

The Influence of Agricultural Marketing on Farmers' Adoption of Sustainable agriculture: An applied study in the Directorate of Agriculture in Najaf

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Abstract

The global shift towards sustainable agriculture is crucial to ensuring food security and preserving the environment. In Iraq, specifically in Najaf Governorate, encouraging farmers to adopt Sustainable agriculture (such as water conservation, organic composting, and integrated pest management) is a key strategic objective. However, adoption rates of these practices are still influenced by a complex set of factors, among which economic viability is paramount. Agricultural marketing which includes market access, pricing, value chains, and information dissemination is assumed to be a key driver of this adoption. This research aims to examine the extent and nature of the influence of agricultural marketing factors on farmers' decision-making in Najaf Governorate regarding the adoption of sustainable agricultural practices. This applied research relied on an inductive quantitative methodology. A structured, closed-ended questionnaire was designed to collect data from a random sample of 150 farmers registered with the Najaf Directorate of Agriculture. The survey measured variables related to marketing challenges (access to markets, price premiums for sustainable products, and reliability of market information) and the degree of adoption of various sustainable practices. The data were analyzed using descriptive statistics, correlation analysis, and multiple regression analysis to determine the relationship between marketing variables and rates of adoption of sustainable practices. To determine the apparent validity and content appropriateness of the questionnaire, the scale was presented to a sample of experts for feedback, and some modifications were made to meet the judges' recommendations. The analysis revealed a strong positive relationship between strong agricultural marketing systems and the adoption of sustainable practices. The main findings indicate the following: Market Access and Price Premiums: Farmers who had access to stable markets or received price premiums for sustainably produced commodities were more likely to invest in Sustainable agriculture.

Information Flows: Reliable access to market information and technical knowledge was a critical factor, reducing the perceived risks of adopting sustainable agriculture.

Key Barriers: The main barriers identified were the lack of organized marketing channels for sustainable products, the absence of price incentives, and high initial transition costs,



exacerbated by marketing uncertainty. The study concluded that agricultural marketing is not merely a passive activity; it is a fundamental factor affecting the economic sustainability of agricultural operations, directly impacting farmers' willingness to adopt Sustainable agriculture. Effective marketing mechanisms can significantly reduce the economic barriers to adoption. The researcher recommends that the Directorate of Agriculture and relevant policymakers develop integrated programs that address both production and marketing. Initiatives should include:

- Establish certification and labeling programs for sustainable products to ensure premium prices.
- Facilitate stronger market linkages between sustainable farmers and retailers/consumers.
- Implement training programs that combine sustainable technologies with market-oriented agricultural education.

Keywords: Sustainable agriculture, agricultural marketing, farmers' adoption of Sustainable agriculture, market access.

Introduction

Agriculture plays a pivotal role in ensuring food security, economic growth, and environmental sustainability, particularly in regions where agriculture remains the primary source of livelihood. In recent decades, the growing global focus on sustainable agricultural practices has drawn significant attention to how farmers can balance productivity with environmental stewardship. However, the successful adoption of Sustainable agriculture often depends on various social, economic, and institutional factors, among which agricultural marketing is a critical factor.

Agricultural marketing facilitates the efficient distribution of agricultural products, enhances farmers' access to markets, and provides essential information on pricing, demand, and quality standards. By connecting farmers

to local, national, and international markets, marketing systems not only improve income stability but also motivate them to adopt modern and environmentally friendly agricultural methods. In the context of Iraq, specifically the Directorate of Agriculture in Najaf, agricultural marketing plays a critical role given the region's agricultural potential and the challenges it faces, including resource constraints, fluctuating market demands, and the need for sustainable resource management. This study seeks to explore the impact of agricultural marketing on farmers' adoption of Sustainable agriculture in the Najaf Agriculture Directorate. By examining the relationship between market access, information dissemination, price incentives, and farmers' decisions to implement sustainable technologies, the research aims to provide insights that support policy development, strengthen market structures,



and enhance the long-term sustainability of agriculture in the region.

