



## **Study on selection of Haikou fruit air carrier based on AHP**

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## Abstract

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<p>With the development of the logistics and transportation industry and the strong support of national policies, the development of the logistics business has also been greatly expanded. In recent years, with the rapid increase in the cargo volume of fresh fruit, the scale of the air cargo industry continues to expand. The object of this study is Haikou fruit, which mainly studies the selection of air carriers to select the right air carriers. First, collect and sort out domestic and foreign literature, and collect some knowledge about carrier selection; Secondly, the present situation of Hainan fruit air cargo and air carriers is studied, and the cargo transportation capacity and service capacity of current carriers are analysed. Then, the evaluation index system of air carrier selection is established, and the weight is determined by AHP. Finally, according to the research conclusions, suggestions on the selection of carriers are put forward, so that Haikou fruit sellers can choose the best air carriers, so as to improve the economic benefits.</p>
<b>Key words</b> Fruit transport、 Air carrier、 Evaluation index system、 Analytic hierarchy process

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## 1 Introduction

This topic is mainly aimed at the selection of Haikou fruit air carriers, to solve the current Haikou fruit air cargo carriers optimization selection, transportation efficiency, timeliness, and other problems. This paper takes domestic airlines as the research object, uses the AHP method to build an evaluation system, compares and selects its advantages and disadvantages, selects Haikou fruit airline carriers, selects better optimization schemes, and finally makes a comprehensive analysis, to determine the selection of carriers, increase the sales of Haikou fruit and increase its economic benefits.

In recent years, with the rapid development of the economy and society, logistics and other service industries have also been developing rapidly. The scale of the logistics industry is also getting larger and larger. From water and land transportation to railway transportation and now air transportation, the annual transportation volume is constantly growing. As a result of the national government's policy and the plan to build a free trade port in Hainan Province, the agricultural output of Hainan Province has been growing in recent years, especially the fruit output. As the mainland's demand for Hainan fruits continues to grow, and customers' requirements for product delivery are becoming more and more strict, Haikou fruit merchants want to respond quickly to the market demand, and efficient fruit transportation process becomes particularly important; Logistics transportation is an important link of aviation logistics. Logistics management is regarded as a good way to manage enterprises, which can be used to expand the competitive advantage of enterprises and enhance the strategic cooperation between enterprises. Reasonable use of logistics management can reduce costs as far as possible, to maximize the utilization rate. In the process of implementing logistics management, the selection of carriers is the most important step. Under the operation mode of transportation outsourcing, how to evaluate and select carriers has become an important link in transportation decision-making. The selection of carriers directly affects the vital interests of enterprises. Choosing a reliable and efficient carrier can not only help the shipper complete transportation activities, realize the value of products and use value, but also make full use of the carrier's advantages in transportation and network, minimize inventory, reduce transportation costs, improve customer satisfaction through efficient and high-quality transportation services, and obtain higher earnings. Therefore, to gain advantages in the increasingly fierce market competition environment and to better adapt to the constantly developing market environment, Haikou fruit vendors must carry out the correct selection of carriers. At the same time, a reasonable transportation process can effectively reduce the logistics time of fruit transportation, improve customer satisfaction and improve the timely response of logistics. Make air transport play its due value, realize the reasonable utilization and efficient allocation of resources, and promote the healthy development of fruit air carriers.

## **2 Research background and significance**

Due to people's special requirements for fruit freshness, there are relatively few cold storage resources and cold storage transportation resources closely related to the development of fruit freshness logistics. Aviation has become an important form of fruit transportation and a key link in fruit logistics. Air transportation can greatly improve the circulation speed of fruit products, and reduce circulation management costs, so that the freshness of fruit products in the market is more competitive. To change the unfavorable situation of low-end competition, better maintain product quality, and improve consumer satisfaction, most Haikou fruit manufacturers began to use air transportation for fruit logistics distribution. Therefore, the development of air logistics also ushered in the spring. At the same time, this study provides certain research support for the evaluation of fruit cargo service quality in the air cargo service industry. The research background and significance of this paper will be introduced in this chapter.

### **2.1 Current status of Haikou aviation industry**

Haikou Meilan International Airport (hereinafter referred to as "Meilan Airport") was officially opened to traffic on May 25, 1999, and successfully listed in Hong Kong in November 2002 (HK.00357). It is one of the important domestic trunk airports in China. The designed capacity is that by 2025, Meilan Airport can meet the operating requirements of 35 million passengers and 400,000 tons of cargo throughput per year. Among them, the international design capacity of the T2 terminal can meet the operation demand of 4.2 million international and regional passengers in 2025. Since then, Meilan Airport has entered a new development era of "double terminals, double runways", and is committed to building an aviation gateway hub facing the Pacific Ocean and Indian Ocean. Since the establishment of Meilan Airport, the production and operation data continue to improve. In 2022, Meilan Airport successfully opened cross-border e-commerce export models such as "9610", "9710" and "9810", realizing the implementation of all types of cross-border e-commerce export, filling the gap of cross-border e-commerce business in Hainan airport ports, and opening new cargo source types and channels for international cargo routes. Star service quality has been recognized internationally; At the same time also has a supporting business to serve passenger travel.

### **2.2 Current exit mode analysis of Haikou Fruit**

This section describes the current ways of leaving the port.

### **2.2.1 Air cargo**

Haikou Meilan International Airport is the main fruit air cargo port in Haikou city, with multiple flights taking off and landing every day, connecting the domestic cities as well as Southeast Asia, Japan, South Korea and other countries and regions. Fruits in Haikou are mainly transported to domestic and foreign markets by air freight. The advantages of air freight are fast speed and high transportation efficiency, which can maintain the freshness of fruits and cover the long-distance market, but the cost is relatively high.

### **2.2.2 Water transportation**

Haikou City has Haikou Port and Hainan Yangpu Port two important fruit ports, these fruits are mainly shipped to Hong Kong, Taiwan, Southeast Asia, Europe and the United States and other places. In Haikou, pineapple, coconut, longan, lychee and other fruits can be kept fresh by sea transportation, while the process and cost can be reduced when exported to foreign markets.

### **2.2.3 Land transport**

Haikou fruit is also transported by road and rail to major cities in China. Among them, railway transport is mainly transported to the inland provinces, while road transport is mainly through road transport within Hainan Island. The advantage of this way is that the cost is relatively low, and suitable for short and short-distance transportation, but there are also some preservation problems and uncontrollable risks

## **2.3 Significance**

The research significance of this paper lies in the combination of theory and practice to solve the practical problem of Haikou fruit air cargo carrier selection.

### **2.3.1 Theoretical significance**

For the study of Haikou fruit air carriers, we should not only solve the existing problems but also examine the management characteristics of Haikou fruit retailers, and maximize the rational use of existing resources. Based on the theory of the AHP index evaluation system, this paper first investigates the problems existing in the selection of Haikou fruit air carriers and their causes, then reconstructs the evaluation index system for each air carrier using the AHP method, carries out a comparative analysis according to the weight analysis of each evaluation index, finds out the better air carriers, and finally determines the final air carriers. Draw a reasonable and feasible scheme for Haikou fruit merchant reference.

