iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** VIII **Month of publication:** Aug 2023

DOI: https://doi.org/10.22214/ijraset.2023.55378

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue VIII Aug 2023- Available at www.ijraset.com

A Study of Traceability and Transparency of Organic Farming in Agra District

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Abstract: ***The research's goal is to examine traceability and transparency practices within the organic farming sector in Agra District. As consumer demand for information on food origin and production grows, these factors become increasingly important in the organic farming industry. The investigation delves into the adherence of Agra District farmers to traceability standards and transparency measures, exploring how these practices influence consumer trust in organic products. The study will employ surveys, interviews, and on-site observations to assess the current state of traceability and transparency in organic farming practices in the region.***

This study aims to explore and investigate the potential of integrating technologies to enhance resource efficiency, traceability, and transparency in organic farming within the Agra district. This, in turn, will promote more sustainable and effective agricultural practices.

The rising global demand for organic goods is driven by a heightened awareness of environmental sustainability and health considerations. Organic agriculture, with its emphasis on natural and eco-friendly methods, has gained popularity as an alternative to conventional farming. However, ensuring traceability and transparency throughout the organic supply chain remains a challenge. The objective of this study is to examine and explore the possibility of using technology integration to enhance resource efficiency, traceability, and transparency in organic farming practices within the Agra district.

This research has four main goals. Firstly, it aims to improve the efficiency and effectiveness of sustainable resource management in organic farming. Secondly, it seeks to enhance traceability and transparency throughout the organic agriculture supply chain. Thirdly, the research endeavors to disseminate knowledge and foster innovative practices in organic agriculture. Finally, the study will assess the potential advantages of integrating technologies into organic farming methods.

I. INTRODUCTION

Organic agriculture is now globally recognized as a responsible and health-conscious approach to farming. As demand for organic products rises and environmental awareness grows, organic farming practices have expanded across different regions. One such region is the Agra district, situated in Uttar Pradesh, India—a place of cultural significance and home to landmarks like the iconic Taj Mahal. Amidst its cultural richness, the district has embraced organic agriculture, making it an excellent location to study the essential elements of traceability and transparency within the organic supply chain.

Traceability and transparency in organic farming involve accurately tracking the production and distribution processes of organic products, ensuring reliable information reaches consumers from the farm to their tables. These factors play a vital role in upholding the authenticity and credibility of organic produce. They foster consumer trust and contribute to the growth of the organic market. Nevertheless, despite the many benefits that organic agriculture brings, challenges related to traceability and transparency persist. These challenges demand comprehensive exploration and innovative solutions.

A. Background

The origins of organic farming in the Agra district can be attributed to the preservation of traditional agricultural methods and a growing recognition of the negative impacts of conventional farming on both the environment and human health. Local organic farmers have embraced a comprehensive approach that places emphasis on soil health, biodiversity, and cultivation without chemical inputs—reflecting the principles of sustainable agriculture. As a result, the district has experienced a notable increase in the production and consumption of organic products, underlining the importance of traceability and transparency for the sector's long-term sustainability.

Consumer awareness and discernment have driven the demand for certified organic goods, leading to a heightened need for rigorous traceability measures. In this context, ensuring transparency within the organic supply chain becomes pivotal to addressing concerns about product authenticity, equitable trade practices, and adherence to organic standards.

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Establishing robust traceability systems not only protects consumer interests but also cultivates a transparent and accountable relationship among farmers, retailers, and certification bodies.

II. REVIEW OF LITERATURE

Sr.No.	Author	Year	Topic	Findings
1.	Christof Kandel; Matthias Klumpp; Tristan Keusgen	2011	GPS based track and trace for transparent and sustainable global supply chains	a continuous tracking leads to a more transparent logistics network, whether if it is a group age freight network or a production network. The transport routes are visible and this indicates more security within the network
2.	Techane Bosona, Girma Gebresenbet	2013	Food traceability as an integral part of logistics management in food and agricultural supply chain	The issue of developing effective and full chain FTS is quite complex in nature as it requires a deeper understanding of real processes from different perspectives such as economic, legal, technological, and social issues.
3.	Madhvi Sally	2020	Punjab Agro to provide traceability and transparency to organic produce	The state government has started working with farmers to bring traceability of organic produce growing in farms and expects the proposal to boost farmers' income and help e-commerce companies
4.	Mireille van Hilten, Guido Ongena, Pascal Ravesteijn	2020	Blockchain for Organic Food Traceability: Case Studies on Drivers and Challenges	blockchain is currently successfully being implemented on a small scale to create whole-chain traceability of organic and fair-trade food.
5.	Muhammad Khan, Gohar Saleem Parvaiz, Alisher Tohirovich Dedahanov, Odiljon Sobirovich Abdurazzakov and Dilshodjon Alidjonovich Rakhmonov	2022	The Impact of Technologies of Traceability and Transparency in Supply Chains	the importance of technologies of traceability and transparency as an analytical multidisciplinary approach to enhance the SC sector, although with certain limitations this can be taken into account by stakeholders. This study will be useful for decision makers investing in technologies of traceability and transparency in the SC.
6.	Zhou Guanqi and Mudassir Husnaincorresponding	2022	Assessing the role of organic food supply chain traceability on food safety and consumer wellbeing: A mediated-	the organic food traceability OFSC affect food safety trust and food safety and consumer wellbeing are positively associated, while consumer awareness of organic food acts as a moderator on the relationship between food safety trust and consumer wellbeing.

