating their technology transfer to the farmers within Madurai and Dindigul districts by using a stratified random sampling technique. The primary data was gathered with the use of an interview schedule that was designed in accordance with the investigation's objectives. The primary data was analyzed and tabulated using frequency and percentage.

Table 1. The distribution of Agri-Startups according to their technologies

S.No	Name of the Agri-Startups	Technologies provided
1.	Adish-technologies private limited	Web-services, Mobile Applications development
2.	Gusto-crop technologies private limited	Nano-based fertilizer and growth products
3.	RNR-Agri developers private limited	Agri-Consultant
4.	Infarmsys technologies private limited	Agritech solution and Soil NPK sensors
5.	BrainfarmsAgrotech private limited	Artificial neural networks (ANN) and Remote sensing

Different categories of role in facilitating the transfer of technologies in questionnaire schedule were developed and used in this study. There were twenty statements on the questionnaire, divided into four categories: Financial Role, Technological Role, Marketing Role and other aspects. In order to ascertain the perceived significance of the various functions performed by

agri-startups, farmers' answers were recorded on a binary scale (Yes/No). Using SPSS software, descriptive statistics data was analyzed and tabulated.

Table 2. The distribution of Agri-Startups and selection of respondents.

S.No	Name of the Agri-Startups	No. of respondents selected
1.	Adish-technologies private limited	30
2.	Gusto-crop technologies private limited	30
3.	RNR-Agri developers private limited	30
4.	Infarmsys technologies private limited	30
5.	BrainfarmsAgrotech private limited	30
	Total	**150**

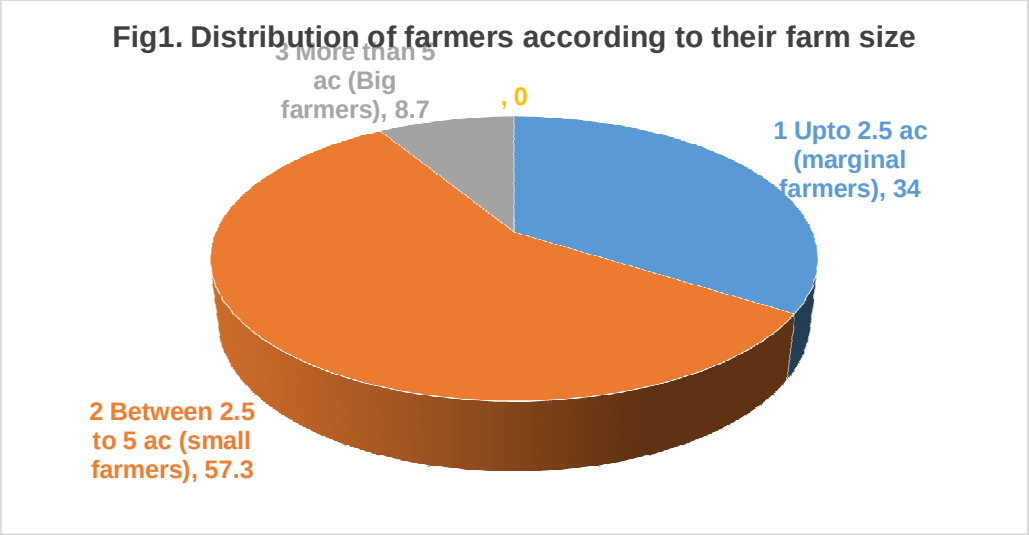
Table 3. The distribution of respondents according to their farm size

S.No	Category	Farm holding	Score
1.	Marginal farmer	Upto 2.5 acres	1
2.	Small farmer	Between 2.5 to 5 acres	2
3.	Big farmer	More than 5 acres	3

Farm Size:

Table 4. Distribution of respondents according to their farm size (n=150)

S. No	Category	Number	Per cent
1.	Upto 2.5 ac (marginal farmers)	51	34.0
2.	Between 2.5 to 5 ac (small farmers)	86	57.3
3.	More than 5 ac (Big farmers)	13	8.7
	Total	**150**	**100.00**



The data presented in table 4 provides insights into the landholding patterns. Notably, the majority of respondents (57.3%) identified as small farmers, followed by (34%) who consider themselves as marginal farmers. A smaller proportion , (8.7%) fall under the category of big farmers.