### **2.3.2 Practical significance**

For Haikou fruit retailers, the selection of fruit carriers is an important part of the logistics transportation process. Although Chinese air carriers have achieved great development in recent years, the construction scale is growing year by year, but there are still many problems to be solved, resulting in the low operating efficiency of fruit transport and high transport cost. Combining the AHP method can not only reasonably plan the selection of fruit transport carriers, improve transport efficiency, ensure the timeliness of transport, and then help to improve the efficiency of enterprises, but also provide ideas for other enterprises to choose air carriers, play a role of reference.



### 3 Literature review

Search and classify the contents of key words in the CNKI, Wanfang, SCI and other bibliographies.

#### 3.1 Fruit transportation

X Jiao, W Xu, and others (2021) proposed a fresh produce cold chain transportation model under low-temperature warehouse conditions to address the inability to achieve both the shortest time and the lowest consumption in fresh produce preservation cold chain transportation solutions. The model is based on the topology of the cold chain transportation network. By setting assumptions for the fresh produce preservation cold chain transportation model, the objective model consists of three parts: vehicle power fuel consumption cost, cold chain transportation refrigeration cost, and total produce loss cost. Under constraints, an improved ant colony algorithm is used to find the optimal route for fresh produce preservation cold chain transportation. Based on the value chain analysis of Thai-Chinese fruit logistics, Promupsorn Wattanakarunyapas (2019) considered various factors that influence transportation decisions. They used a binary logit model to investigate the choice of fruit transportation modes in Thai-Chinese logistics. They found that the selection of transportation modes is influenced by factors such as enterprise size, transportation duration, and transportation delays. By analyzing Thai-Chinese fruit logistics transportation using the binary logit model, they identified that transportation time, transportation delays, and transportation losses are the main factors to be considered. Yang Qing (2018) studied the current status of cross-border fruit cold chain logistics transportation between China and Vietnam. They discovered issues in the cold chain transportation of fruits between China and Vietnam, such as improper packaging, unreasonable stacking, lack of unified transshipment points, and inconsistent standards. Jia Shue (2017) conducted field research to investigate the current situation of fruit logistics in Zepu County, Kashgar, Xinjiang. They surveyed the logistics conditions of fruit sales companies and cooperatives and, based on the existing conditions, infrastructure, and the cold chain logistics development experience of developed countries, proposed a Zepu County fruit cold chain logistics model based on an information platform.

#### 3.2 Air carrier

Yu, Shunan, Yang, Zhongzhen, and others (2019) conducted an empirical analysis of the pricing strategies of two competing air cargo carriers in the spot market for the same route. They concluded that the two airlines obtain more revenue by adopting optimized differential pricing methods compared to a single pricing method. Theoretically, their research enriches the literature on pricing strategy optimization under competition and provides reference for air cargo carriers in implementing differential pricing strategies. HC Chu (2014) investigated the important factors influencing the

selection of air cargo agents and route decisions by considering the preferences and selection behavior of different-sized enterprises based on their average annual cargo handling volume. The study found that the latent class model effectively identified heterogeneity in preferences among different categories of air cargo agents when estimating influencing factors. They concluded that large and medium-sized enterprises have different concerns and preferences in choosing airlines compared to small-sized enterprises. CI Hsu and HC Li (2009) examined how product characteristics, value, inventory costs, freight costs, transportation distance, and time influence international firms' selection of air cargo carriers. By considering the spatial distribution of origin patterns and the temporal variations of industry structure, they further aggregated the air cargo demand of carriers on different routes.

### **3.3 Analytic hierarchy process**

Ebru Surucu-Balci and Okan Tuna (2020) employed a hybrid approach to identify, classify, and rank the driving factors of food loss related to logistics. They found that these factors have a greater impact on the quantity of food loss in the fruits and vegetables supply chain, and they used the Analytic Hierarchy Process to prioritize the driving factors that significantly affect the amount of grain loss. Show-Hui S. Huang and Wen-Kai K. Hsu (2015) proposed a fuzzy Analytic Hierarchy Process-based discrepancy index to evaluate the perception differences of civil aviation users and operators regarding these Safety Risk Assessments (SRAs), considering the operational characteristics of Collision Avoidance for Cooperative Cars (CACC). They also discussed the theoretical and managerial implications of CACC in improving service quality. AH Azadnia and P Ghadimi (2013) proposed a combined approach of fuzzy Analytic Hierarchy Process and fuzzy logic to address the sustainable supplier selection problem. They used the fuzzy Analytic Hierarchy Process to calculate the weights of sustainable evaluation indicators and sub-indicators. Finally, they validated the effectiveness of this method using the petroleum industry as an example. Cheng Ping and Zhang Jing (2022) applied the Analytic Hierarchy Process (AHP) to evaluate the health of suppliers in a self-operated e-commerce company, S Enterprise. They addressed issues such as the incomplete evaluation index system for suppliers and the use of traditional evaluation methods. By considering factors such as product quality, delivery capability, pre-sale and after-sale services, as well as qualifications of supplier companies, they proposed a supplier health evaluation method that combines the Analytic Hierarchy Process with Grey Correlation Analysis. They explained in detail the implementation path and rationality of the proposed method through simulations. Wang Yaqing (2020) developed a data center site selection method by clarifying the objectives, establishing selection principles, outlining the selection process, listing the factors influencing the selection, and adopting selection methods. Using Company T as an example, they analyzed the factors within the system and established an index system and model using the Analytic Hierarchy

Process. They conducted a weight analysis of the factors influencing the site selection, and under the premise of satisfying the consistency test of the data, they comprehensively evaluated the economic, service, and environmental factors of alternative sites, selecting the city with the highest score as the construction site.

### **3.4 Summary of literature review**

To sum up, foreign researches on AHP involve a wide range of fields, but few types of researches on the selection and optimization of carriers, especially the selection of fruit air carriers; But most of the domestic selection for AHP and carrier is choice of the land transport carrier. The aviation field is involved less and compared with foreign countries, the fresh aviation logistics industry in our country started late, influenced by the airline logistics center's cargo handling capacity, the number of cargo aircraft and the staff's comprehensive quality, etc., all kinds of factors. Cargo scale, distribution scope, and service capacity is still very limited, and the growth of fresh air cargo business cannot meet the personalized transportation needs of large enterprise customers. What needs to be pointed out more is the general lack of fresh logistics management concept of modern airlines, although major domestic airlines have invested a lot of energy in the development of fresh cargo business, trying to fresh cargo business as a new profit growth point, some companies have set up a special fresh cargo department. However, for most aviation enterprises, cold chain logistics is still a pain point restricting the development of the industry. The proportion of fresh product cargo in the whole business system is generally low, and the damage rate and cost are high (the damage rate of fresh products in China is as high as 25%, and the cost is twice higher than that of ordinary products, while the loss in developed countries is maintained at about 5%). The product quality is difficult to control. It is difficult to establish industry standards, and many airlines have the problem of low-quality of fresh cargo service, which has affected the development of the air cargo industry of fresh products to a certain extent. Therefore, in the face of the rapid development of the fresh product air cargo industry, in addition to improving the cold storage resources and refrigerated transportation resources closely related to fresh product logistics, aviation enterprises themselves should also constantly adjust the direction of industrial development, optimize the fresh cargo service process, and improve the quality of fresh product cargo service.