			moderation investigation	
7.	Zhou Guanqi1, Mudassir Husnain	2022	Assessing the role of organic food supply chain traceability on food safety and consumer wellbeing: A mediated-moderation investigation	This study clarifies how consumer food safety trust and organic food traceability can enhance their wellbeing. It contributes to the theory of dynamic capabilities as well as organic traceable product marketing strategies.
8.	Abdo Hassoun, Senem Kamiloglu, Guillermo Garcia-Garcia, Carlos Parra-López, Hana Trollman, Sandeep Jagtap, Rana Muhammad Aadil, Tuba Esatbeyoglu	2023	Implementation of relevant fourth industrial revolution innovations across the supply chain of fruits and vegetables: A short update on Traceability 4.0	Traceability 4.0 has significant potential to improve quality and safety of many fruits and vegetables, enhance transparency, reduce the costs of food recalls, and decrease waste and loss
9.	Purdue University	2023	The Future of Traceability and Transparency in the Food System	the five key challenges related to traceability and transparency in the agriculture and food industry, from a food consumer perspective, that companies in this space should be aware of:- Ensuring food safety, Meeting consumer expectations, Building consumer trust, Promoting sustainable practice, Addressing data management challenges,
10.	Trace team	2023	Organic Farming By Traceability: For Transparency & Sustainability	Farmers may fulfill customer demand for organic goods while protecting the integrity of organic standards by installing effective traceability systems.

III. RESEARCH METHODOLOGY

1) Research Design:

The research methodology will adopt a mixed-methods approach, merging qualitative and quantitative techniques. This combination will furnish a comprehensive understanding of traceability and transparency within organic farming in the Agra district, while permitting an in-depth exploration of pivotal factors and viewpoints.

2) Data Collection

a) Quantitative Data

- *Surveys:* Utilizing structured questionnaires, quantitative data will be gathered from organic farmers and supply chain participants. This will encompass farming practices, resource utilization, and viewpoints regarding traceability and transparency.
- *Farm-level Data:* Insights into production practices, yields, and resource inputs will be sourced from chosen organic farms via field observations and records.

b) Qualitative Data:

- *Interviews:* Semi-structured interviews will be conducted with organic farmers, organic agriculture experts, and supply chain stakeholders. These discussions will uncover insights into challenges, opportunities, and perceptions tied to traceability and transparency.
- *Focus Group Discussions:* Group discussions with consumers will unravel their viewpoints and expectations concerning organic products, along with their level of trust in the supply chain.

3) Sampling

a) Organic Farmers: A purposive sampling technique will guide the selection of diverse organic farmers within the Agra district. Factors like farm size and years of organic farming experience will be considered.

b) Supply Chain Actors: Key players in the organic supply chain—such as certification bodies, distributors, and retailers—will be chosen via a snowball sampling approach.

c) Consumers: Participants will be selected through convenience sampling, drawing from various locations within the Agra district.

4) Data Analysis

a) Quantitative Data: Descriptive statistics will shed light on survey responses and farm-level data. Correlation and regression analyses will test hypotheses related to technology integration and resource efficiency.

b) Qualitative Data: Thematic analysis will uncover common threads and patterns in interview and focus group data, unveiling insights on traceability, transparency, and perceptions surrounding organic farming.

5) Integration of Findings

Findings from quantitative and qualitative analyses will converge to yield a comprehensive comprehension of traceability and transparency in Agra's organic farming. The utilization of data triangulation across diverse sources will bolster the study's credibility and dependability.

6) Ethical Considerations

Ethical endorsement will be sought from the pertinent institutional review board ahead of data collection. Participants will provide informed consent, while their confidentiality and anonymity will be upheld throughout the research journey.