, the research problem can be summarized by raising the following question: What is the impact of agricultural marketing on farmers' adoption of sustainable agricultural practices?

This study aims to analyze the impact of agricultural marketing on the adoption of sustainable agricultural practices by farmers registered with the Najaf Agriculture Directorate. Its specific objectives are:

1. Assess the current level of awareness of and adoption of key sustainable agricultural practices among farmers in Najaf Governorate.
2. Evaluate the current agricultural marketing strategies and channels used by farmers, including their access to market information, their ability to secure insurance premiums, and their connection to stable markets.
3. Analyze the relationship between the effectiveness of farmers' marketing capabilities and their likelihood of adopting sustainable agricultural practices.
4. Identify the key constraints (e.g., infrastructure, information, and finance) in the current marketing system that hinder the promotion of sustainable agricultural practices.
5. Provide evidence-based recommendations to the Najaf Agriculture Directorate and policymakers on how to leverage marketing mechanisms to stimulate widespread adoption of sustainable agriculture. The importance of the research

will focus on the valuable and significant results for stakeholders:

1. For farmers: The study can demonstrate how adopting sustainable agricultural practices can be economically beneficial by improving market access and increasing insurance premiums, thereby reducing perceived risks.
2. For the Najaf Directorate of Agriculture: The study will provide important data for designing more effective extension programs, subsidies, and policies that integrate marketing support with promoting sustainability.
3. For policymakers: The study will highlight the need to develop agricultural infrastructure (such as cold chains and processing units) and market institutions (such as organic or "green" product certifications) that reward sustainable production
4. For academic research: The study will contribute to building theoretical and empirical knowledge about the behaviors that lead to the adoption of sustainable agricultural practices, particularly highlighting the unexplored relationship between marketing and sustainability in the Middle East context. The research variables are as follows:
 1. Independent variable: Agricultural marketing (market access, pricing, supply chain integration Value, promotion strategies)
 2. Dependent variable: Adoption of sustainable agricultural practices (such as organic farming, water conservation, and crop rotation). The research hypothesis could be that (effective agricultural



marketing positively affects farmers' adoption of sustainable agricultural practices). As for the research methodology, the researcher relied on a quantitative survey of farmers, which included qualitative interviews with agricultural extension officers and marketing cooperatives, and statistical analysis (such as regression analysis) to identify significant relationships. The study population and sample were limited to farmers operating within the administrative boundaries of Najaf Governorate, and registered with or benefiting from the Directorate of Agriculture. The research will focus on a selected group of sustainable agricultural practices relevant to the agricultural and climatic conditions of the region, such as water-saving irrigation, organic fertilization, and integrated pest management. The study will address marketing variables, including market access, price information, contract farming capabilities, and value-added activities. The study will rely on a questionnaire distributed to (150) farmers.

Materials and Methods

Among the previous studies addressed by a number of researchers within the framework of this research are: Study (1) (The Importance of Agricultural Marketing in Stimulating Plant Production in the Fezzan Region), where the study sought to solve marketing problems, particularly those related to the transportation, storage, and pricing of agricultural goods and their delivery to different regions of Libya. Study (2) (The Role of Agricultural Marketing in Achieving Sustainable Development: The Experience of the Kingdom of Saudi Arabia), which concluded that adopting a responsible

agricultural marketing mix is of great importance in achieving agricultural, economic, social, and environmental sustainability, and thus achieving sustainable development. Study (3) also addressed (The Level of Farmers' Awareness of the Dimensions of Sustainable Agricultural Development in Egypt), where the study found that there is a significant gap in communicating information and educating farmers about sustainable agricultural practices, and that the only channel for spreading awareness and conveying information is the Egyptian Agricultural Channel. Among the recommendations of this study is to adopt multiple methods for communicating agricultural information and raising awareness.

