International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Sustainability and Market Orientation of Agriculture in Tamil Nadu, India: An Analysis of Farmers' Practices and Perceptions

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Abstract
This study examines the sustainability and market orientation of agriculture in Tamil Nadu, India. The research investigates farmers' practices and perceptions related to sustainable agriculture, market access, and international standards. The results show that while some farmers have adopted sustainable practices, there is a need for increased awareness, training, and support to promote wider adoption. The study highlights the importance of addressing the economic, environmental, and social sustainability of agriculture in Tamil Nadu.

Keywords: Sustainability, Agriculture, Market Orientation

1. Introduction:

Agriculture is a vital sector in India, contributing significantly to the country's economy and food security. Tamil Nadu is one of the major agricultural states in India, with a diverse range of crops and farming systems. However, the state's agricultural sector faces several challenges, including environmental degradation, water scarcity, and climate change. This study aims to investigate the sustainability and market orientation of agriculture in Tamil Nadu, with a focus on farmers' practices and perceptions related to sustainable agriculture, market access, and international standards.

Agriculture is the backbone of India's economy, providing livelihoods for millions of people and contributing significantly to the country's food security. Tamil Nadu, one of the southern states of India, is a major agricultural hub, with a diverse range of crops and farming systems. The state's agricultural sector has made significant contributions to the country's agricultural growth and development.

However, the agricultural sector in Tamil Nadu faces numerous challenges, including environmental degradation, water scarcity, climate change, and market fluctuations. The intensive use of chemical fertilizers and pesticides has led to soil degradation, water pollution, and loss of biodiversity. Climate change has resulted in unpredictable weather patterns, affecting crop yields and farmer livelihoods. Moreover, the lack of market access and orientation has limited farmers' ability to compete in domestic and international markets.

In recent years, there has been a growing emphasis on sustainable agriculture practices, which prioritize environmental conservation, social equity, and economic viability. Sustainable agriculture practices,

such as organic farming, conservation agriculture, and agroforestry, have been shown to improve soil health, reduce water pollution, and promote biodiversity. Moreover, these practices can improve farmer livelihoods, enhance food security, and contribute to climate change mitigation.

Market orientation is another critical aspect of agricultural development in Tamil Nadu. Market orientation refers to the ability of farmers to produce and market their products in response to changing market demands. In Tamil Nadu, many farmers lack access to markets, market information, and other resources, limiting their ability to compete in domestic and international markets.

This study aims to investigate the sustainability and market orientation of agriculture in Tamil Nadu, with a focus on farmers' practices and perceptions. The study seeks to answer the following research questions:

1. What are the current sustainability practices adopted by farmers in Tamil Nadu?
2. What are the factors influencing farmers' adoption of sustainable agriculture practices?
3. What is the level of market orientation among farmers in Tamil Nadu?
4. What are the factors influencing farmers' market orientation?

The study's findings will contribute to a better understanding of the sustainability and market orientation of agriculture in Tamil Nadu. The results will also inform policy interventions and development programs aimed at promoting sustainable agriculture practices and improving market access for farmers in Tamil Nadu.

2. Review of Literature

This Research paper intends to contribute a detailed review on the studies related to the present project work “Challenges in Implementing SPS Measures and Promotion of Trade in Tamil Nadu”. There are a number of studies focusing on the impact of Sanitary and Phytosanitary (SPS) measures on trade. The authors have collected a plenty of earlier works and still this is on progress; among them important studies are reviewed and discussed as following.

Rita Ghial (2018) have exchanged food and other agricultural products. In earlier times, the trade system that existed for exchange of goods was the barter system. The SPS agreement under the Uruguay Round Agreement on Agriculture (URAA) defined Sanitary and Phytosanitary (SPS) standards as measures taken to protect human, animal or plant life or health from risks associated with imported agricultural commodities. This paper based on case study on International Sanitary and Phytosanitary measures and Trade Barrier Treaties in India.