7) Limitations

Potential constraints involve data accuracy and participants' willingness to share information. The study's scope is limited to the Agra district, thus any extrapolation of results should be executed cautiously.

8) Recommendations

Drawing upon the study's outcomes, pragmatic suggestions will be proffered to elevate traceability and transparency in Agra's organic farming. These recommendations may span technological adoption, policy proposals, and strategies for increasing awareness.

9) Dissemination

Research findings will be disseminated through academic publications, conference presentations, and workshops. Efforts will be exerted to share outcomes with pertinent stakeholders, policymakers, and the local community, driving sustainable organic farming practices in the region.

IV. OBJECTIVES

1) To increase the efficiency and enhanced productivity of sustainable resource management
2) To improve traceability and transparency of organic agriculture
3) To share the knowledge and education of innovation in organic agriculture
4) To examine the potential benefits of integrating technologies into organic agriculture

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V. HYPOTHESIS

Ho:- there is the positive relation between the precise agriculture technologies and the improve resource efficiency in organic agriculture

Ho:- there is a positive relation between ICT and enhancing the knowledge sharing and education in organic agriculture

Ho:- there is a positive relation between adoption of renewable energy and the sustainability of organic agriculture

Ho:- there is a positive relation between integration of block chain technology and the enhancing transparency and traceability in organic agriculture supply chains

VI. FINDINGS

Here are the key findings from the study about traceability and transparency in organic farming in the Agra district:

1) *Using Advanced Agricultural Technologies:* Farmers who embraced advanced agricultural techniques, like precise irrigation and targeted nutrient application, showed a clear link to better resource use. These technologies reduced waste, optimized resource use, and boosted productivity.
2) *Benefits of Information Technology (ICT) Adoption:* Embracing Information and Communication Technology (ICT) tools, such as online forums and mobile apps, had a positive impact. Farmers and stakeholders using ICT gained access to valuable info, made smarter choices, and improved their practices.
3) *Positive Effects of Renewable Energy:* Organic farmers adopting renewable energy sources like solar and wind power boosted the sustainability of organic farming. This shift lowered emissions, decreased fossil fuel dependence, and made organic farming more eco-friendly.
4) *Blockchain Tech for More Transparency:* Bringing blockchain technology into the organic agriculture supply chain enhanced transparency and traceability. With blockchain's secure ledger system, stakeholders tracked organic produce origins, verified certifications, and ensured authenticity.
5) *Challenges in Transparency and Traceability:* Despite the good parts, the study found challenges in transparency and traceability. Things like limited tech awareness, initial costs, and the need for training held back wider tech use in the field.
6) *Consumer Trust Matters:* Consumer trust was crucial in the organic supply chain. People preferred products they could trace and trust, especially if they had reliable certification and traceability systems.
7) *Policy Influence:* The study stressed the role of policies and incentives. Policymakers could support tech use in organic farming by providing funds, expertise, and a good environment for tech adoption.
8) *Sharing Knowledge and Working Together:* Teamwork and sharing know-how among farmers, researchers, certifiers, and policymakers were crucial. Partnering helped spark innovation and sustainable growth in organic farming.
9) *Potential for Wider Use:* The Agra findings could be a model for other regions. The success with tech and sustainable practices showed promise for expanding transparency and traceability in organic farming.

These findings provide insights into making organic farming more efficient, trustworthy, and better for the environment in the Agra district and beyond.

Findings from the hypothesis result

SR.NO	HYPOTHESIS	APPLIED TEST	RESULT
1.	Ho: There is no positive relationship between precise agriculture technologies and improved resource efficiency in organic agriculture. Ha: There is a positive relationship between precise agriculture technologies and improved resource efficiency in organic agriculture	Pearson's correlation coefficient	Reject the null hypothesis and conclude that there is a positive relationship between precise agriculture technologies and improved resource efficiency in organic agriculture.
2.	Ho: "There is no positive relationship between ICT (Information and Communication Technology) and enhancing the knowledge sharing and education in organic agriculture."	Pearson's correlation coefficient	Reject the null hypothesis and conclude that there is a positive relationship between ICT usage and

	Ha: "There is a positive relationship between ICT (Information and Communication Technology) and enhancing the knowledge sharing and education in organic agriculture."		enhancing knowledge sharing and education in organic agriculture.
3.	Ho: "There is no positive relationship between ICT usage and enhancing knowledge sharing and education in organic agriculture," Ha: "There is a positive relationship between ICT usage and enhancing knowledge sharing and education in organic agriculture,"	Pearson's correlation coefficient	Reject the null hypothesis and conclude that there is a positive relationship between ICT usage and enhanced knowledge sharing and education in organic agriculture.
4.	Ho: there is no positive relation between adoption of renewable energy and the sustainability of organic agriculture Ha: there is a positive relation between adoption of renewable energy and the sustainability of organic agriculture	Pearson's correlation coefficient	there is a positive relation between adoption of renewable energy and the sustainability of organic agriculture