First: The Concept of Agricultural Marketing:

Agricultural marketing encompasses all activities, agencies, and policies involved in moving agricultural products from the site of production to the final consumer. It is a complex and vital process that not only ensures food security but also plays a crucial role in the economic development of countries, especially those with agricultural economies. This multifaceted discipline involves a series of interconnected functions and a variety of intermediaries, all navigating an environment fraught with unique challenges and emerging opportunities (4) Agricultural marketing refers to the process of planning, organizing, directing, and managing the efficient and profitable transportation of agricultural products from farms to consumers. It encompasses all



activities related to the movement of food and fiber from producers to end users (5)

Agricultural marketing encompasses all services and activities that contribute to the movement of agricultural products from farm to consumer. It is an essential component of the entire food supply chain, and its efficiency directly impacts farmers' livelihoods, food security, and the economy as a whole (6)

Agricultural marketing is the process of planning, organizing, directing, and trading agricultural products to satisfy the farmer, producer, and consumer. It includes all activities that contribute to the flow of goods and services from the farm to the final consumer(7)

Why is agricultural marketing important?

Agricultural marketing is important for the following reasons: (8)

1. For farmers

- **Increased income:** Effective marketing helps farmers obtain better prices, avoid exploitation by middlemen, and capture a greater share of consumer income.
- **Reduced risk:** Understanding market demands helps farmers determine the quality and quantity of crops they grow, reducing the risk of overproduction and losses.
- **Access to markets:** Connects isolated farmers to larger, often international, markets.

2. For consumers

- **Availability:** Ensures a steady and reliable supply of a variety of food products year-round.
- **Quality and safety:** Standards and grading in marketing ensure product quality and safety for consumers.
- **Fair prices:** Effective marketing systems reduce costs, which can lead to lower prices for consumers.

3. For the economy

- **Reduces waste:** An efficient system reduces post-harvest losses (which can be enormous in developing countries).
- **Provides employment opportunities:** The entire marketing chain (transportation, logistics, processing, and retail) provides significant employment opportunities.
- **Generates foreign exchange:** Exporting agricultural products is a major source of income for many countries.
- **Agricultural development:** Marketing profits can be reinvested in agriculture to improve sustainable technologies and practices.

1. **Product:** The actual agricultural commodity (e.g., wheat, rice, milk). Decisions include quality, grading, standardization, packaging, and branding (e.g., organic, fair trade, local).

2. **Price:** Setting the right price. This is influenced by production costs, quality, demand, seasonality, and government policies (e.g., subsidies, minimum support prices).



3. Place (distribution): How the product gets from the farm to the consumer. This includes channels such as:

- Traditional: village markets, popular markets, wholesalers, and retailers.
- Modern: supermarkets, hypermarkets, and export chains.
- Direct: farmers' markets, community-supported agriculture, and farmer's stalls.
- Digital: e-commerce platforms and online delivery services.

4. Promotion: Communicating the value of the product to the consumer. This includes advertising, personal selling, sales promotion, and public relations.

Second: The Concept of Sustainability:

Farmers' adoption of sustainable agricultural practices is critical to addressing global challenges such as climate change, biodiversity loss, and food insecurity. However, despite the known benefits, the adoption rate of these practices remains low in many parts of the world. A range of factors, including economic, social, and technological considerations, influence farmers' decisions to transition to more sustainable methods (9). The term "farmer adoption of Sustainable agriculture" typically refers to the extent to which farmers incorporate environmentally friendly, resource-saving, and socially responsible methods into their agricultural operations. This concept is widely studied in agricultural economics, environmental science, and rural development: (10). Sustainable agricultural practices are a broad range of farming methods that aim to meet society's food

and fiber needs today without compromising the ability of future generations to do so. These practices are designed to conserve resources, be environmentally friendly, economically viable, and socially just (11)

Strategies to Encourage the Adoption of Sustainable Agriculture:

To accelerate the transition to sustainable agriculture, a multifaceted approach is necessary: (12)

