Optimization Path of Unsalable Agricultural Products Supply Chain in Live Broadcast Situation

Lirong Peng[1*,a], Jialu Gao[1,b], Junhui Ren[1,c], Liwen Zheng[1,d], Kaixin Xiao[1,e]

[1]*Businee and Tourism School, Sichuan Agricultural University, Chengdu, China*
[a*]*892859269@qq.com*, [b]*1006773440@qq.com*, [c]*1838113735@qq.com*, [d]*2382544757@qq.com*, [e]*2337297955@qq.com*
Corresponding author: Lirong Peng

ABSTRACT
At present, during the epidemic period in China, the problem of unsalable agricultural products is serious, the efficiency of the supply chain is low, the transformation of enterprises is difficult, and the live broadcast of e-commerce encounters a bottleneck. The main purpose of this study is to analyze what factors the unsalable agricultural products fundamentally come from, and what factors should be vigorously developed and preserved in the face of emergencies, so as to provide suggestions for enterprises. This time mainly analyzes the factors affecting the unsalable of agricultural products under the background of the epidemic situation in 2020, and obtains the optimization path of agricultural product supply chain by using grounded theory and AHP analysis method.

Keywords: *unsalable agricultural products; AHP analysis method; Supply chain optimization; Evolutionary Economics*

1. INTRODUCTION

1.1. Research Project Background

In recent years, China's live broadcasting industry has attracted extensive attention from all walks of life. With the rapid development of the network industry, some live broadcasting platforms attached to the network have entered the public's vision. According to the survey, e-commerce live broadcasting of agricultural products has developed rapidly in the field of live broadcasting. In 2016, more than 10 live broadcasts were widely reported by major media [6]. In 2020, under the influence of the COVID-19, the webcast market reached a record high, and the market scale was preliminarily estimated to reach 150billion yuan.

Since 2011, from unsalable vegetables to unsalable fruits, unsalable agricultural products in China have emerged one after another. The phenomenon of "cheap vegetables hurting farmers" has become an important livelihood problem at present. The low sales price has caused serious losses to vegetable farmers [5]. It is urgent to solve the problem of unsalable agricultural products and optimize the supply chain path of agricultural products.

Starting from the specific performance of unsalable agricultural products in the live broadcast situation, this paper analyzes and solves the impact of unsalable agricultural products on the supply chain and unsalable factors through AHP analytic hierarchy process and evolutionary economics, so as to promote suppliers to innovate. Provide a novel research perspective and feasible suggestions for the live broadcast of unsalable agricultural products.

1.2. Research Meaning

Help promote the balance of supply and demand market and improve the operation efficiency of agricultural product supply chain [1]; Guide China's agricultural economic development and brand development of agricultural products, and promote the upgrading of agricultural structure.

1.3. Research Status

Compared with the traditional sales model, webcast with goods is more attractive. The development of e-commerce and live broadcasting provides a platform for the transaction and information exchange of unsalable agricultural products, broaden the sales channels of high-quality agricultural products in unsalable agricultural

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products areas, and realize the increase of farmers' income [2]. Local governments provide farmers with scientific and technical guidance and production and marketing information, so that farmers can quickly and efficiently obtain national agricultural information [4].

Under the influence of the COVID-19, live broadcasting with goods has developed vigorously. With the help of the video live broadcasting platform, it has helped to sell unsalable agricultural products. Live broadcasting of agricultural products is an emerging development direction of agricultural products marketing. It realizes the precise production and marketing docking, helps to maximize the interests of both sides, and is of great significance to the development of agricultural products.

The live broadcast sales mode is conducive to the reverse construction of the agricultural product supply chain. The whole process repeats the role of the team as a link between the preceding and the following, finds the selling points of products and feeds back the sales situation of farmers' products, so as to achieve the effective organization of the team and the efficient connection of all links [3].

2. ANALYSIS ON THE THE CAUSES OF UNSALABLE AGRICULTURAL PRODUCTS

Weak rural network infrastructure; The marketing system of agricultural products is not perfect; There are serious deficiencies and lags in farmers' information; High transportation costs lead to unsalable; The logistics and distribution efficiency of agricultural products is low.