In conclusion, the study's findings underscore the importance of embracing innovative technologies to enhance resource efficiency, traceability, and transparency in organic farming. By addressing challenges, fostering knowledge sharing, and implementing supportive policies, the Agra district can lead the way towards a more sustainable and transparent organic agriculture sector.

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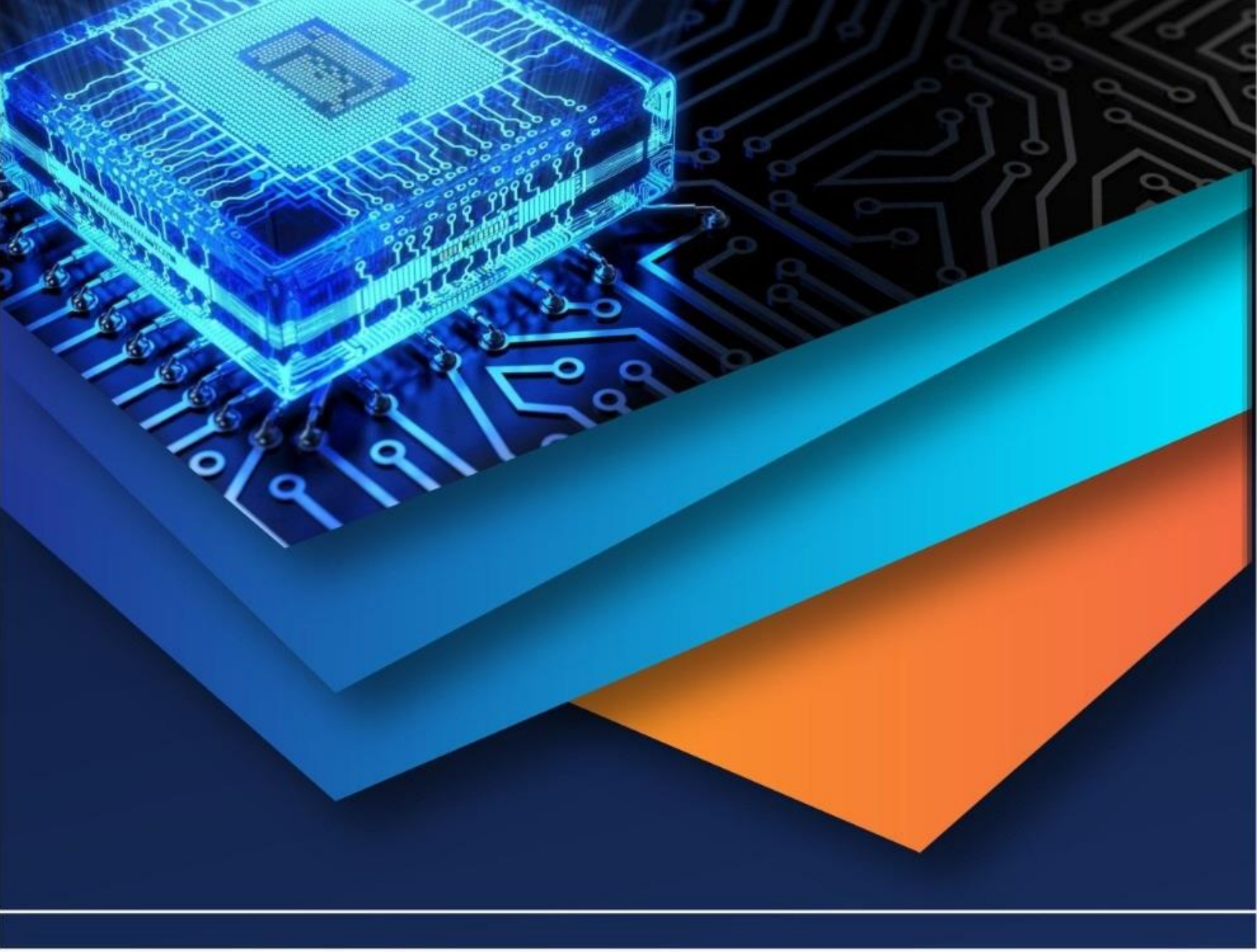

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