1. Financial incentives: Providing payments, subsidies, or tax incentives to compensate farmers for the costs and risks of adopting new practices.
2. Education and Training: Promoting a "learning-by-doing" approach through farmer field schools and participatory research, where farmers themselves participate in testing and adapting new methods.
3. Market and Supply Chain Support: Establishing and legitimizing local markets for sustainably produced goods, and providing infrastructure support such as collective transportation and storage.
4. Policy and Institutional Support: Enacting legislation that recognizes and promotes sustainable agriculture, and creating an enabling environment that addresses barriers such as poverty and lack of infrastructure.
5. Information and Technology: Leveraging digital tools and technologies, such as precision agriculture and weather forecasting, to provide real-time data that helps farmers make informed decisions.



Benefits of Sustainable Agriculture:

Sustainable agricultural practices offer numerous benefits, including: (13)

Environmental Protection: By reducing chemical inputs and promoting biodiversity, Sustainable agriculture help protect ecosystems and improve soil and water quality.

Economic viability: Sustainable agriculture can achieve long-term profitability by reducing input costs and improving crop resilience.

Social equity: These practices can improve the quality of life for farmers and rural communities by promoting fair labor practices and ensuring food security.

Some key sustainable agricultural practices include: (14)

1. **Crop Rotation:** This involves alternating the types of crops grown in a specific field over time. This rotation helps control pests and diseases, improve soil fertility, and reduce the buildup of pathogens. Through crop rotation, farmers can maintain nutrient levels and promote biodiversity in their ecosystems.

2. **Cover Crops:** These crops are grown during fallow periods to protect soil health and control erosion. Cover crops improve soil moisture retention, reduce nutrient loss, and control weeds, reducing the need for synthetic fertilizers and herbicides.

3. **Agroforestry:** This practice integrates trees and shrubs into agricultural landscapes, enhancing biodiversity, improving soil health, storing carbon, and contributing to climate change mitigation.

Agroforestry systems can provide multiple benefits, including improved crop yields and wildlife habitats. 4. **Precision Agriculture:** Using techniques such as variable rate tillage and soil moisture monitoring, precision agriculture enables farmers to optimize resource use. This method reduces waste and environmental impact by applying water, fertilizers, and pesticides only when needed, resulting in increased efficiency and crop yields.

5. **Conservation Tillage:** This practice minimizes soil disturbance and helps maintain soil structure and health. By reducing tillage, farmers can improve soil organic matter, reduce erosion, and improve water retention.

6. **Integrated Pest Management:** Integrated pest management focuses on using natural pest control methods rather than relying solely on chemical pesticides. This approach encourages the use of beneficial insects and other natural predators to manage pest populations, reducing chemical inputs and promoting ecosystem health.

7. **Organic Agriculture:** This method avoids synthetic fertilizers and pesticides, relying instead on natural processes and materials. Organic farming practices promote soil health and biodiversity while producing food free of harmful chemicals.

Results and Discussions

Using the (Smart PLS) statistical analysis program (and before that, the apparent reliability and validity of the research sample scale were determined, and the apparent validity and suitability of the questionnaire content were determined.



The scale was presented to a sample of experts for the purpose of expressing their comments and opinions on it, and some modifications were made that agreed with the opinions of the arbitrators.

The main effect hypothesis states that there is a statistically significant positive effect relationship between the agricultural marketing variable and the sustainable agriculture variable. To test this hypothesis, a structural model was constructed, as shown in Figure (1), which reflects the hypothesized relationships between the two variables within the PLS-SEM framework. The results of testing this hypothesis are presented in Table (1), which shows the path coefficients and t-values derived from the bootstrapping process to determine the significance of the relationship. This analysis is used to determine the strength of the relationship between agricultural marketing and the effectiveness of sustainable agriculture, in addition to assessing the significance of the direct effect of artificial intelligence on the effectiveness of sustainable agriculture according to accepted statistical standards (15)