3. INTERNAL LOGIC UNDER EVOLUTIONARY ECONOMICS

3.1 Phase I

The logic of "learning diffusion" for enterprises to carry out e-commerce sales and establish online stores. The direct manifestation of enterprises' e-commerce sales is that some enterprises with independent entrepreneurial ability have lower learning costs such as technology exchange and information acquisition than the average level. When their learning costs are lower than the average level, the more obvious the diffusion effect of live e-commerce. This diffusion effect can stimulate enterprises to further reduce learning costs, so as to obtain more ideal benefits and form new e-commerce online stores. In addition, the change of consumer demand in the e-commerce market and the perfection of e-commerce information acquisition channels have a certain impact on the development of live broadcast e-commerce and the learning cost and ideal income of enterprises. In the process of e-commerce sales, the decline proportion of the average learning cost of e-commerce sales of all enterprises is in positive proportion to the probability variance of the learning cost of e-commerce sales of a single enterprise, that is, the greater the decline proportion of the average learning cost of e-commerce sales of all enterprises, the more obvious the diversity of e-commerce sales behavior of a single enterprise, and the difference of learning cost will continue to expand. It shows that the development of enterprise e-commerce will inevitably lead to the increase of the diversity of e-commerce sales behavior of a single enterprise and all enterprises and the reduction of learning cost of a single enterprise.

3.2 Phase II

The logic of "choice innovation" for enterprises to carry out e-commerce sales and establish online stores. The initially established e-commerce online store improves the learning ability of e-commerce sales of all enterprises and reduces the learning cost of e-commerce sales. This requires enterprises carrying out e-commerce sales to continuously improve their e-commerce sales learning ability and ensure that their e-commerce sales learning cost is always lower than the average level. In addition, the learning cost of e-commerce sales shows the different behavior characteristics of enterprises in the process of e-commerce sales. The greater the difference in e-commerce sales behavior of enterprises, the lower the average learning cost for all enterprises to carry out e-commerce sales, and constantly restrict the enterprises with high learning cost to carry out e-commerce sales. In order to adapt to the demand selection mechanism of e-commerce market, the average learning cost of e-commerce sales needs to be continuously reduced, and the diversity and difference of e-commerce sales behavior of enterprises need to be continuously strengthened.

Therefore, only through continuous innovation can live e-commerce solve the problem of stopping development.

4. ANALYTIC HIERARCHY PROCESS

4.1 Data Sources

Through the live broadcast case, pick up the comments and other information sent by netizens, extract keywords by using Python crawler technology, calculate the index weight of the agricultural product supply chain performance evaluation system at all levels by using AHP and MATLAB software, and apply it to the supply chain analysis.

4.2 Introduction To AHP

4.2.1 Content introduction

Analytic hierarchy process (AHP) refers to a systematic method that takes a complex multi-objective decision-making problem as a system, decomposes the objective into multiple objectives or criteria, and then decomposes it into several levels of multiple indicators (or criteria and constraints), and calculates the hierarchical single ranking (weight) and total ranking through the qualitative index fuzzy quantitative method, so as to be used as the objective (multiple indicators) and multi scheme optimization decision-making.

Analytic hierarchy process decomposes the decision-making problem into different hierarchical structures according to the order of the general objective, sub objectives of each level, evaluation criteria and specific alternative investment scheme, and then uses the method of solving the eigenvector of the judgment matrix to obtain the priority weight of each element of each level to an element of the upper level. Finally, the method of weighted sum is used to merge the final weight of each alternative scheme to the general objective. The one with the largest final weight is the optimal scheme.

4.2.2 Basic principles

According to the nature of the problem and the overall goal to be achieved, the analytic hierarchy process decomposes the problem into different constituent factors, and aggregates and combines the factors according to different levels according to the correlation, influence and subordinate relationship between the factors to form a multi-level analysis structure model, Thus, the problem is finally attributed to the determination of the relatively important weight of the lowest level (schemes and measures for decision-making) relative to the highest level (overall goal) or the arrangement of the relative advantages and disadvantages.

4.3 Analysis Steps

4.3.1 Establish hierarchical structure model

Divide the decision-making objectives, factors to be considered (decision-making criteria) and decision-making objects into the highest level, middle level and lowest level according to the relationship between them, and draw the hierarchical structure diagram. The highest level refers to the purpose of decision-making and the problems to be solved. The lowest level refers to the alternatives in decision-making. The middle layer refers to the factors considered and the criteria for decision-making. For the two adjacent layers, the high layer is called the target layer and the low layer is the factor layer.