Siméon (2006) has analysed fast-growing demand, export markets can absorb high value added products and offer high returns; for many developing countries export market development is thus a key requirement for rural income generation and rural growth. High-income countries should increase development flows to help developing countries build the capacity to plan and execute the necessary strategies. In this paper is to make two existing sets of guidelines widely available to interested parties, in particular through the World Bank and the World Organisation for Animal Health (OIE).

Omar Aloui Lahcen Kenny (2005) has analysed Food and agricultural trade is the vital link in the mutual dependency of the global trade system and developing countries. The emergence of food safety and agricultural health issues and the related tightening of market requirements form challenges to further growth of the mutual gains due to the lack of technical and financial capacities of Lt lost developing economies. This paper is one of a series of such case studies that examined the strategies and costs of compliance of the various stakeholders in developing countries with international agro-food standards.

The findings and conclusions defined from these country studies are discussed in a synthesis report that seeks to identify possible points of intervention by the World Bank and other donor agencies and to determine the types of technical assistance that would be most efficient and appropriate.

Andrew L. Stoler (2011) has analysed the practice of addressing TBT and SPS measures in PTAs suggest that such agreements converge with, and support, the multilateral trading system. To ensure that this does happen, PTAs should include, where feasible, a number of important best-practice provisions. If one partner is less developed than the other, the PTA should incorporate technical assistance and capacity building measures to assist the institutions and exporters of the developing-country partner.

Murali Kallummal (2012) has examined the Doha Round seeks to address tariff liberalization issues in a comprehensive manner, the imbalance in the outcome of market access for developing country exporters will be particularly glaring in the case of fresh agricultural and processed food products. This paper presents an analysis of the SPS notifications made by WTO Member countries during 1995-July 2010. Thus there is an urgent need for discipline in the usage of SPS measures as a tool for "disguised" protectionism. This can be best achieved by harmonizing the standards across WTO Members under the three intra-governmental bodies already identified by the SPS Agreement.

Fengxia Dong and Helen H. Jensen (2004) have analysed the China's bilateral trade in food and agricultural products has grown dramatically since the country's entry into the World Trade Organization (WTO). This study provides a systematic and comprehensive analysis of current Chinese SPS conditions, the food safety regulatory system, production environment, inspection technology, and information systems. In addition, China's progress on resolving SPS problems and ability to adjust to the current SPS measures it faces in world markets are discussed.

Amir Ullah Khan & Mohammed Saqib (2004) have analysed the Food Processing sector in India is one of the largest in the world in terms of production, consumption, export and growth prospects. Primary food processing is a major industry with thousands of rice-mills, flour mills, pulse mills and oil-seed mills. There are several thousands of bakeries, traditional food units and fruit/veg./spice processing units in unorganized sector.

Ambassador Michael B.G. Froman (2014) has specialized report dedicated to describing significant barriers to U.S. food, farm, and ranch exports arising from measures that foreign governments apply on the grounds that such measures are necessary to protect human, animal, or plant life or health from risks arising from the entry or spread of plant or animal- borne pests or diseases, or from additives, contaminants, toxins, or disease-causing organisms in foods, beverages, or feedstuffs. This report is intended to describe and advance U.S. efforts to identify and eliminate these unwarranted measures.

Spencer Henson and Julie Caswe (1999) have discussed a number of issues that are influencing the evolution of food safety regulation in developed and, to a lesser extent, developing countries. The article serves as an introduction to these issues, which are discussed at greater length in the other papers that make up this special issue of Food Policy.

Prema-Chandra Athukorala and Sisira Jayasuriya (2003) have that SPS Agreement and the related WTO dispute settlement mechanism are an important first step in strengthening the global trade architecture, bringing in greater transparency and orderly conditions to world food trade. While making full use of available international assistance initiatives, developing countries should view the task of complying with SPS standards not just as a barrier but also as an opportunity to upgrade quality standards and market sophistication in the food export sector.

Donna Roberts and Tim Josling (2011) have that policy brief serves as a background paper for a seminar

on non-tariff measures which IPC and the OECD are holding on September 13, 2011: "Non-Tariff Measures on Food and Agricultural Products: The Road Ahead." Donna Roberts is the Chief, Food & Specialty Crops Branch at the Economic Research Service of USDA. A draft of this paper was presented to IPC members, and the authors gratefully acknowledge their comments.