## 4 Research methodology and theoretical basis

This paper intends to use AHP to establish the evaluation index system of the Haikou fruit air carrier and some simple prediction methods.

### 4.1 Main research content

#### (1) Demand forecast

Based on the statistics of the fruit yield in Hainan in recent years, a suitable forecasting method is selected to forecast the fruit yield in the next few years.

#### (2) Analysis of carriers

Through the analysis of the current development status of Haikou Fruit air cargo, find out the current air carriers of Haikou Fruit, and then make a simple analysis of the current situation of the carriers, and analyse its cargo transportation capacity and service capacity.

#### (3) Establish an evaluation index system

Taking Haikou fruit air carriers as the research object, by analysing the current research status of Haikou fruit transport air carriers, investigating the low efficiency of Haikou fruit transport and its causes, and based on the constraints and factors that need to be considered in the realistic analysis, the content and methods of the research are expounded (introducing the theory and methodology of AHP weight analysis, It focuses on the factors of a first-level index, second-level index and third-level index. Because of the selection of transport carriers, the AHP method is used to select carriers with good economic performance, time and other benefits, and then determine the final air carrier.

### 4.2 Research method

(1) Literature research method: Refer to database-related academic journals and professional kinds of literature, including CNKI database, Wan fang Database and other Chinese and English databases, read and analyse relevant academic journals and professional literatures, deepen the understanding and knowledge of relevant theories, and help the completion of the paper.

(2) Field investigation method: Conduct field investigation on the research object, understand and master the actual situation, collect relevant data, combine the actual situation with the theory, and provide data support for the writing of the paper.

(3) Demand forecasting method: This paper intends to use the regression analysis method for forecasting. The regression analysis and prediction method is based on the analysis of the correlation between independent variables and dependent variables, to establish the regression equation between variables, and take this as the prediction model. Unary linear regression is a method to analyse the linear correlation between only one white variable  $x$  and dependent variable  $y$ . The theoretical model is  $y = a + bx$ , where  $y$  is the dependent variable,  $x$  is the independent variable,  $a$  is the regression constant, and  $b$  is the regression coefficient. The least square method is used to solve the estimates of  $a$  and  $b$

### 4.3 Theoretical basis

This chapter will introduce the research methods used in this paper.

#### 4.3.1 Definition and Principle of Analytic Hierarchy Process

Analytic Hierarchy Process (AHP) is proposed by T.L. saaty, a famous American professor of operations research, and others in the 1970s. It is a multi-criteria decision-making method combining qualitative and quantitative analysis by quantifying decision makers' experience judgment and introducing it into the decision-making system. It can deal with multi-objective, multi-criterion and multi-level complex decision-making problems. The Analytic hierarchy process (AHP) is a kind of decision-making method that systematizes the difficult decision-making problems to deal with. It decomposes the relevant elements of the decision-making problems into the levels of objectives, criteria, schemes, etc., and carries out qualitative and quantitative analysis on this basis. Stratification requires an in-depth analysis of influencing factors and internal relations, etc., to construct a hierarchical structure model, which can be divided into several levels according to the actual situation, including first-level indicators, second-level indicators, third-level indicators, etc. After the establishment of the hierarchical index tree of the decision problem, the hierarchical analysis mathematical model can be built. Then, combined with the objective and accurate judgment given by relevant experts familiar with the research problem, the weight of each index is expressed quantitatively, and then the weight of each level of indicator is synthesized. Finally, the synthesized weight is obtained, and then the obtained weight is used to solve the problem. AHP first groups the factors involved in complex system problems and forms an ordered hierarchical structure model after grouping the factors. Then, it reflects the relative importance of each factor at each level by constructing a judgment matrix, carries out a hierarchical single ranking and consistency test, and finally completes the overall hierarchical ranking and consistency test. Through ranking calculation, the overall ranking of the importance degree of decision factors relative to the overall target layer is obtained to optimize the scheme.

### **4.3.2 The design idea of analytic hierarchy process**

The steps of analytic hierarchy process model include: (1) Constructing analytic hierarchy process hierarchy model; (2) Construct a judgment matrix; (3) Verify the consistency and hierarchical ordering of the constructed judgment matrix; (4) The final evaluation is obtained after calculating the composite weight.

## 5 The present situation of Haikou fruit and Hainan Air Cargo Industry

Through the search of Haikou fruit outbound status information, this chapter will be stated.

### 5.1 Export market analysis

Hainan fruit export market in the United States, the European Union, Japan, Australia, Canada and other 20 countries and regions. Haikou fruit is mainly exported to more than 10 countries and regions such as the United States, Japan, Canada and the United Kingdom. Demand for fresh litchi from high-end markets in the United States, Canada and Europe is huge, accounting for about 80 percent of Haikou's litchi exports. To sum up, Guangdong fruit export markets are mainly concentrated in the European Union, Asia and the United States. Haikou fruit export market is relatively concentrated, we should try our best to open up a new fruit export market, and select a suitable air carriers.

### 5.2 Demand for fruit air cargo

By analysing the yield of main fruit varieties in Hainan Province in recent two years, the prediction method of linear regression model is used. The prediction model of unitary a linear regression analysis is as follows:

$$Y_t = aX_t + b \quad (\text{Equation 1})$$

Where  $x_t$  represents the value of the independent variable in period  $t$ ;  $Y_t$  represents the value of  $t$  period dependent variable;

$a$  and  $b$  represent the parameters of the unary linear regression equation.

Parameters  $a$  and  $b$  can be obtained by the following formula (with representatives):

$$a = \frac{n \sum x_i Y_i - \sum x_i \sum Y_i}{n \sum x_i^2 - (\sum x_i)^2} \quad (\text{Equation 2})$$

$$b = \frac{\sum y_i}{n} - a \frac{\sum x_i}{n} \quad (\text{Equation 3})$$

This simple forecasting method provides a simple forecast of future production and air cargo demand, and the results are shown in the table below:

Table 1 Analysis of future fruit yield

Fruit name	21year (Ten thousand tons)	22year (Ten thousand tons)	23 Annual forecast value (Ten	25 Annual forecast value (Ten

			thousand tons)	thousand tons)
banana	114.93	114.82	114.71	114.49
pineapple	45.03	51.61	58.19	71.35
mango	83.09	84.59	85.67	88.11
longan	6.00	6.12	6.24	6.48
lychee	21.85	20.76	19.67	22.34

Table 2 Air cargo capacity demand

Air cargo capacity requirements	2020(Ten thousand tons)	2021(Ten thousand tons)	2022(Ten thousand tons)	2023(Ten thousand tons)	2024 forecast value (Ten thousand tons)
	13.5	15.0	12.4	12.5	12.0

### 5.3 Current development status of Hainan air cargo industry

The Hainan air cargo industry is moving towards diversification and internationalization by cooperating with overseas air cargo enterprises and airlines, expanding the coverage of Hainan's cargo network, and enhancing its position in the international cargo transportation field. In the future, the air cargo industry in Hainan Province is expected to continue to thrive and become an important air cargo hub in China and even the Asia-Pacific region.

