

Research on the Supply Chain Development of "Farm-to-Super Docking" for Fresh Agricultural Products in Chengdu City

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Abstract: This study adopts a structural modelling approach, aiming at exploring the development status and influencing factors of the "farm-to-supermarket" model in the supply chain of fresh agricultural products in Chengdu city, as well as its impact on supply chain efficiency and market competitiveness. Firstly, through the literature review of the supply chain of agricultural products in Chengdu, we learnt about the problems of the traditional model and the background of the emergence of the "agricultural super-docking" model. Secondly, the theoretical framework of the impact of the "agricultural super-docking" model on the supply chain of fresh agricultural products in Chengdu is constructed by using structural modelling methodology, and then the relevant data of the "agricultural super-docking" model in Chengdu are collected through field research and empirically investigated by using Structural Equation Modelling (SEM). SEM) was used to analyse the data empirically.

1. Introduction

As an economic centre and an important agricultural product production base in western China, Chengdu city has rich natural resources and agricultural industries. However, the traditional supply chain of agricultural products is plagued with problems such as information asymmetry, many circulation links and high wastage, which limit the circulation efficiency and market competitiveness of agricultural products. With the acceleration of urbanisation and the continuous advancement of consumption upgrading, the market's demand for agricultural products' quality, safety and freshness is increasing, and the traditional circulation model has been difficult to meet the market's demand^[1]

The purpose of this study is to explore the development status, influencing factors, and impact on supply chain efficiency and market competitiveness of the "farm-to-supermarket" model in the fresh produce supply chain of Chengdu City through the structural modelling approach. By establishing a structural model framework and analysing the relationship between the various elements in the model, we aim to comprehensively understand the impact of the "agricultural super-docking" model on the fresh produce supply chain in Chengdu. ^[2]In addition, this study aims to provide theoretical support and practical guidance for the optimisation of the circulation system of agricultural products in Chengdu, to promote the synergistic development of urban and rural economies, and to promote the sustainable development of the local economy^[3]. As show in table 1.

2. Empirical analysis of the development of the "agricultural super-docking" supply chain for fresh agricultural products in Chengdu City

2.1 Distribution of Sample Characteristics

Table 1 Description of the distribution of sample characteristics

variant	options (as in computer software settings)	frequency	per cent
distinguishing between the sexes	male	27	42.9 %
	women	36	57.1%
(a person's) age	Under 30	41	65.1%
	31-40 years	16	25.4 %
	41-50 years	5	7.9%
	51-60 years	1	1.6 %
academic qualifications	junior high school	4	6.3 %
	University and above	45	71.4%
Number of years of professional experience	congrats! (on passing an exam)	6	9.5%
	branch (of medicine)	8	12.7%
	10-15 years	2	3.2 %
	5-10 years	9	14.3 %
careers	Less than 5 years	52	82.5%
	hypermarket	11	17.5 %
	supply and marketing cooperative	3	4.8 %
	family farmer	4	6.3 %
	Members of professional farmers' cooperatives	2	3.2 %

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the rest	29	46.0 %
fresh food supermarket	5	7.9%
cottage industry	2	3.2 %
hypermarket	7	11.1%

2.2 Reliability analysis

In this study, assessing the quality of scale results is crucial to ensure meaningful subsequent analyses, as the main factors were measured using scales^[4]. Internal consistency of each dimension was initially examined using Cronbach's coefficient reliability test. This coefficient ranges from 0 to 1, with higher values indicating greater reliability. Generally, coefficients below 0.6 are deemed unreliable, necessitating questionnaire redesign or data recollection and reanalysis. Coefficients between 0.6 and 0.7 are considered credible, 0.7 to 0.8 relatively credible, 0.8 to 0.9 very credible, and 0.9 to 1 extremely credible. As show in table 2.