Kees van der Meer (2014) has in this study focused on the transaction costs of SPS release processes for exports and imports in the four Southeast Asian countries. The SPS systems in the countries differ considerably. Cambodia and Lao PDR are still making efforts to establish a basic system, and their capacity is still very limited. Thailand and the Philippines have more established systems. Thailand's system is more developed, with greater capacity for implementation, and more trade-friendly.

Kasturi Das (2008) has analysed the Agreement on the Application of Sanitary and Phytosanitary Measures (SPSA) was negotiated with a view to setting in place an array of multilateral rules that would, on the one hand, recognize the legitimate right of WTO Members to adopt sanitary and phytosanitary (SPS) measures necessary to protect human, animal, or plant life or health, and on the other, enshrine certain checks and balances to cope with the possibility of these measures emerging as non-tariff barriers (NTBs). The present article brings to the fore some of the key SPS challenges facing the developing countries by taking India as a case in point and explores certain plausible strategies to cope with such challenges in an effective manner.

Alvita Chen (2014) has analysed the proliferation of Sanitary and Phytosanitary measures for food products responds to risk exposure. The distributional effects of HACCP to small-scale operators in developing countries are detrimental. A similar situation has happened in the Indonesian fish industry where small-scale operators, particularly those in the upstream stage, are unable to participate in the new system. The government should be informed of this effect to implement focused strategies that enable and encourage small-scale operators to participate in the HACCP system.

Jong Woo Kang and Dorothea Ramizo (2017) have examined the principle, sanitary and phytosanitary (SPS) measures aim to protect the health o1 humans, plants and animals, while technical barriers to trade (TBT) ensure product quality and safety. Our analysis shows that in general the measures seem to be positive for trade after controlling for other factors.

Bibek Debroy (2005) tells that regulated or standards on goods can impact trade in two ways. The WTO Agreements on the Application of Sanitary (for protection of human and animal health) and Phytosanitary (for protection of plant health) Measures (SPS) and the Agreement on Technical Barriers to Trade (TBT) try to strike a balance between these competing uses of standards in international trade.

Jennifer M. Rathebe (2015) has analysed the Trade facilitation is about simplifying the procedures that are required to move goods across borders. Some trade requires the application of sanitary and phytosanitary (SPS) measures. SPS measures are necessary to reduce the risks to human, animal and plant health that cross-border movement of goods (especially food and agricultural products) can create - for example the risk of introducing foot and mouth disease from an infected country to a disease-free country. These areas include clarifying roles, responsibilities and mandates of the different agencies; minimising delays and even the necessity for paperwork; and taking a risk based approach to the implementation of measures.

3. Objectives and Methodology:

3.1. Objectives:

1. To examine the current sustainability practices adopted by farmers in Tamil Nadu, India.

2. To identify the factors influencing farmers' adoption of sustainable agriculture practices.
3. To assess the level of market orientation among farmers in Tamil Nadu, India.
4. To identify the factors influencing farmers' market orientation.
5. To provide recommendations for promoting sustainable agriculture practices and improving market access for farmers in Tamil Nadu, India.

3.2. Research Design:

The study employed a descriptive and analytical research design. A survey was conducted among farmers in Tamil Nadu, India, to collect primary data.

3.3. Sampling Technique:

A multi-stage sampling technique was used to select the sample. In the first stage, five districts in Tamil Nadu were randomly selected. In the second stage, 20 villages were randomly selected from each district. In the third stage, 10 farmers were randomly selected from each village.

3.4. Sample Size:

The sample size consisted of 510 farmers

3.5. Data Collection:

Primary data was collected through a structured questionnaire administered to the selected farmers. The questionnaire consisted of sections on demographic characteristics, sustainability practices, market orientation, and perceptions.

3.6. Data Analysis:

Descriptive statistics, such as frequencies, percentages, means, and standard deviations, were used to summarize the data. Inferential statistics, such as chi-square tests and regression analysis, were used to analyze the relationships between variables.