#### 5.3.1 Development status

The air cargo industry in Hainan Province is currently experiencing rapid development. With the advancement of the Hainan Free Trade Port policy and favorable policies for the aviation industry, the air cargo sector in Hainan has shown a promising growth trend. The construction of the Hainan Free Trade Port provides ample space for development and policy support for air cargo transportation, attracting a large number of air cargo enterprises and investors to enter the Hainan market. The air cargo infrastructure is continuously improving, including modern cargo facilities such as Haikou Meilan International Airport and Sanya Phoenix International Airport, which provide efficient and convenient cargo services. Hainan Province has also increased efforts in the development of the air cargo logistics system, promoting the expansion of the scale of air cargo operations and enhancing operational efficiency.



### **5.3.2 Route network**

The air cargo industry of Hainan Province has an extensive route network, including many domestic and foreign cities and regions, such as Beijing, Shanghai, Guangzhou, Shenzhen, Hong Kong, Singapore, Bangkok, Melbourne, etc. Economic activities and consumer demand of these cities and regions have a great demand for air cargo industry. In addition, airports across Hainan province continue to expand their airline network. For example, in 2021, they opened direct flights from Haikou to Yangon, Myanmar, further expanding the market for air cargo in Hainan.

### **5.3.3 Cargo plane capacity**

Hainan Airlines has a large air cargo team and a large cargo aircraft capacity, including Boeing 737, Boeing 767, Boeing 787, Airbus A330 and other cargo aircraft. In addition, major airlines are introducing new freighters, such as the first Boeing 747-8F freighter in 2020, to improve cargo capacity and efficiency and enhance competitiveness.

### **5.3.4 Policy support**

The Hainan provincial government has given high policy support to the air cargo industry, including increasing investment, optimizing service and reducing taxes and fees. For example, in 2018, Hainan Province put forward the 13th Five-Year Plan for the development of air logistics, which clearly proposed the goals of building an "air Silk Road" and building an international air cargo hub, providing a favourable policy environment and development opportunities for the development of air cargo in Hainan Province.

### **5.3.5 Business development**

Hainan's air cargo business is constantly expanding, such as strengthening cooperation with domestic and foreign airlines and logistics enterprises to explore domestic and international markets and provide cargo services worldwide. For example, Hainan Airlines has signed cooperation agreements with German Lufthansa, Emirates Airlines and other companies to expand the market of Hainan Air cargo and improve the growth and development of business.

## **5.4 Haikou fruit airlift reasons**

Most fruits produced in Hainan are in season with a short shelf life and need to be refrigerated for transportation. Compared with land transportation and air transportation, air transportation is fast, safe and punctual with high efficiency, which greatly reduces the delivery time. At the same time, air transportation also has the following advantages:

#### **5.4.1 Flexibility**

Not limited by the terrain, whether plateau or plain, ocean or desert can fly over. Air transport relative to other modes of transport in distance, time to shorten lot, according to the passenger flow or cargo size adjustment of different models, there are passenger aircraft and there are pure cargo aircraft.

#### **5.4.2 Good safety and low breakage rate**

On the ground, due to the relatively high price of air cargo, the operation process is much stricter than other modes of transportation, and the damage situation is greatly reduced. After the cargo is loaded on the aircraft, it is difficult for the cargo to be damaged in the air, so the damage rate of the cargo is low and the safety is good in the whole cargo transportation link.

#### **5.4.3 International and large space span**

Air transport allows close links between countries. International trade enables Hainan fruits not only to go out of Hainan but also to go to the world. At any time from any place in the world, they can be transported to their destination quickly, safely and reliably.

## **6 Analysis of the current situation, transportation capacity and service capacity of Haikou fruit carriers**

This chapter will introduce the ability analysis in each aspects which has been collected.

### **6.1 Current status of carriers**

There are many air carriers of Hainan fruit leaving the port. The following are some of the main carriers:

**China Southern Airlines:** As a major carrier in southern China, China Southern Airlines has a route network with Haikou as its hub, including flights to mainland China and Southeast Asian countries. China Southern also provides customized cold chain logistics services for Hainan fruit exports to ensure the freshness and quality of fruit.

**Hainan Airlines:** Hainan Airlines is the local carrier of Hainan Province, headquartered in Haikou, which flies to Southeast Asia, Europe and North America, also provides air transport services for Haikou's fruit exports.

### **6.2 Transportation capacity analysis**

#### **(1) Extensive airline network**

The network covers major economic regions of the world, including Asia, Europe, America and Oceania. Its route network is complementary to the passenger route network of its parent company, China Southern Airlines, and can provide a full range of logistics services and efficient and convenient transportation solutions for customers.

#### **(2) Advanced transportation equipment**

It has a number of large cargo aircraft, including Boeing 747, Boeing 777, Airbus A330 and other advanced models, which can meet the transportation needs of various cargo. Meanwhile, its cargo planes are equipped with modern cargo loading equipment and airborne cargo tracking system, improving cargo efficiency and safety.

#### **(3) Professional logistics services**

Provide a full range of logistics services, including air freight, ground transportation, warehousing and distribution links, to provide customers with one-stop logistics solutions. Its professional logistics team and modern logistics management system can meet customers' needs for efficient, accurate and safe logistics services.

#### (4) Diversified customer groups

Customer groups include domestic and foreign large enterprises, multinational corporations, international organizations, government agencies, etc., covering a wide range of industries, including electronics, clothing, automobiles, machinery, medicine, etc. The diversification of its customer groups, so that its transport capacity gives full play to improve freight utilization and transport efficiency.

### 6.3 Service capability analysis

#### (1) China Southern Airlines

**Extensive route network coverage:** China Southern Air Cargo's route network covers many cities and regions at home and abroad, including Asia, Europe, America and Africa. This allows it to offer flexible freight services to its customers and meet the logistics needs of different regions and countries; **Strong logistics operation capability:** China Southern Cargo has a complete logistics operation system, including an advanced cargo management system, real-time tracking system and air cargo insurance services. These systems and services can improve the safety and transportation efficiency of goods, and provide customers with a full range of logistics services support; **Sufficient cargo capacity:** China Southern Cargo has a variety of cargo aircraft, including Boeing 747, Boeing 777, Airbus A330 and so on. These cargo planes have a strong capacity to meet the needs of customers for different types and quantities of cargo transportation. At the same time, China Southern Cargo also cooperates with other airlines to share capacity resources and further improve its logistics service capacity. **Excellent logistics personnel team:** The logistics personnel team of China Southern Air Cargo has rich experience in logistics management and operation. They are able to provide professional logistics consulting and services according to the needs of customers and ensure the safety and timely arrival of goods to the destination.