Table 2 Reliability analysis of factors influencing the development of the supply chain of "agricultural super-docking" of fresh agricultural products in Chengdu

variant	Cronbach factor	item count (of a consignment etc)
Infrastructure factors	0.835	3
Fresh produce supply factors	0.891	5
Logistics facilities, equipment and technical factors	0.831	4
Government enabling factors	0.926	4
Co-operative attitude factor	0.899	3
Development of the "agriculture-supermarket linkage" supply chain	0.87	3
Chengdu Fresh Produce	0.967	22

3. Validated factor analysis of the factors influencing the development of the supply chain of fresh agricultural products in Chengdu "farm-to-super-dock"

3.1 The fitness test of the model of factors influencing the development of the supply chain of "agricultural super-docking" of fresh agricultural products in Chengdu

According to the test results of model fitness in Table 3, CMIN/DF (chi-square degrees of freedom ratio) = 2.450, in the range of 1-3, RMSEA (root mean square of error) = 0.048, in the excellent range of <0.05, and the test results of IFI, TLI, and CFI are all above 0.8, which is a good level. Therefore, the results of this analysis can show that the model of influencing factors on the development of the supply chain of fresh agricultural products in Chengdu city has a good degree of adaptability.

Table 3. Model Fit Tests

norm	reference standard	Actual results
CMIN/DF	1-3 is excellent, 3-5 is good	2.450
RMSEA	<0.05 is excellent, <0.08 is good	0.048
IFI	>0.9 is excellent, >0.8 is good	0.890
TLI	>0.9 is excellent, >0.8 is good	0.843
CFI	>0.9 is excellent, >0.8 is good	0.884

3.2 The fitness test of the model of influencing factors on the development of the supply chain of "farm-to-super-docking" in Chengdu fresh agricultural products

Once the CFA model is confirmed to have a good fit, the scale's convergent validity (AVE) and composite reliability (CR) for each dimension will be assessed further. This involves computing standardized factor loadings for each measurement item within the established CFA model^[5]. Subsequently, AVE and CR for each dimension will be determined according to predefined formulas. Meeting the criteria of a minimum AVE value of 0.5 and a minimum CR value of 0.7 indicates satisfactory convergent validity and composite reliability.

Calculation formula:

$$AVE = \sum (\lambda_i^2) / \sum (\sigma_i^2) \quad (1)$$

Average Extracted Variance (AVE) is the explanatory power of the variance of the measured variable of the latent variable, if the AVE is higher, it means that the concept has higher reliability and convergent validity. Ideally, the standardised value should be greater than 0.5 Fornell and Larcker (1981), with 0.36 to 0.5 being the acceptable threshold^[6].

$$CR = (n / (n - 1)) * (1 - (\sum SD / \sum X)^2) \quad (2)$$

Where Cr denotes the reliability coefficient, n denotes the total number of questions in the measurement instrument or questionnaire, SD denotes the standard deviation, X denotes the mean, and Σ denotes the sum^[7].

The validity test results for the health literacy scale demonstrate AVE values exceeding 0.5 and CR values surpassing 0.7 for each dimension. This comprehensive outcome suggests strong convergent validity and combined reliability across all dimensions^[8].

According to the results of the analysis in Table 4, the standardised correlation coefficients between the dimensions in this test of discriminant validity are less than the square root of the corresponding AVE values of the dimensions, thus indicating that there is good discriminant validity between the dimensions^[9].

Table 4 Results of differentiated validity tests for each dimension of the scale

variable	infrastructure considerations	Fresh produce Supply factors	Logistics facilities, equipment and technical factors	Government enabling factors	Co-operative attitude factor	"Farm-to-Super Docking" Supply Chain Rutting moreover
Infrastructure factors	0.654					
Fresh produce supply factors	0.788	0.636				

Logistics facilities, equipment and technical factors	0.833	0.969	0.555			
Government enabling factors	0.643	0.844	0.862	0.763		
Co-operative attitude factor	0.691	0.897	0.941	0.815	0.757	
Development of the "agriculture - supermarket linkage" supply chain	0.643	0.890	0.873	0.810	0.997	0.689
Square root of AVE value	0.809	0.797	0.745	0.873	0.870	0.830

4. Countermeasures for the development of the supply chain of "agricultural and supermarket docking" for fresh agricultural products in Chengdu City

4.1. Improvement of rural cold storage facilities

The degree of sophistication of rural cold storage facilities is closely related to the quality of fresh produce^[10]. The Government should increase subsidies for the construction of cold storage facilities in rural areas, increase their capacity, and reasonably plan their construction so that they are equipped with warehousing, processing and distribution functions to facilitate the storage and sale of agricultural products^[11]. Farmers' professional cooperatives should increase investment in cold storage construction and introduce automatic control technology to ensure the quality of cold chain logistics storage^[12]. During the construction process, they should pay attention to environmental protection, adopt green building materials and energy-saving design, and regularly maintain the equipment to ensure the long-term stable operation of the facilities^[13].