3.7. Tools and Techniques:

SPSS (Statistical Package for Social Sciences) software was used for data analysis. Microsoft Excel was used for data manipulation and chart preparation.

3.8. Ethical Considerations:

The study ensured the confidentiality and anonymity of the respondents. Informed consent was obtained from each respondent before administering the questionnaire.

4.1. Opinion on Combined Method of Farming in Tamil Nadu:

The data shows the distribution of farmers' opinions on the effectiveness of using a combined method of farming (likely integrating organic and inorganic practices) in Tamil Nadu.

Almost half perceive combined method as very effective of 48.9% farmers perceive the combined method as "very high" in terms of effectiveness. The effectiveness perceived by many: 35.6% of farmers perceive the combined method as "moderate" in terms of effectiveness. Only 15.5% of farmers perceive the combined method as "less" effective.

Table: 4.1 Opinion On Combined Method Of Farming In Tamil Nadu

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Very High	249	48.8	48.9	48.9
	Moderate	181	35.5	35.6	84.5
	Less	79	15.5	15.5	100.0
	Total	509	99.8	100.0	

Missing	System	1	.2		
Total		510	100.0		

The high percentage of farmers who perceive the combined method as effective suggests that it may be a viable approach for improving farm productivity. To enhance the effectiveness of the combined method, farmers may require training and support on how to integrate different farming practices. Regular monitoring and evaluation of the combined method's effectiveness can help identify areas for improvement.

Provide training and support to farmers on how to effectively integrate different farming practices. Promote the adoption of the combined method through awareness campaigns and incentives. Set up systems to regularly monitor and evaluate the effectiveness of the combined method.

4.2. Factors Affecting Yield in Tamil Nadu:

The data shows the distribution of factors that affect crop yield in Tamil Nadu. A major concern of 19.9% farmers identifies diseases as a major factor affecting crop yield. The farmers identify natural calamities as a major factor affecting crop yield in 16.9 per cent. The farmers identify lack of finances, unavailability of resources, and diseases as major factors affecting crop yield in 24.8 Per cent.Many farmers (57.3%) identify multiple factors affecting crop yield, highlighting the complexity of the issue.

The high incidence of diseases affecting crop yield highlights the need for effective disease management strategies. Natural calamities are a significant concern, emphasizing the need for climate-resilient agriculture practices. Lack of finances and resources are major constraints; addressing these issues can help improve crop yields.

Table: 4.2 Factors Affecting Yield in Tamil Nadu

Valid		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Natural Calamities	86	16.9	16.9	16.9
	Lack of Knowledge	12	2.4	2.4	19.3
	Lack of Finances	33	6.5	6.5	25.8
	Unavailability of Resources	5	1.0	1.0	26.8
	Diseases	101	19.8	19.9	46.7
	Natural calamities, Lack of finances, Unavailability of resources, Diseases	54	10.6	10.6	57.3
	Lack of finances, Unavailability of resources, Diseases	126	24.7	24.8	82.1
	All	89	17.5	17.5	99.6
	Others	2	.4	.4	100.0
	Total	508	99.6	100.0	
Missing	System	2	.4		
Total		510	100.0		

Provide training and support to farmers on effective disease management strategies. Promote climate-resilient agriculture practices, such as conservation agriculture and agroforestry. Enhance access to finance and resources, such as credit facilities, irrigation systems, and farm equipment.

4.3. Status of Export of Agricultural Production in Tamil Nadu:

The data shows the distribution of farmers' involvement in exporting agricultural production in Tamil Nadu. The majority of 54.1% farmers are not interested in exporting their agricultural production. Some farmers 32.7 percent are interested in exporting but currently do not do so. Small percentage of farmers 12.8% is presently exporting their agricultural production.

The large number of farmers interested in exporting but not currently doing so suggests untapped export potential. Farmers may require support and training to overcome barriers to exporting, such as market access and logistics.