#### (2) Hainan Airlines

**Route network:** Hainan Airlines has an extensive domestic and international route network, covering many important business centers and logistics hubs around the world. This enables Hainan Airlines to provide a wide range of logistics services; **Cargo fleet:** Hainan Airlines has a modern cargo fleet, including Boeing 747, Boeing 737 and Airbus A330 models, which have efficient carrying capacity and adaptability to meet the cargo needs of different types and sizes; **Efficient cargo management system:** Hainan Airlines has an advanced cargo management system, which can track and manage the entire cargo process, from cargo receipt to delivery, achieving high efficiency, low cost and high quality; **Professional logistics team:** Hainan Airlines has an experienced logistics

team, able to provide a full range of logistics services, including cargo packaging, unloading, loading and delivery links, to ensure that the cargo can reach the destination safely and quickly.

## 7 The evaluation system of Haikou Fruit cargo air Carrier Selection

In order to meet the freight demand for Haikou fruit, according to the evaluation index system, a selection process system of optimal air carriers is provided for Haikou fruit suppliers.

### 7.1 The selection and meaning of indicators

In this process, I considered the literature, the current situation of Haikou fruit suppliers and aviation carriers, as well as the specific situation of fruit transportation requirements and characteristics, consulted experts in this field and relevant responsible personnel, and finally selected four key indicators of reliability, responsiveness, tangibility and accuracy, and then refined the key indicators, which mainly include: Fresh-keeping safety, reasonable charges, loss of goods, simple and convenient degree of business procedures, feedback processing time, complaints and claims, an advanced degree of infrastructure, flight size and level, transportation time, on-time delivery rate, on-time delivery rate, aviation operation speed. The specific sources are shown in the following table:

Table 3 Evaluation Indicators and their sources

First-order index	Indicator source	Secondary index	Indicator source
Reliability	The 22 <sup>nd</sup> and 27 <sup>th</sup> of the Source	Fresh-keeping safety	The 22 <sup>nd</sup> of the Source
		Reasonable charge	The 22 <sup>nd</sup> and 26 <sup>th</sup> of the Source
		Loss of goods	The 22 <sup>nd</sup> 、23 <sup>th</sup> and 24 <sup>th</sup> of the Source
Responsiveness	The 22 <sup>nd</sup> and 27 <sup>th</sup> of the Source	The degree of simplicity and convenience of business procedures	The 22 <sup>nd</sup> of the Source
		Feedback aging	The 22 <sup>nd</sup> and 26 <sup>th</sup> of the Source
		Complaint and claim	The 22 <sup>nd</sup> 、23 <sup>th</sup> 、24 <sup>th</sup> and 26 <sup>th</sup> of the Source
Tangibility	The 22 <sup>nd</sup> of the Source	How advanced the infrastructure is	The 22 <sup>nd</sup> and 26 <sup>th</sup> of the Source
		Flight size and frequency	The 24 <sup>th</sup> 、25 <sup>th</sup> 、26 <sup>th</sup> of the Source

		Age of Transportation	The 25 <sup>th</sup> and 26 <sup>th</sup> of the Source
Accuracy	The 25 <sup>th</sup> and 27 <sup>th</sup> of the Source	On-time delivery rate	The 22 <sup>nd</sup> , 23 <sup>th</sup> , 24 <sup>th</sup> and 25 <sup>th</sup> of the Source
		On-time delivery rate	The 25 <sup>th</sup> of the Source
		Airspeed	The 22 <sup>nd</sup> of the Source

### 7.1.1 Reliability

The air cargo terminal of the air carrier can provide the corresponding service for the customers according to the promised content. For example, the fresh-keeping and safety of fruits are well guaranteed, and the loss rate is within a reasonable range. At the same time, there is no additional charge for packaging and refrigeration, so as to ensure the reasonableness of the charge. This index refers to literatures [25] and [27]. The first-level index includes three second-level indexes: fresh-keeping safety (from literature [22]), reasonable charge (from literature [22] and [26]), and goods loss (from literature [22], [23] and [24]).

### 7.1.2 Responsiveness

The air cargo terminal of the air carrier can improve its service quality in a shorter period of time, so as to continuously meet the actual demand of Hainan fruit merchants for products. For example: optimize the procedure mode, after the fruit arrived at the destination, timely notify the other party, delivery procedures are more convenient than other products when customers encounter problems, can take the way to solve the complaint, when customers complain online, the website should also establish a fresh fruit problem library or arrange fruit freight line customer service timely solution, help customers solve problems in time. This index refers to literature [22] and [27]. The first-level index includes three second-level indexes: the degree of simplicity and convenience of business procedures (from literature [22]), the time of feedback processing (from literature [22], [26]) and the complaint and claim (from literature [22], [23], [24], [26]).

### 7.1.3 Tangibility

The infrastructure of air cargo terminals of air carriers can be deeply felt by customers, giving customers a great sense of belonging. For example, the layout of a reasonable temperature control area, reasonable cold reservoir area, advanced temperature control center and other infrastructure. This index is referenced from literature [22]. The first-level index includes three second-level

indexes: advanced degree of infrastructure (from references [22] and [26]), flight size and frequency (from references [24], [25] and [26]), and transportation time (from references [25] and [26]).

#### 7.1.4 Accuracy

The punctual delivery of fruits by air carriers, the accurate delivery of goods by air cargo to customers, the retention of cargo function and the information provided by air cargo companies can accurately reflect the current status and progress of cargo services. This index refers to literature [22] and [27]. The first-level index includes three second-level indexes: on-time delivery rate (from literature [22], [23], [24], [25]), on-time delivery rate (from literature [25]), and aviation operating speed (from literature [22]).

## 7.2 Determination of index weight

After the carrier selection index system is completed, the weight of the index is determined by the analytic hierarchy process, and the carrier selection is analysed according to the calculated results.