4.3.2 Pairwise comparison matrix

When determining the weight of each factor at each level, if it is only a qualitative result, it is often not easy to be accepted by others. Therefore, Saaty et al. Proposed the consistent matrix method, that is, they do not compare all factors together, but compare them with each other. At this time, the relative scale is adopted to reduce the difficulty of comparing the factors with different properties as much as possible and improve the accuracy. For example, for a certain criterion, the schemes under it shall be compared in pairs, and the grade shall be evaluated according to its importance.

a^{ij} is the comparison result of the importance of element I and element J. Table 1 lists the 9 importance levels and their assignments given by Saaty. The matrix formed by pairwise comparison results is called judgment matrix. The judgment matrix has the following properties:

$$a^{ij} = \frac{1}{a_{ji}}$$

The scaling method for judging matrix element a is as follows:

Table 1: scale table

Factor I is better than factor J	Quantized value
Equally important	1
Slightly important	3
Strong importance	5
Strongly important	7
Extremely important	9
Intermediate value of two adjacent judgments	2，4，6，8

4.3.3 Hierarchical single ranking and its consistency test

The eigenvector corresponding to the maximum eigenvalue λ^{max} of the judgment matrix is normalized (so that the sum of the elements in the vector is equal to 1) and then recorded as W. The element of W is the ranking weight of the relative importance of the factors at the same level to the factors at the previous level. This process is called hierarchical single ranking. If you can confirm the hierarchical single sorting, you need to conduct consistency inspection. The so-called consistency inspection refers to determining the allowable range of inconsistency for A. Among them, the only non-zero eigenvalue of n-order uniform matrix is n; The largest eigenvalue λ≥n of n-order positive reciprocal matrix A, if and only then λ=n, A is a uniform matrix.

Because λ Continuous dependence a_{ij}, then λ The more than N, the more serious the inconsistency of A. the consistency index is calculated by CI. The smaller the CI,

the greater the consistency. The feature vector corresponding to the maximum eigenvalue is used as the weight vector of the influence degree of the compared factor on a certain factor in the upper layer. The greater the degree of inconsistency, the greater the judgment error. Therefore, it can be used λ- n value to measure the inconsistency of A. The consistency index is defined as:

$$CI = \frac{\lambda - n}{n - 1}$$

CI = 0, with complete consistency; Ci is close to 0, with satisfactory consistency; The larger the CI, the more serious the inconsistency.

In order to measure the size of Ci, the random consistency index RI is introduced:

The random consistency index RI is related to the order of the judgment matrix. Generally, the greater the order of the matrix, the greater the possibility of random deviation of consistency. Its corresponding relationship is shown in Table 2:

Table 2: standard value of average random consistency index RI (different standards have different RI values)

Order	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Considering that the deviation of consistency may be caused by random reasons, when checking whether the judgment matrix has satisfactory consistency, it is also necessary to compare CI with random consistency index RI to obtain the test coefficient Cr, and the formula is as follows:

$$CR = \frac{CI}{RI}$$

Generally, if CR < 0.1, it is considered that the judgment matrix passes the consistency test, otherwise it does not have satisfactory consistency.

4.3.4 Hierarchical total ranking and its consistency test

Calculating the weight of the relative importance of all factors at a certain level to the highest level (overall goal) is called hierarchical total ranking. This process is carried out from the highest level to the lowest level.

4.4 Specific Implementation

4.4.1 Construct judgment matrix

D1 price mechanism, D2 market competition, D3 brand, D4 sales channel, D5 consumption concept, D6 information channel, D7 production concept, D8 production mode, D9 policy support, D10 production and marketing transparency, D11 supply chain, D12 sales focus, D13 information technology, D14 industry trend, D15 business capability, D16 live E-commerce.

According to the following standards, the value is assigned through the questionnaire and network data.