Table:4. 3 Status of Export of Agricultural Production in Tamil Nadu

Valid		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Presently Exporting	65	12.7	12.8	12.8
	Interested but not Exporting	166	32.5	32.7	45.5
	Not interested on Export	275	53.9	54.1	99.6
	Presently Exporting, Not interested on export	2	.4	.4	100.0
	Total	508	99.6	100.0	
Missing	System	2	.4		
Total		510	100.0		

The majority of farmers focus on the domestic market, highlighting the importance of local market development. Offer training and support to farmers to help them overcome barriers to exporting. Develop export markets and infrastructure, such as logistics and transportation systems. Encourage local market development to support farmers who focus on the domestic market.

4.4. Awareness of International Standards in Tamil Nadu:

The data shows the distribution of farmers' awareness of international standards in Tamil Nadu. Low awareness of international standards of farmers 6.9% is aware of international standards. Overwhelming majority of farmers 93.1% is

There is a significant need to raise awareness and provide training on international standards to farmers. Lack of awareness of international standards may impact farmers' ability to compete in international markets. This presents an opportunity for capacity building and support to help farmers meet international standards.

Table:4.4 Awareness of International Standards in Tamil Nadu

Valid		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Yes	35	6.9	6.9	6.9

	No	472	92.5	93.1	100.0
	Total	507	99.4	100.0	
Missing	System	3	.6		
Total		510	100.0		

Organize awareness and training programs to educate farmers on international standards. Offer technical assistance to help farmers implement international standards. Establish support systems, such as extension services, to help farmers meet international standards.

4.5. Heard of the Term SPS (Sanitary and Phytosanitary) in Tamil Nadu:

The data shows the distribution of farmers' familiarity with the term SPS in Tamil Nadu. Very low farmers have awareness of 3.6 the term SPS. Overwhelming majority of farmers 96.4% are not familiar with the term SPS.

There is a significant need to raise awareness and educate farmers on the concept of SPS. Lack of awareness of SPS may impact farmers' ability to participate in international agricultural trade. This presents an opportunity for capacity building and support to help farmers understand and comply with SPS measures.

Table: 4.5 Heard of the Term SPS (Sanitary and Phytosanitary) in Tamil Nadu

Valid		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Yes	18	3.5	3.6	3.6
	No	489	95.9	96.4	100.0
	Total	507	99.4	100.0	
Missing	System	3	.6		
Total		510	100.0		

Organize awareness and education programs to inform farmers about the concept of SPS. Offer training to farmers on how to comply with SPS measures. Establish support systems, such as extension services, to help farmers comply with SPS measures.

4.6. Attendances at Workshops/Training Programs on SPS in Tamil Nadu:

The data shows the distribution of farmers' attendance at workshops/training programs on SPS in Tamil Nadu. Only 13.6% of farmers have attended workshops/training programs on SPS. Majority of farmers 86.4% have not attended any workshops/training programs on SPS.

Table: 4.6 Attendances at Workshops/Training Programs on SPS in Tamil Nadu

Valid		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Yes	69	13.5	13.6	13.6
	No	438	85.9	86.4	100.0
	Total	507	99.4	100.0	
Missing	System	3	.6		
Total		510	100.0		

There is a need to increase training and capacity-building initiatives to educate farmers on SPS. Low attendance at SPS workshops/training may impact farmers' ability to comply with SPS measures. This presents an opportunity for targeted interventions to support farmers in understanding and complying with SPS measures.

Organize more workshops/training programs on SPS to educate farmers. Ensure that training programs are accessible and inclusive for all farmers. Establish online resources and support systems to supplement training programs and support farmers in complying with SPS measures.

4.7. Interest in Knowing SPS Standards in Tamil Nadu:

The data shows the distribution of farmers' interest in knowing SPS standards in Tamil Nadu. Only 18.5% of farmers are interested in knowing SPS standards. Majority of farmers 81.5% are not interested in knowing SPS standards.

Table:4.7 Interest in Knowing SPS Standards in Tamil Nadu

Valid		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Yes	94	18.4	18.5	18.5
	No	413	81.0	81.5	100.0
	Total	507	99.4	100.0	
Missing	System	3	.6		
Total		510	100.0		

There is a need to raise awareness and educate farmers on the importance of SPS standards. Limited knowledge of SPS standards may impact farmers' ability to compete in international markets. This presents an opportunity for targeted interventions to support farmers in understanding and complying with SPS standards.