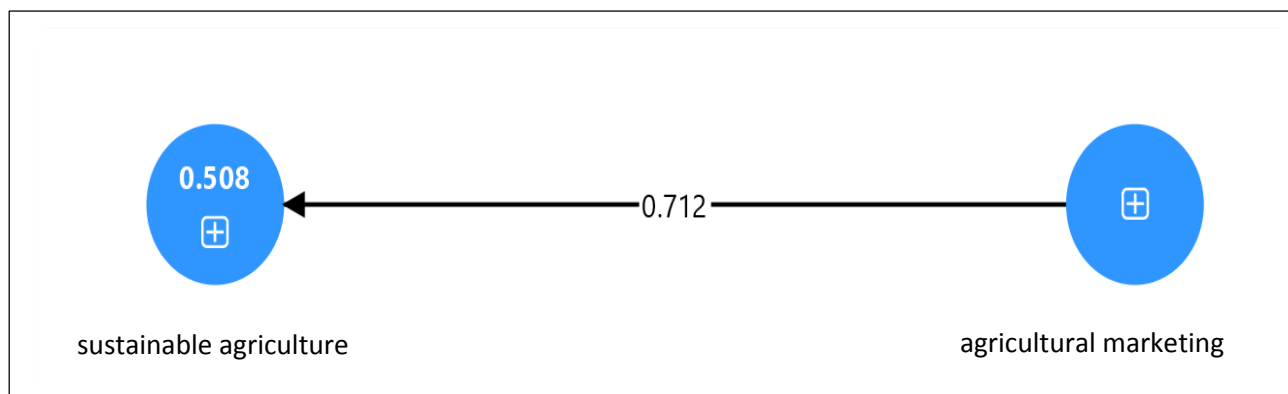


Figure 1. The structural model for testing the main effect hypothesis.

Explanatory note about the structural model:

The numbers on the arrows represent the values of the path coefficients, which reflect the strength and direction of the direct influence between the variables in the model.

Which reflects the extent to which the independent variables can explain the

The numbers inside the circles represent the coefficient of determination (R^2) values for each dependent variable, which reflect how well the independent variables explain the variance in the dependent variable.

The symbol [+] indicates that dependent variables are hidden when not needed in evaluating the structural model. This simplifies the model and clearly demonstrates the main

Table 1. Results of evaluating the structural model for the main effect hypothesis

coefficient of determination R^2	Effect size f^2	The result	p Value	T Value	Path coefficient	VIF	The path	hypothesis	Quality of conformity SRMR
0.508	0.782	acceptance	0	10.702	0.712	1	AM→SA	H1	0.06

Source: SmartPLS output

Table (1) displays the results of the structural model evaluation for the main effect hypothesis, which states that there is a statistically significant positive effect of artificial intelligence on sustainable agriculture. The results showed conformity quality standard SRMR goodness-of-fit criterion was 0.06, which is less than the maximum acceptable value (0.08), indicating that the model has a good fit with the actual data according to PLS-SEM standards. The path coefficient between agricultural marketing and the effectiveness of sustainable agriculture was 0.712, which met the required criteria for both the t-value and the significance level (p), indicating the significant direct effect of agricultural marketing on the effectiveness of sustainable agriculture. Accordingly, the effect hypotheses can be accepted. The coefficient of determination (R^2) for the dependent variable was 0.508, indicating that the independent variable (agricultural marketing) explains approximately 50% of the variance in the effectiveness of sustainable agriculture, while the remaining percentage indicates the presence of other factors that were not studied within the scope of this study.

Third: Testing the sub-hypotheses of the main effect hypothesis. The researcher built the structural model shown in Figure (2) for the purpose of testing the hypotheses subordinate to the main influence hypothesis (H1-1, H1-2, H1-3, H1-4), Its results are shown in Table (2).