4.2 Enhanced use of cold chain logistics facilities and equipment by supermarkets

Strengthening the use of cold-chain logistics facilities and equipment by supermarkets to enhance the efficiency of the "farm-to-supermarket" logistics of fresh agricultural products and ensure product quality. The government can subsidise supermarkets to build cold storage and other facilities to improve the efficiency of the logistics process. Supermarkets can make use of third-party logistics resources to ensure professionalism and guarantee the quality of product transport^[14]. At the same time, supermarkets need to strengthen their own strength, raise awareness of the use of cold-chain logistics facilities and equipment, and actively promote the "agriculture-supermarket docking" to expand its scale^[15].

4.3 Improvement of cold chain logistics technologies

Improving the level of cold chain logistics technology can help to enhance the efficiency of fresh agricultural products in the logistics link of "agricultural-supermarket docking", which mainly includes the following points: the government should enhance the understanding of farmers' professional cooperatives on the pre-cooling treatment of fresh agricultural products and adopt various pre-cooling treatment methods^[16]; the cooperatives need to introduce the vacuum pre-cooling technology and train the relevant personnel to improve the technical level; the third party logistics enterprises should actively adopt cold chain logistics technology, such as vacuum pre-cooling technology, temperature control, automatic sorting, block chain traceability, etc., to reduce losses and ensure product quality. Third-party logistics enterprises should actively adopt cold chain logistics technologies, such as vacuum pre-cooling technology, temperature control, automatic sorting, block chain traceability, etc., in order to reduce losses and ensure product quality^[17].

5. Conclusions

This paper analyses the influencing factors on the development of the "agricultural super-docking" supply chain of fresh agricultural products in Chengdu City on the basis of systematically combing the relevant literature at home and abroad, and further, adopts the questionnaire survey data, establishes a structural equation model to quantitatively analyse the role of these influencing factors on the development of "agricultural super-docking" supply chain of fresh agricultural products in Chengdu City, and finally puts forward countermeasure suggestions. Further, questionnaire data are used to establish a structural equation model to quantitatively analyse the role of these influencing factors on the development of the "farm-to-supermarket" supply chain for fresh agricultural products in Chengdu, and finally put forward countermeasure suggestions^[18].

The main findings of this paper are as follows:

- (1) This paper summarises the influencing factors on the development of the supply chain of "agricultural super-docking" for fresh agricultural products in Chengdu into five aspects, namely, infrastructure, supply of fresh agricultural products, logistics facilities and equipment, technology, government support, and attitude to co-operation.
- (2) Quantitatively analysing the influence of each factor on the development of the supply chain of fresh agricultural products in Chengdu by constructing a structural equation model and using questionnaire data.
- (3) In order to promote the development of the supply chain of fresh agricultural products in Chengdu, countermeasures are proposed to strengthen the supply of fresh agricultural products, improve logistics facilities and equipment and technology, maintain a positive attitude of co-operation between farmers and supermarkets, improve infrastructure construction, and strengthen government support.

6. Deficiencies

There is less literature on the development of the supply chain of fresh agricultural products in Chengdu city, and the questionnaire data in this study is small, the measurement is not comprehensive enough to form a final conclusion, which needs to be supplemented in this regard, and the existing references are too much qualitative research, and there is no ready-made scale for reference, and at the same time, the problems facing the development of the supply chain of fresh agricultural products in Chengdu city are relatively complex^[19]. At the same time, the problems faced by the development of the "agricultural super docking" supply chain of fresh agricultural products in Chengdu City are relatively complex, coupled with my limited academic research capacity, the scale designed in this paper is difficult to include all the relevant content, and future research can be based on continuing to enrich the content of the scale, so as to make the structural equation modelling and analysis part of the paper more complete and relevant to the actual situation. and fit the reality.

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