### 1. Establish a hierarchical structure model

According to the current status and existing problems of Haikou fruits mentioned above, the selection of carriers of Haikou fruits is mainly carried out from four aspects: reliability, responsiveness, tangibility and accuracy, and then the corresponding hierarchy is constructed. The specific content is shown in Figure 1 below:

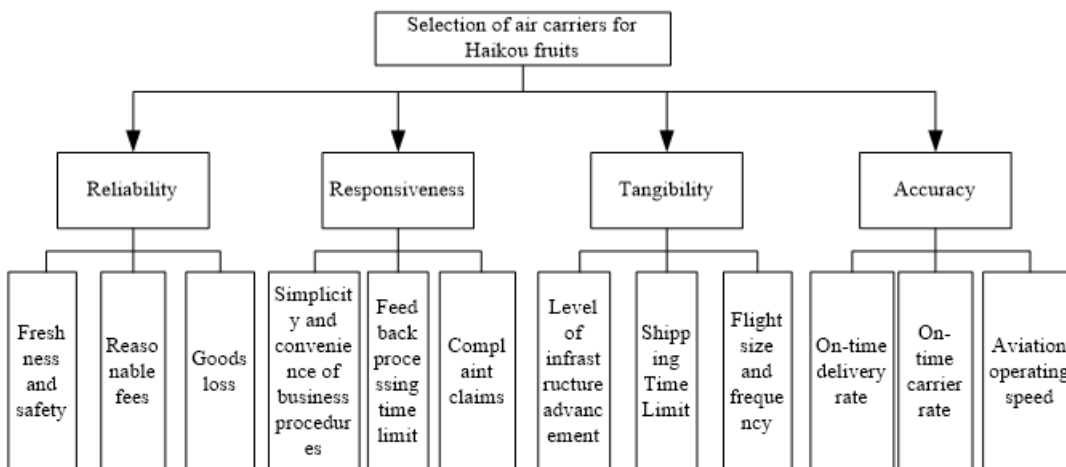


Figure 1. The evaluation system of Haikou fruit air carrier selection(Chen,2023)

Using an analytic hierarchy process to determine the weight



First, construct a judgment (pair comparison) matrix

The 1-9 scale method, as shown in Table 7.1 below, is used to determine the importance of the two indicators. The meanings of each value are as follows. The structure model of evaluation index was constructed, and relevant experts were asked to score the importance of each index to determine its relative importance. The judgment matrix  $M_{ij}$  was constructed, in which  $M_{ij} = 1/M_{ji}, M_{ii} = 1$ .

Table 4

Quantized value	Meaning	Description
1	Comparing the two indicators, the former is as important as the latter	The quantified value of importance can also be the number between them 2, 4, 6, and 8, which is the quantified value of the importance of the latter relative to the former.
3	Comparing the two indicators, the former is slightly more important than the latter	
5	Comparing the two indicators, the former is significantly more important than the latter	
7	Comparing the two indicators, the former is more important than the latter	
9	Comparing the two indicators, the former is absolutely more important than the latter	

Hierarchical single sort and consistency check

The eigenvector corresponding to the maximum eigen root of the judgment matrix is written  $W$  after normalization (so that the sum of all elements in the vector is equal to 1). Element  $W$  is the ranking weight of the relative importance of a factor at the same level to a factor at the next level. This process is called hierarchical single ranking. A consistency test is needed to confirm whether a single hierarchical sort can be confirmed. The so-called consistency test refers to determining the allowable range of inconsistency for  $A$ . Where the unique non-zero eigen root of an  $n$ -order uniform matrix is  $n$ ; The largest characteristic root of  $A$  positive reciprocal matrix of order  $n$ ,  $A$  is a uniform matrix if and only if  $\lambda = n$ .

Since  $\lambda$  is continuously dependent on  $a_{ij}$ , the larger the  $\lambda$  is than  $n$ , the more serious the inconsistency of  $A$ . The consistency index is calculated by  $CI$ , and the smaller the  $CI$  is, the greater the consistency is. The eigenvector corresponding to the maximum eigenvalue is used as the weight vector of the influence degree of the compared factor on the upper factor. The greater the degree

of inconsistency, the greater the judgment error. Therefore, the magnitude of  $\lambda - n$  can be used to measure the degree of inconsistency of A. The consistency check steps are as follows,

Define the consistency index as:

$CI = (\lambda - n) / (n - 1)$ ,  $CI = 0$ , there is complete consistency;  $CI$  is close to 0 and has 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. Among them, the random consistency index  $RI$  is related to the order of the judgment matrix. In general, the larger the order of the matrix, the greater the possibility of random deviation of consistency, and the corresponding relationship is shown in the table:

Table 5 Average random consistency index  $RI$  standard value (different standards,  $RI$  value will be slightly different)

Order of matrix	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 verifying whether the judgment matrix has satisfactory consistency,  $CI$  and random consistency index  $RI$  need to be compared to obtain the test coefficient  $CR$ , the formula is as follows:

$$CR = CI / RI$$

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

Third, hierarchical total sorting and consistency checking

Total ranking refers to the relative weight of each index element in the lowest level relative to the total target. Total sort computes the total sort from the top level (target level) down to the lowest level. The consistency test of the total ranking of the hierarchy is also carried out layer by layer from high to low. If the consistency index of some factors in the criterion hierarchy for single ranking is  $CI$  and the corresponding average random consistency index is  $CR_j$ , then the random consistency ratio  $CR$  of the total ranking of the criterion hierarchy can be calculated.

When  $RI < 0.10$ , the total hierarchical sorting results are consistent; otherwise, readjust the values of elements in the judgment matrix. The experts in this field use the 1-9 scale method to score. In the pairwise comparison and judgment between factors in AHP, the degree of importance of one factor is quantitatively expressed, and the fuzzy judgment matrix is obtained. Then the weight is calculated and the consistency test is carried out. The following table shows the judgment matrix and consistency test between primary and secondary indexes.

Table 6 Judgment matrix and consistency test among first-level indicators

	Reliability	Responsiveness	Tangibility	Accuracy	Consistency check
Reliability	1	1/4	1/5	1/3	$\lambda_{max} = 4.25$
Responsiveness	4	1	1/2	5	$CI = 0.09$
Tangibility	5	2	1	3	$RI = 0.89$
Accuracy	3	1/5	1/3	1	$CR = 0.091 < 0.1$ , pass the test

Table 7 Reliability judgment matrix and consistency test

	Fresh-keeping safety	Reasonable charge	Loss of goods	Consistency check
Fresh-keeping safety	1	2	3	$\lambda_{max} = 3.05$
Reasonable charge	1/2	1	3	$CI = 0.03$
Loss of goods	1/3	1/3	1	$RI = 0.89$
$CR = 0.0517 < 0.1$ , pass the test				

Table 8 Responsiveness judgment matrix and consistency test

	The degree of simplicity and convenience of business procedures	Feedback aging	Complaint and claim	Consistency check
The degree of simplicity and convenience of business procedures	1	3	3	$\lambda_{max} = 3.05$
Feedback aging	1/3	1	2	$CI = 0.03$

Complaint and claim	1/3	1/2	1	$RI = 0.52$
$CR = 0.091 < 0.1$ , pass the test				

Table 9 Corporeal judgment matrix and consistency test

	How advanced the infrastructure is	Age of transportation	Flight size and frequency	Consistency check
How advanced the infrastructure is	1	6	2	$\lambda_{max} = 3.02$
Age of transportation	1/6	1	1/2	$CI = 0.01$
Flight size and frequency	1/2	2	1	$RI = 0.52$
$CR = 0.0175 < 0.1$ , pass the test				