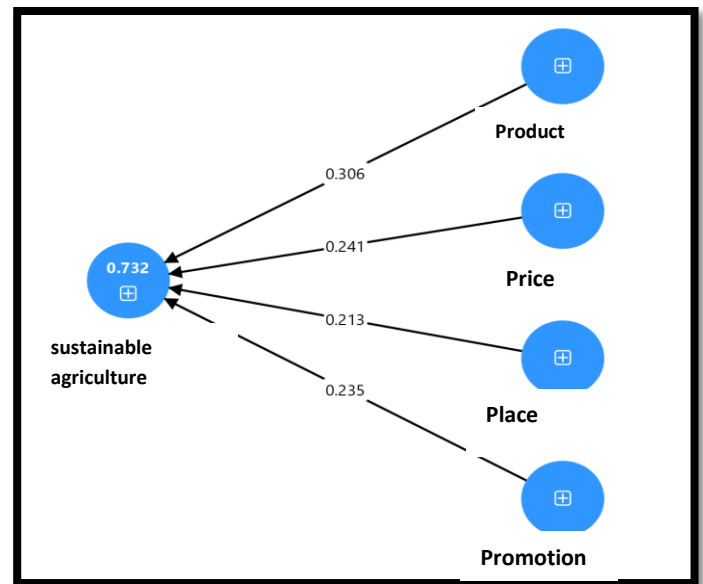


Figure 2. The structural model for testing

the first sub-hypotheses

Explanatory note about the structural model:

The numbers on the arrows represent the values of the path coefficients, which reflect the strength and direction of the direct influence between the variables in the model.

The numbers inside the circles represent the values of the coefficient of determination (R^2) for each dependent variable, which reflects the extent to which the independent variables explain the variance in the dependent variable.

The symbol [+] indicates that clauses following a variable are hidden when they are not needed in evaluating the structural model, in order to simplify the model and clearly show the main relationships between variables.

Table 2. Results of evaluating the structural model for the sub-hypotheses of the main influence hypothesis

Coefficient of determination R^2	Effect size f^2	The result	p-Value	t Value	Path coefficient	VIF	The path	hypothesis	Quality of conformity SRMR
0.732	0.337	accept	0.000	6.103	0.306	1.180	PRU→ SA	H1-1	0.06
	0.506	accept	0.011	4.886	0.241	1.271	PRI→ SA	H1-2	
	0.326	accept	0.000	3.956	0.213	1.257	PLC→ SA	H1-3	
	0.312	accept	0.000	4.010	0.235	1.423	PRO → SA	H1-4	

Source: SmartPLS program outputs:

Table (2) displays the results of evaluating the structural model for the sub-hypotheses of the main effect hypothesis, which relates to the effect of the dimensions of the agricultural marketing variable on the sustainable agriculture effectiveness variable. The results showed that the SRMR goodness-of-fit criterion reached 0.06, which is less than the maximum acceptable value (0.08), indicating that the model has a good fit with the actual data according to PLS-SEM standards. The path coefficients for the four sub-hypotheses all met the required criteria for t values and the significance level (p), indicating the significant direct effect of each dimension of agricultural marketing on the effectiveness of sustainable agriculture. Accordingly, the sub-hypotheses arising from the main effect hypothesis can be accepted. The coefficient of determination (R^2) for the dependent variable reached 0.732, reflecting that the dimensions of the agricultural marketing variable explain approximately 73% of the variance in the effectiveness of sustainable agriculture,

while the remaining percentage represents other factors that were not studied within the scope of this study.

Through the results of the above analysis of the hypothesis in question, it can be said that the hypothesis has been achieved through the results of the relationship of influence and correlation of agricultural marketing and farmers' adoption of sustainable agriculture methods, as detailed in the conclusions and recommendations below:

Conclusion

Firstly: Based on the data analysis and results of this applied study conducted in Najaf Governorate, the following main conclusions were drawn:

