

# An Overview of Agricultural Supply Chain and Customization

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## ABSTRACT

The promotion of national policies and the progress of information technology have made customized agriculture possible. Compared with contract farming, customized agriculture can not only guarantee the income problem of farmers, but also better guarantee the quality of agricultural products and close to the market demand. This paper systematically reviews the current research status of agricultural supply chain and customization, summarises the shortcomings of the existing research, and points out the direction for the subsequent research.

## KEYWORDS

Customized Agriculture, Agricultural Supply Chain, Customization

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## 1. INTRODUCTION

At present, global agriculture has stepped into the period of scale, quality and information development, and the structural reform of the agricultural supply side is imperative, providing a historical opportunity for the directional adjustment of agricultural research. Chinese Academy of Agricultural Sciences to give full play to the advantages of rich resources of special crops and unique natural geographical conditions, market demand, targeted agricultural research services, and actively explore the development of customized agriculture, which is conducive to promoting the transformation of scientific and technological achievements, but also conducive to strengthening the protection of intellectual property rights, and has become a new model for the sustainable development of agricultural research.

Customized agriculture refers to the individual requirements of consumers, the organization of agricultural products to carry out order-based production, the harvest of regional characteristics of the original ecological agricultural and sideline products, to carry out agricultural services throughout the personalized production and customized management mode. It is a product of the Internet era, and is a development mode oriented to the quality and safety of agricultural products. The content of customization includes the shape, quality, packaging and flavour of the agricultural products, as well as the time requirements of the finished products and logistics services. This paper reviews the research results on agricultural supply chain and customization in recent years, summarises the shortcomings of existing research, and proposes directions for further research in the future.

## 2. RESEARCH STATUS

### 2.1. Research on agricultural supply chain

Considering the importance of agricultural supply chains, many scholars have studied pricing decisions in agricultural supply chains. Kazaz and Webster analysed the impact of transaction costs on the decisions of members of an agricultural supply chain when there is uncertainty about the yield

of agricultural products. The study found that risk-averse agribusinesses lease more land for agricultural production. Yang et al. examined how organic agricultural products play a role in the supply chain and considered the possibility of manufacturers offering goods directly to consumers and the possibility of adopting independent retailers. Yu et al. examined the organic certification and wholesale pricing strategies of competing suppliers under the agricultural supply chain. It was found that if competing suppliers tended to be asymmetric in their certification strategies, buyers tended to choose products with organic labels. Perlman et al. examined the market pricing strategies of competing firms offering vertically differentiated agricultural products. One firm offered organic produce while the competing firm offered conventionally grown produce. The study found that retailers would set the same price range for organic and conventional products if the products depreciated to the same degree. Tarun et al. considered farmers' pricing decisions for an input agricultural product under revenue sharing and wholesale price contracts, with pricing scenarios that included regulated, deregulated, constructed four models of firms with full monopoly, duopoly, and comparatively analysed the degree of market competition, government allocation of weighting, and contract choice on the profitability of each party.

Contract farming has grown rapidly to guarantee farmers' profits and supply various distributors, processors, and supermarkets. Enterprises can form two-way supply chain partnerships with farmers through contract farming, and form long-term stable and mutually beneficial cooperative relationships with farmers. A number of scholars have conducted studies on contract farming. Huh et al. considered contract farming, in which firms have access to multiple local farmers and can also source crops from external markets. The study found that giving farmers the possibility of default may increase the manufacturer's expected returns. Niu et al. used a Nash negotiation model to explore the role of agricultural intermediaries in agricultural supply chains consisting of farmers and agribusinesses, where agricultural intermediaries collaborate with farmers by signing revenue-sharing contracts. The study found that the co-operative model allows for co-ordination in the agricultural supply chain. Mishra et al. assessed the impact of smallholder farmers' perceived production risk on the adoption of contract farming using on-farm data and endogenous switching regressions. In addition, Mishra et al. found that contract farming producers exhibit higher efficiency and lower production risk. Hu et al. investigated the options for farmers to participate in contract farming, where farmers make decisions based on the contract and previous market prices. When there is no strategy to reduce market price volatility, pre-season procurement contracts will benefit both the firm and the farmer. Zhang et al. applied performance pay and deferred payment to contract farming to quantify when and how contract farming improves smallholder productivity and incomes, and found that buyers pay higher prices to ensure farmers' long-term viability when they have a long-term perspective and are able to internalise the benefits of farmers' improvements.