Table10 Accuracy judgment matrix and consistency test

	On-time delivery rate	On-time delivery rate	Air speed	Consistency check
On-time delivery rate	1	2	4	$\lambda_{max} = 3.09$
On-time delivery rate	1/2	1	5	$CI = 0.05$
Air speed	1/4	1/5	1	$RI = 0.52$
$CR = 0.0911 < 0.1$ , pass the test				

According to the above judgment matrix obtained weight, summary can be obtained,

Table 11 A weighted ranking table of aggregated income

Target	First-order index	Weight	Secondary index	Weight	Combined weight	Importance ranking
Haikou fruit air carrier's choice	Reliability	0.0709	Fresh-keeping safety	0.5247	0.0372	9
			Reasonable charge	0.3338	0.0237	10
			Loss of goods	0.1416	0.0010	12

	Respon- siveness	0.3448	The degree of simplicity and convenience of business procedures	0.5889	0.2031	2
			Feedback ag- ing	0.2519	0.0869	4
			Complaint and claim	0.1593	0.0550	6
	Tangibility	0.4444	How ad- vanced the in- frastructure is	0.6127	0.2723	1
			Age of trans- portation	0.1180	0.0524	7
			Flight size and fre- quency	0.2693	0.1197	3
	Accuracy	0.1400	On-time deliv- ery rate	0.5321	0.0745	5
			On-time deliv- ery rate	0.3661	0.0513	8
			Air speed	0.1018	0.0143	11

### 7.3 Hainan fruit air carrier selection of scoring established standards

In this paper, in the process of evaluating the importance of the above indicators, ten core personnel are selected from the staff in the business to form a scoring group, which is graded according to the professional functions of the company staff, analyses the specific methods and processes, and implements the percentage system evaluation system:

#### 1. Reliability

The "fresh-keeping safety" was scored on-site by insiders, as shown in the table 12 below,

Grade	Score	Description
Excellent	100	The packing, appearance and freshness of the fruit will be all right when it reaches its destination.
Good	80	The above item is not completed
Medium	60	The above two items are not completed

Poor	0	None of the above has been completed
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The "reasonable charge" will be scored on-site by insiders, as shown in the table 13 below,

Grade	Score	Description
Excellent	100	Fruit transport when the loading rate, air mileage charges, the selection of the billing weight and gross weight of the cargo and the volume of the cargo charge standard are reasonable
Good	80	The above charge is unreasonable
Medium	60	The above two items do not add up
Poor	0	Three or more of the above are unreasonable

The "loss of goods" is scored by insiders on-site, as shown in the table 14 below,

Grade	Score	Description
Excellent	100	The phenomenon of fruit being squeezed, bad fruit and rotten taste did not appear in the process of transportation or when the fruit arrived at the destination
Good	80	One of these three phenomena occurs
Medium	60	Two of the above three phenomena occur
Poor	0	All three phenomena are present

## 2.Responsiveness

The "simplicity and convenience of business procedures" was scored by insiders on-site, as shown in the table 15 below,

Grade	Score	Description
Excellent	100	It is convenient to sign and check the shipping documents, check the cargo, and transfer the cargo information between the cargo station and the airline
Good	80	The above is less convenient

Medium	60	The above two items are less convenient
Poor	0	None of the above is convenient

The "feedback processing time" will be scored on-site by insiders, as shown in the table 16 below,

Grade	Score	Description
Excellent	100	The processing time, processing plan and processing result of the customer's feedback are all within a reasonable range
Good	80	The above one does not make sense
Medium	60	The above two items do not add up
Poor	0	None of the above is reasonable

The "complaints and claims" will be scored on-site by insiders, as shown in the table 17 below,

Grade	Score	Description
Excellent	100	The degree of timely feedback and settlement of complaints, the degree of timely compensation for accident handling and the degree of customer satisfaction with the solution are all within a reasonable range
Good	80	The above one does not make sense
Medium	60	The above two items do not add up
Poor	0	None of the above is reasonable

### 3.Tangibility

The "advanced level of infrastructure" was scored on-site by industry insiders, as shown in the table 18 below,

Grade	Score	Description
Excellent	100	The system and coordination of transportation infrastructure such as cargo platforms, trucks and roads, and the forward-looking and innovative design capability of infrastructure are more advanced

Good	80	One of the above three is less advanced
Medium	60	Two of the three are less advanced
Poor	0	All three are less advanced

The "transportation time limitation" is scored on-site by insiders, as shown in the table 19 below,

Grade	Score	Description
Excellent	100	Delivery time, delivery time, signing time are timelier
Good	80	One of the three items above is not timely
Medium	60	Two of the above three items are not timely
Poor	0	None of the above three items are timely

The "frequency and scale of flights" are scored on-site by industry insiders, as shown in the table 20 below,

Grade	Score	Description
Excellent	100	The route network between the two cities is dense, the operation scale is large, and the number of round trips is reasonable
Good	80	One of these three things is not reasonable
Medium	60	Two of the above three are unreasonable
Poor	0	None of these three things makes sense

#### 4. Accuracy

The "on-time delivery rate" was scored on-site by industry insiders, as shown in the table 21 below,

Grade	Score	Description
Excellent	100	The on-time delivery rate of actual demand statistics and actual on-time delivery rate of actual commitment statistics are within a reasonable range



Good	80	One of the above items is not within the reasonable range
Poor	0	Neither of these is reasonable

The "on-time delivery rate" is scored on-site by insiders, as shown in the table 22 below,

Grade	Score	Description
Excellent	100	The ratio of the number of flights whose actual departure time is more consistent with the planned departure time (normal flights) to the total number of flights, and the frequency of the flight landing time being delayed or less than 30 minutes in advance of the planned landing time (flight time schedule) are within a reasonable range
Good	80	One of the above two items is not reasonable
Poor	0	Neither of the above is reasonable

The "flight operation speed" is scored on-site by insiders, as shown in the table 23 below,

Grade	Score	Description
Excellent	100	The actual flight speed of different types of aircraft in the air can meet the requirements of economy, safety and comfort
Good	80	One of the above three items does not meet the requirements
Medium	60	Two of the above three items do not meet the requirements
Poor	0	The above three do not meet the requirements

#### 7.4 Carrier selected implementation process

According to the establishment of the above index system and scoring system, the selection phase of carriers of Hainan Fruit Air began. Combined with the actual situation of the company and the selection evaluation system, the optimized carrier selection evaluation flow chart is shown in Figure 2,