Table 3: definition of analytic hierarchy process scale1

Scale	Definition and description
1	Two elements are equally important to an attribute
3	When comparing two elements, one element is slightly more important than the other
5	Comparing the two elements, one element is obviously more important than the other
2,4	Indicates the scale when it needs to be split between the above two standards
1/b I j	Two opposite elements of comparison

Table 4: scale data

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16
D1	1	2	4	1	2	1	1/2	1	3	1/3	5	3	1	3	2	3
D2	1/2	1	3	5	1	1/3	1	4	1/2	3	1	1/2	1/2	1/4	1	1
D3	1/4	1/3	1	4	1/3	1/2	1/2	3	1/4	2	1	1	1/4	1/5	1	1/3
D4	1	1/5	1/4	1	1/5	1/3	2	4	1/5	4	1/3	1/2	1/2	1/3	2	1/2
D5	1/2	1	3	5	1	1/2	3	4	1/4	2	1/2	1/2	1	1/4	2	1
D6	1	3	2	3	2	1	4	3	1/3	1	1	2	1/3	1/2	1	1/2
D7	2	1	2	1/2	1/3	1/4	1	4	1/5	1	1/3	1/4	1/2	1/5	1/3	1/2
D8	1	1/4	1/3	1/4	1/4	1/3	1/4	1	1/4	3	1/4	1/3	1/3	1/4	1/3	1/2
D9	1/3	2	4	5	4	3	5	4	1	5	4	3	4	3	4	3
D10	3	1/3	1/2	1/4	1/2	1	1	1/3	1/5	1	1/3	1/2	1/2	1/4	1/2	1/3
D11	1/5	1	1	3	2	1	3	4	1/4	3	1	1/2	1	1/4	3	1
D12	1/3	2	1	2	2	1/2	4	3	1/3	2	2	1	2	1/3	1	1/2
D13	1	2	4	2	1	3	2	3	1/4	2	1	1/2	1	1/5	2	1/3
D14	1/3	4	5	3	4	2	5	4	1/3	4	4	3	5	1	4	1
D15	1/2	1	1	1/2	1/2	1	3	3	1/4	2	1/3	1	1/2	1/4	1	1/3
D16	1/3	1	3	2	1	2	2	2	1/3	3	1	2	3	1	3	1
SUM	13 2/7	22 1/9	35 1/9	37 1/2	22 1/9	17 3/4	37 1/4	47 1/3	7 8/9	38 1/3	23 1/9	19 4/7	21 3/7	11 1/4	28 1/6	14 5/6

4.4.2 Hierarchical single ranking and its consistency test

Table 5: hierarchical single sorting

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	SUM	M
D1	53/704	17/188	48/421	2/75	17/188	4/71	2/149	3/142	194/513	1/999	193/8	127/829	12/257	221/830	12/169	18/89	122	0.11
D2	30/797	17/376	36/421	2/15	17/376	4/213	4/149	6/71	52/825	5/564	12/27	6/235	6/257	15/676	6/169	6/89	7/9	0.05
D3	15/797	14/929	12/421	8/75	14/929	2/71	2/149	9/142	26/825	5/846	12/27	12/235	3/257	3/169	6/169	2/89	275/5	0.03
D4	53/704	7/774	3/421	2/75	7/774	4/213	8/149	6/71	3/119	7/592	4/277	6/235	6/257	5/169	12/169	3/89	1/2	0.03
D5	30/797	17/376	36/421	2/15	17/376	2/71	12/149	6/71	26/825	5/846	6/277	6/235	12/257	15/676	12/169	6/89	540/6	0.05
D6	53/704	94/693	24/421	2/25	17/188	4/71	16/149	9/142	5/119	2/677	12/27	24/235	4/257	15/338	6/169	3/89	1	0.06
D7	53/352	17/376	24/421	1/75	14/929	1/71	4/149	6/71	3/119	2/677	4/277	3/235	6/257	3/169	2/169	3/89	547/9	0.03
D8	53/704	11/973	4/421	1/150	11/973	4/213	1/149	3/142	26/825	5/564	3/277	4/235	4/257	15/676	2/169	3/89	1/3	0.02
D9	20/797	17/188	48/421	2/15	17/94	12/71	20/149	6/71	119/944	3/203	157/9	127/829	175/937	221/830	24/169	18/89	210/4	0.14
D10	159/704	14/929	6/421	1/150	17/752	4/71	4/149	1/142	3/119	2/677	4/277	6/235	6/257	15/676	3/169	2/89	5/9	0.03
D11	12/797	17/376	12/421	2/25	17/188	4/71	12/149	6/71	26/825	5/564	12/27	6/235	12/257	15/676	18/169	6/89	393/4	0.05
D12	20/797	17/188	12/421	4/75	17/188	2/71	16/149	9/142	5/119	5/846	24/27	12/235	24/257	5/169	6/169	3/89	6/7	0.05
D13	53/704	17/188	48/421	4/75	17/376	12/71	8/149	9/142	26/825	5/846	12/27	6/235	12/257	3/169	12/169	2/89	13/14	0.06
D14	20/797	17/94	60/421	2/25	17/94	8/71	20/149	6/71	5/119	7/592	157/9	127/829	187/801	15/169	24/169	6/89	16/7	0.12
D15	30/797	17/376	12/421	1/75	17/752	4/71	12/149	9/142	26/825	5/846	4/277	12/235	6/257	15/676	6/169	2/89	513/9	0.03
D16	20/797	17/376	36/421	4/75	17/376	8/71	8/149	3/71	5/119	5/564	12/27	24/235	36/257	15/169	18/169	6/89	11/9	0.07