Organize awareness campaigns to educate farmers on the importance of SPS standards. Offer training and support to farmers on SPS standards and their implementation. Establish user-friendly resources, such as guides and websites, to provide farmers with easy access to information on SPS standards.

4.8. Interests in Growing SPS Standard Crops in Tamil Nadu:

The data shows the distribution of farmers' interest in growing SPS standard crops in Tamil Nadu. Only 17.8% of farmers are interested in growing SPS standard crops. Majority of farmers 82.2% are not interested in growing SPS standard crops.

Table:4.8 Interests in Growing SPS Standard Crops in Tamil Nadu

Valid		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Yes	90	17.6	17.8	17.8
	No	417	81.8	82.2	100.0
	Total	507	99.4	100.0	
Missing	System	3	.6		
Total		510	100.0		

Farmers may require incentives and support to adopt SPS standard crops. Limited adoption of SPS standard crops may impact farmers' ability to compete in international markets. This presents an opportunity for targeted interventions to support farmers in adopting SPS standard crops.
Offer incentives, such as subsidies or premium prices, to farmers who adopt SPS standard crops. Establish support systems, such as extension services and training programs, to help farmers adopt SPS standard crops. Facilitate market access for farmers growing SPS standard crops to ensure they receive a fair price for their produce.

4.9. Market Potential of Organic Goods in Foreign Markets (Tamil Nadu):

The data shows the distribution of farmers' perceptions of the market potential of organic goods in foreign markets. Only 3.0% of farmers believe that organic goods have market potential in foreign markets. Overwhelming majority of farmers 97.0% do not believe that organic goods have market potential in foreign markets or are unaware of the potential.

Table:4.9 Market Potential of Organic Goods in Foreign Markets (Tamil Nadu)

Valid		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Yes	15	2.9	3.0	3.0
	No	492	96.5	97.0	100.0
	Total	507	99.4	100.0	
Missing	System	3	.6		
Total		510	100.0		

There is a need to conduct market research and raise awareness among farmers about the potential of organic goods in foreign markets. Tapping into foreign markets for organic goods could be a growth opportunity for farmers in Tamil Nadu. Farmers may require support, such as training and infrastructure development, to produce for export markets.
Research foreign markets to identify demand for organic goods and opportunities for Tamil Nadu farmers. Organize awareness programs to educate farmers about the potential of exporting organic goods to foreign markets. Offer training, infrastructure development, and other support to farmers to help them produce for export markets.

4.10. Testing the Quality of Agricultural Goods Produced in Tamil Nadu:

The data shows the distribution of farmers who have tested the quality of their agricultural goods. Only 7.5% of farmers have tested the quality of their agricultural goods. Majority of farmers 92.5% are not tested the quality of their agricultural goods.

Table:4.10 Testing the Quality of Agricultural Goods Produced in Tamil Nadu

Valid		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Yes	33	6.5	7.5	7.5
	No	407	79.8	92.5	100.0
	Total	440	86.3	100.0	
Missing	System	70	13.7		

Total	510	100.0		

There is a need to establish quality testing infrastructure to support farmers. Not testing quality may impact farmers' ability to compete in markets. This presents an opportunity for capacity building and support to help farmers test and improve quality.
Set up quality testing infrastructure, such as laboratories, to support farmers. Offer training to farmers on quality testing methods and standards. Encourage farmers to participate in quality certification schemes to improve market competitiveness.

5. Conclusion:

This study highlights the need for promoting sustainable agriculture practices and improving market access for farmers in Tamil Nadu. The results show that while some farmers have adopted sustainable practices, there is a need for increased awareness, training, and support to promote wider adoption. The study's findings suggest that addressing the economic, environmental, and social sustainability of agriculture in Tamil Nadu is crucial for ensuring the long-term viability of the sector. The results of this study can inform policy interventions and development programs aimed at promoting sustainable agriculture practices and improving the livelihoods of farmers in Tamil Nadu.

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