3. RESULT AND DISCUSSION

3.1 Listing of respondents according to the role of Agri-Startups in facilitating technology transfer

Table 5. shows the frequency and percent of farmers in the role of Agri-Startups in Facilitating Technology Transfer

(n=150)

S.No.	Statements	Frequency	Percentage
A.	**Financial Role**		
1.	Agri-startups attract investment for agricultural technology development	109	72.7
2.	Agri-startups sources of initial capital for innovative agricultural ideas	70	46.7
3.	Agri-startups invest in creating new markets for agricultural technologies	77	51.3

4.	Agri-startups aim to generate financial returns through successful technology commercialization	74	49.3
5.	Agri-startups willing to take on higher risks associated with technological development in agriculture	66	44.0
B.	**Technological Role**		
6.	Agri-startups develop or adopt new agricultural technologies	122	81.3
7.	Agri-startups facilitate the adoption of new technologies by farmers	87	58.0
8.	Agri-startups operate demonstration farms to showcase new agricultural technologies	65	43.3
9.	Agri-startups provide educational programs to farmers regarding new technologies	57	38.0
10.	Agri-startups focus on increasing productivity and sustainability through technology transfer	80	53.3
C.	**Marketing Role**		
11.	Agri-startups identify market needs and opportunities in the agricultural sector	108	72.0
12.	Agri-startups use to promote and market their agricultural technologies	98	65.3
13.	Specific channels or platforms through which agri-startups reach their target audience	58	38.7
14.	Agri-startups differentiate their agricultural technologies from competitors in the market	82	54.7
15.	Agri-startups offer after-sales support or services to enhance customer satisfaction	62	41.3

D.	**other**		
16.	Farmers perceive the innovations introduced by agri-startups in the agricultural sector	105	70.0
17.	Farmers find agri-startups' technologies relevant and beneficial to their farming practices	70	46.7
18.	Farmers aware of the role of agri-startups in driving technological advancements in agriculture	59	39.3
19.	Farmers evaluate the effectiveness and practicality of technologies introduced by agri-startups	75	50.0
20.	Farmers perceive agri-startups as reliable sources of information and support for adopting new technologies	58	38.7

S.NO	Level	Frequency	Percentage
1.	Low	66	44.0
2.	Medium	65	43.3
3.	High	19	12.7
	Total	**150**	**100.00**

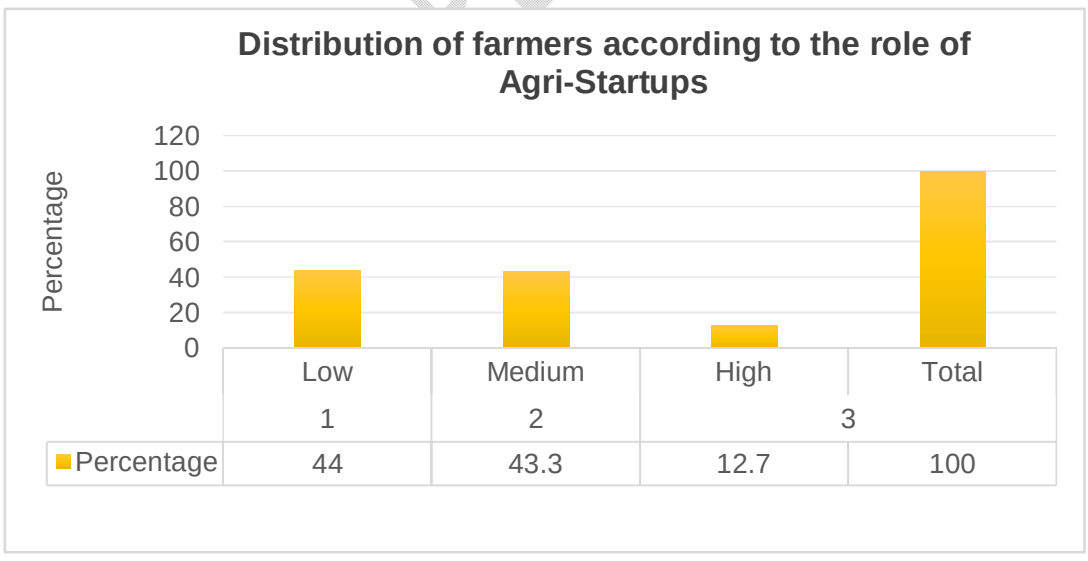


Fig. 2. Comparison of farmers according to their overall response towards the role of Agri-startups