$$CI = \frac{\lambda - n}{n - 1}$$

$$RI = \frac{CI_1 + CI_2 + \cdots + CI_n}{n}$$

(λIs a fixed value)

$$CR = \frac{CI}{RI}$$

(1) Calculated by the above formula:

λ≈18

CI≈0.187

RI=1.6

CR≈0.1

In case of error, the test is passed and the data is valid.

(2) The total score is calculated:

D1=2.17	D2=0.96	D3=0.64	D4=0.75
D5=1.03	D6=1.17	D7=0.69	D8=0.46
D9=2.74	D10=0.71	D11=1.07	D12=1.06
D13=1.14	D14=2.30	D15=0.70	D16=1.36

It can be concluded that the proportion of 16 factors is sorted as follows:

D9 > D14 > D1> D16 > D6 > D13 > D11 > D12 > D5 > D2 > D4 > D10 > D15 > D7 > D3 > D8

(3) It can be concluded that

The most important factors are D9 policy support, D14 industry trend, D1 price mechanism, D16 live e-commerce and D6 information channel. At the same time, they are more consistent with our research direction of optimizing the supply chain up and down the live broadcasting point, and also provide the perspective of optimization suggestions.

5. CONCLUSIONS

Therefore, we can optimize the realization path of agricultural products supply chain from five aspects: policy support, conforming to industry trends, adjusting price mechanism, broadening information channels and selling focus. The theory of evolutionary economics also proves that the boom of live broadcasting promotes the government to issue policy support, form multiple e-commerce industrial parks, and combine various forms with the anchor to bring goods to promote the development of agricultural products industry. After years of development, the e-commerce industry has encountered a bottleneck period of traffic, and the cost of obtaining customers is getting higher and higher. Live broadcasting has become an important factor to promote the development of e-commerce agricultural products industry. When selling agricultural products through e-commerce channels, we should try our best to maintain the corrosion resistance. However, after considering the transportation cost, we believe that the deep processing of products can not only maintain the corrosion resistance of products, but also avoid consuming a lot of costs. Therefore, the live broadcast promotes the transformation and upgrading of products and gives agricultural product manufacturers and dealers a certain bargaining power. In addition, the live broadcast itself has a strong traffic nature, and selling focus online Red economy is one of the characteristics of the live broadcast, so the live broadcast will broaden the information channels. Based on the above analysis of the five factors affecting the supply chain of live broadcasting, and according to the development logic of e-commerce under evolutionary economics, six points can solve the problem of unsalable agricultural products under the background of live broadcasting: policy support, conforming to industry trends, adjusting price mechanism, broadening information channels, selling focus, and innovating products and sales methods.

REFERENCES

[1] Cui Rui (2021). Discussion on Problems and Countermeasures of live broadcast e-commerce business model from the perspective of supply chain [J]Business economics research, 69-71

[2] Chen Yuanyuan (2021) Design of resource docking platform for unsalable agricultural products from the perspective of targeted Poverty Alleviation -- Taking "Nongle" app as an example [J] Rural science and technology, 12 (05): 123-124

[3] Hua Yongjian (2020). Research on "agricultural products + live broadcast" reverse supply chain model [J]Price theory and practice, 129-132

[4] Tang Lixin (2009) SWOT analysis of online marketing of agricultural products in China [J] Heilongjiang foreign trade and economic cooperation, 115-116

[5] Yan Hong (2016) Research on network marketing strategy of unsalable agricultural products from the perspective of farmers [J]Agricultural economy, 119-121

[6] Yu Xunpei, Yu Chenwei (2016) Current situation and trend of e-commerce live broadcasting of agricultural products [J] China agricultural information, 158-160