1. There is a strong, statistically significant, positive relationship between the effectiveness of agricultural marketing channels and farmers' adoption of sustainable agricultural practices in Najaf. Farmers who see a clear and reliable market for sustainably produced goods are more likely to invest in and implement sustainable agricultural practices.
2. Ensuring market access is the most important marketing factor influencing adoption. Uncertainty about selling crops at a profitable price is a greater barrier to adoption than the initial cost of sustainable inputs. Farmers are reluctant to transition to sustainable methods without assurances of an attractive market for their products.
3. The possibility of a price premium for sustainably certified or high-quality products is a strong incentive. However, this premium must be large enough to

offset real or perceived risks, such as potential initial yield declines during the transition to organic or resource-conserving agriculture. 4. There is a significant knowledge gap among farmers regarding the technical aspects of structural adjustment programs and market strategies for selling their "sustainable" products. Farmers are unsure how to communicate the value of their practices to consumers and access niche markets that pay premiums.

5. The current agricultural marketing infrastructure in Najaf (such as cold storage, efficient transportation, and organized collection points) is inadequate to meet the specific needs for high-quality, perishable, sustainable products. This leads to post-harvest losses and undermines farmers' confidence.

6. While marketing is a dominant factor, a farmer's decision to adopt this method is also influenced by their age, educational level, farm size, and access to formal credit. Younger, more educated farmers with smaller, more diversified operations were more responsive to market signals for sustainability.

Secondly: To address identified challenges and capitalize on opportunities, the following recommendations are proposed for multiple stakeholders:

1. For the Najaf Agriculture Directorate and Policymakers
 - Establish a "Sustainable Produce Purchase Guarantee Program": Launch a pilot program in which the Directorate, in partnership with the government, commits to purchasing a predetermined quantity of



certified sustainable produce (such as organic dates and greenhouse vegetables) at a fixed premium price. This would mitigate the risks of the transition process for pioneer farmers.

- **Develop and implement a local sustainability certification/label:** Create a well-known and trusted label (such as "Najaf Green" or "Najaf Sustainable") with clear criteria. This label would help consumers identify and select local sustainable produce, allowing farmers to differentiate their products in the market.

- **Invest in marketing infrastructure:** Prioritize public investment in cold storage facilities, packing houses, and refrigerated transport specifically for handling high-value and sustainable produce, to reduce losses and maintain quality.

- **Integrate marketing into extension services:** Update agricultural extension programs to include modules on marketing and business management. Extension workers should be trained to advise farmers not only on sustainable farming practices, but also on how to sell their produce profitably.

2. For Farmers and Cooperatives

- **Form sustainable agricultural cooperatives:** Encourage farmers to organize into cooperatives to achieve economies of scale. Cooperatives can collectively invest in certifications, negotiate better prices with buyers, pool produce to meet large orders, and develop a common brand.

- **Engage in direct marketing:** Explore and develop direct-to-consumer marketing channels, such as farmers' markets in Najaf

or subscription box programs (community-supported agriculture). This allows farmers to receive the full retail price and build personal relationships with consumers.

- **Proactive communication:** Farmers should learn to document and communicate their Sustainable agriculture (e.g., through social media and farm visits) to build a narrative around their brand and justify price increases based on value, not just cost.

3. For Researchers and Academics

- **Conduct a digital market feasibility study:** Explore the possibility of developing a digital platform or mobile application that directly connects farmers in Najaf practicing SAPs with retailers, restaurants, and consumers across Iraq.

- **Market feasibility study:** Conduct follow-up studies to understand consumer awareness, willingness to pay, and purchasing motivations in Najaf and other major Iraqi cities regarding sustainably produced local food. This market information is critical for designing effective marketing strategies.

4. For the Private Sector and Investors

- **Invest in sustainable agricultural projects:** Encourage private investment in companies that manufacture, package, and market sustainable agricultural products from Najaf, adding value and expanding their reach.

- **Launch consumer awareness campaigns:** Retailers and supermarkets can play a key role by organizing in-store promotions, tasting sessions, and media presentations that highlight the benefits of sustainable



local produce, stimulating consumer demand.

Conflict of Interest

The authors have no conflict of interest.

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