3.1 Interpretation

- ✓ Regarding the functions and effects of Agri-startups in technology transfer and adoption, the great majority of farmers (44%) express a low degree of agreement.
- ✓ Very few farmers are doubtful or ignorant of the contributions made by agri-startups, as seen by the low percentage of farmers (43.33%) who express moderate levels of agreement.
- ✓ Similarly, just a small proportion of farmers (12.7%) express strong agreement, indicating that they strongly recognise and appreciate the role that agri-startups play in the adoption and transfer of agricultural technology.

3.1.1 Financial Role

According to (72.7%) of farmers, agri-startups are powerful draws for funding for the development of agricultural technologies. This demonstrates how important it is for them to direct funding towards agricultural innovation. Furthermore, a sustainable approach to innovation is suggested by the fact that (44%) of farmers acknowledged that the goal of agri-startups is to make money through technological commercialisation.

3.1.2 Technological Role

On the part of agri-startups in creating or implementing innovative agricultural technology, there was the greatest level of agreement (81.3%) noted. This emphasises how important a role they play in pushing agricultural technology innovation. Additionally, (38%) of farmers recognised the contribution of agri-startups to the adoption of new technology, emphasising the significance these companies play in the spread of innovations.

3.1.3 Marketing Role

The marketing efforts of agri-startups were highly regarded; according to (72%) of farmers, they successfully market and promote agricultural innovations. This shows that agri-startups are not only coming up with innovative ideas but also making sure those ideas are successfully communicated to the intended audience.

3.1.4 Other aspects

Agri-startup innovations were positively viewed by (70%) of farmers, and (38.7%) of them felt that these technologies were relevant and helpful to their farming methods. This suggests that farmers are largely receiving agri-startup advances positively.

According to the survey of 150 samples, Agri-startups are involved in technology transfer in a variety of ways. They excel in attracting capital, creating cutting-edge technology, and promoting their inventions.

4. CONCLUSION

In conclude , the agricultural industry in Southern districts of Tamil Nadu is greatly benefiting from the technological transfer that Agri-startups are facilitating. This study identifies important areas for improvement while also demonstrating the revolutionary potential of Agri-Startups in transforming agriculture in the districts of Madurai and Dindigul, Tamil Nadu. Nonetheless, there is a noticeable discrepancy between invention and real-world adoption, as evidenced by the different levels of farmer agreement (44% low, 43.33% middle, and 12.7% high) regarding their overall role in technology transfer. Agri-Startups need to concentrate on closing this gap in order to have the most possible impact. They may do this by strengthening their educational initiatives, boosting post-purchase assistance, and providing thorough field testing to show the real benefits of their innovations. Through tackling these obstacles, Agri-Startups can realise their full potential as pivotal agents of agricultural modernisation, making a substantial and long-lasting impact on the agricultural landscape of the area. The present study contributes to our understanding of the Agri-Startup ecosystem in rural India and offers significant perspectives for policymakers, agricultural extension agencies, and the startups themselves in influencing the progression of agriculture.

RECOMMENDATIONS

- ✓ Agri-startups ought to put more effort into showcasing the useful advantages of their innovations in the field through longer field tests and presentations.
- ✓ Improve educational and assistance initiatives to forge closer ties with farmers and position Agri-startups as trustworthy providers of agricultural data.
- ✓ To increase relevance and adoption rates, concentrate on creating technologies that specifically solve regional agriculture issues.
- ✓ To guarantee the long-term viability of adopted technologies, bolster after-sales support.

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