## **2.2. Research on customization**

Research on customization mainly revolves around mass customization supply chains, and product diversity and price competition have been widely studied in the MC supply chain literature. Li et al. consider the competition between manufacturers offering online customization channels and traditional retailers, and construct four models of decentralised, centralised decision-making single channels versus decentralised, centralised decision-making dual channels, and comparatively analyse consumer acceptance of online channels, consumer adaptation costs on manufacturers' customization levels, product prices, sales volumes, and profits for all parties. Cil and Pangburn focus on MC research in improving product-consumer preference alignment and exploring product-specific and brand-level components of consumer utility functions. It is shown that differentiating retail prices by offering low prices to consumers with extreme preferences and high prices to consumers with more dominant preferences is optimal for MCs. Jost and Süsser constructed a game model that analyses the manufacturer's decision on the degree of mass customization, the product's price, and the consumer's decision on the level of individual effort, consumer sensitivity to product differences on product price,

demand, consumer surplus, and welfare. Choi et al. assessed the impact of risk aversion on supply chains selling customized products and found that in a competitive market environment, consumers can enjoy MC services, but supply chain performance may be degraded with respect to the level of risk aversion. Francisco considered products characterised by two dimensions: a horizontal dimension reflecting product variety and a vertical dimension reflecting the degree of product customization, constructed a Salop circular model with duopoly, collusion, deviated profits, and discount coefficients, and analysed the impact of the degree of product customization on product prices, profits, consumer surplus, and social welfare. Yazdani et al. assessed the impact of customer fit on mass customization, and observed that when the degree of consumer fit is relatively high, customizers can earn higher profits, while traditional firms can earn more profits when consumer fit is medium. Su constructed centralised decision-making, decentralised decision-making, including Nash equilibrium, C2B e-commerce firm dominance, traditional firm dominance, based on the supply chain consisting of one supplier and two manufacturers with horizontal price competition, including C2B e-commerce firms, traditional firms, and constructed four models, and comparatively analysed the impact of cross-price impact coefficients on the level of customization effort, standard versus customized product prices, demand, and profitability of each party. Alptekinoglu and Orsdemir developed a model to assess the sustainability of the fashion industry with MCs. Firms maximise their profits by deciding on the optimal product range, price and inventory levels. The study suggests that MC can achieve win-win outcomes in terms of profitability and sustainability, but may increase overproduction and harm the environment.

Several scholars have considered integration in MC supply chains. Firstly, customizers can integrate with retailers. Wang and Lesmono assessed the value of enhanced product customization in vertically differentiated markets and developed an integration model that integrates production and marketing decisions. The study found that the level of customization can be increased if consumers are able to participate in the supply chain. Zhang and Zheng examined the impact of the integration of customized and standard products on both online and offline retailers and observed that the profitability of online retailers would increase with the cost of customization if additional standard product lines were introduced. The findings suggest that through channel integration, omni-channel retailers should offer customized products online and standard products offline. Secondly, customizers can integrate with manufacturers. Shao evaluates an integrated firm that balances product lines between customized and standard products and shows that a high level of MC system does not necessarily increase firms' profits.

Other scholars have conducted research around product co-creation and consumer customization. Syam and Pazgal modelled the interaction between monopolies and consumers and explored firms' pricing strategies. It is found that pricing structure affects customers' incentives to participate in product co-creation, and that a single price may be more beneficial to the firm than adopting a price discrimination strategy. Basu and Bhaskaran investigate the impact of co-design on the firm's optimal strategy for product line and product quality by modelling firms' and consumers' co-design efforts applied to the co-design process. The study shows that consumers participate in the co-design process only if both standard and customised products are available to them. Broeke and Pappariadis devised an analytical model to investigate when firms and consumers should engage in co-creation and when they should avoid it. The study found that co-creation is not always beneficial to both parties, that under certain conditions it can lead to negative effects, and obtained boundary conditions that determine whether firms and consumers should engage in co-creation.

### **3. CONCLUSION AND RESEARCH PROSPECT**

From the perspective of previous research, in-depth studies have been conducted on agricultural supply chain and customization, but there are still many aspects that have not been studied: 1) The research on agricultural supply chain is mainly based on the game between farmers and enterprises,

taking into account the impact of uncertainties such as weather, disasters, pests, etc., as well as coordinating and optimising the agricultural supply chain through the mechanisms of cost sharing and revenue sharing, and also conducting research on contract farming. However, the above studies do not include platforms in the research object, platforms as a link between farmers and consumers, in order to solve the problems of poor supervision of agricultural products customization and consumers' concern about the quality of customized agricultural products, platforms will provide cold chain logistics services and supervise farmers. Therefore it is necessary to consider the platform intervention in the context of customized agriculture. 2) Research on customization mainly focuses on mass customization, considering the impact of product diversity, price competition, customization lead time, MC waiting time, self-designed fun, consumer returns and other factors on the MC supply chain, as well as research on MC supply chain integration, product co-creation and consumer customization. However, the above studies have not explored the customization efforts put in by farmers in the context of customized agriculture, and farmers have to put in certain customization efforts in order to bring the customized agricultural products closer to the fully satisfied and ideal agricultural products in the minds of the consumers and to improve quality, nutritional value, appearance and other integrative factors. Therefore, future research is necessary to consider the supply chain in the context of customized agriculture where the platform provides cold chain logistics services and supervision, and the farmers make customized efforts.

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