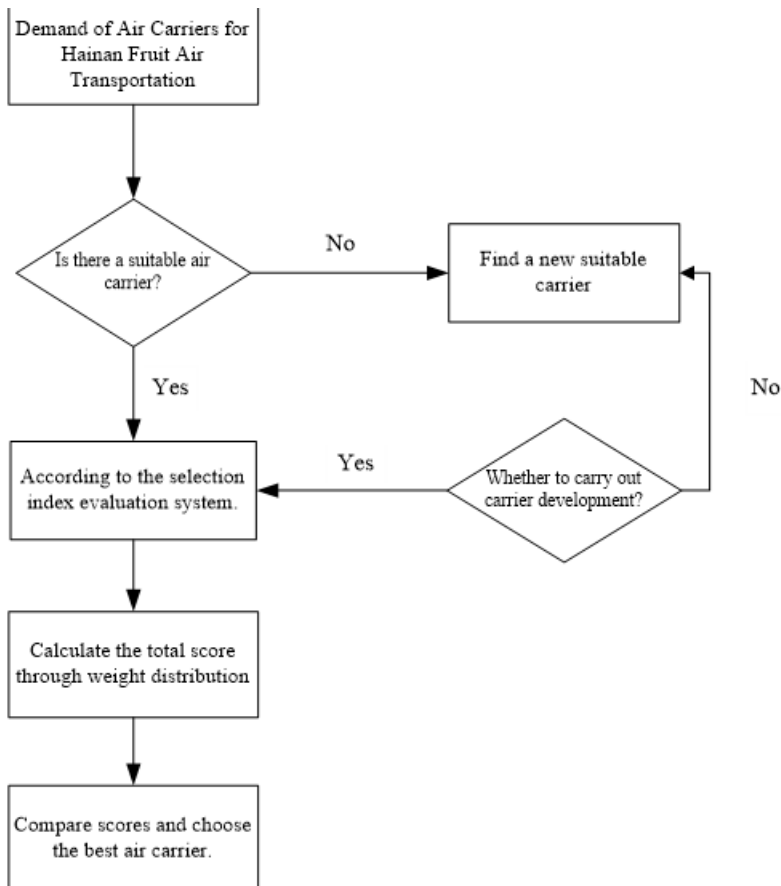


Figure 2 Implementation flow chart of carrier selection(Chen,2023)

In view of the above carrier implementation flow chart, Haikou fruit merchants should first analyze the competition in a specific market, know who is the market leader, what is the current market development trend, and what is the positioning of major airlines in the market, so as to have a general understanding of potential carriers. After careful analysis of the market, Haikou fruit merchants will determine the carrier selection target according to their business needs and establish an evaluation index system, and then through various public information and publicity. These channels include active inquiry and introduction of carriers, professional media advertising, Internet search and other ways to select carriers according to the importance ranking factors obtained from the weight ranking table in Table 2.6. At the same time, fruit merchants need to ask the air carriers already included in the selection scheme for the required data. Including whether the reliability of fresh-keeping safety in the previous air cargo orders of the air carrier is up to standard, whether the charges are reasonable, whether the loss rate of goods is within a reasonable range, whether the business procedures for fruit consignment are simple, convenient and easy to operate for fruit merchants, whether after-sales feedback and claims are handled in time and properly, whether the advanced infrastructure of the carrier in logistics meets the requirements of fruit merchants in the process of fruit transportation, Whether the transportation

timeliness from the receipt of the order to the arrival of the goods at the customer's hands is up to standard, whether the flight arrangement of the air carrier is reasonable, whether the freight is delivered on time, and whether the running speed is safe and reliable, in the process of analyzing and comparing these materials, we should focus on the indicators contained in "tangible" and "responsiveness", and preliminarily screen potential carriers according to the above logistics carrier selection criteria and business needs of enterprises. Get an inspection list of carriers, and make a preliminary evaluation of these logistics service providers. Haikou fruit merchants collect different quotations and service items from various air carriers for final comprehensive evaluation. Finally, Haikou fruit merchants should invite experts in aviation logistics, air freight, international logistics, aviation operation and management to make an in-depth analysis and comprehensive evaluation of the obtained data and materials and make the best choice.

## 8 Discussion

According to the index system established above and the weight ranking results obtained, this chapter will discuss the results and put forward some constructive suggestions for Haikou fruit sellers to choose air carriers.

### 8.1 Results

When selecting air carriers for Hainan fruits, the index system was established and the weights of primary and secondary indexes were calculated through AHP, and the calculated results were ranked from high to low. It is not difficult to find that the score of tangibility is high, followed by responsiveness, accuracy, and reliability. We can draw a conclusion that from the perspective of fruit sellers, tangibility is the most important for them because the advanced level of infrastructure directly affects the results of the whole transportation. If the facilities are not advanced, then every link will be affected, and eventually lead to unsatisfactory transportation results. Based on this, this paper puts forward different suggestions from the perspective of air carriers and fruit sellers respectively.

From the perspective of a fruit merchant, choosing the right carrier has a huge advantage for one's own development.

(1) When selecting air carriers, fruit suppliers should first evaluate themselves. The first content is to evaluate their own logistics objectives, so as to clarify the average logistics service level of the industry. Then, based on its own resources and strategies, it evaluates the target selected by the expected logistics carriers and takes this target as the technical standard to evaluate the logistics capability of external logistics carriers. The second content is to evaluate its own internal operation mode to determine the best docking mode and the best cost combination.

(2) Fruit suppliers should formulate several standards when choosing carriers. For example, the fruit perfection rate, fruit damage rate and fruit damage degree included in the quality of logistics service can reflect the state of the fruit received by customers, and also reflect the logistics service quality of air logistics carriers; Thirdly, the carrier's freight rate, delivery time, advanced level of infrastructure, etc., can reflect the level and ability of the service provided by the airline.

From an air carrier's perspective,

(1) To enhance the advanced level of their own airline infrastructure to improve their competitiveness,

(2) Simplify the cargo business process of various airlines to improve business efficiency

(3) Reasonable planning of flight frequency and flight scale between different cities

(4) Strengthen the customized services of its own aviation department and improve the strategic cooperation ability with fruit vendors. Strengthen the construction of information service, modern logistics information system is a subset of enterprise information, it has the characteristics of real-time, systematic, network professional, intelligence, through the logistics carriers and customers to establish the Internet, so that fruit carriers and logistics carriers information sharing, can save a lot of time and logistics costs, flexible response to uncertain product demand; At the same time, we should provide flexible value-added services, cultivate a high-quality logistics management team, and have a set of perfect logistics emergency services when emergencies occur.

## **8.2 Conclusion and prospect**

According to the above suggestions, this section will give a comprehensive summary and outlook on the future development.

### **8.2.1 Conclusion**

The selection of air logistics carriers is a key link in the logistics transportation process of Hainan fruit merchants. In practical application, the evaluation system is often not reasonable and the evaluation method is not suitable enough, which leads to poor logistics performance. For enterprises without their own logistics team, the correct selection of air logistics carriers is closely related to the logistics cost of the enterprise. Production cost and enterprise reputation, so the establishment of the corresponding index and model are of great significance. From the perspective of enterprises in need of air logistics services, this paper conducts an in-depth study on the selection of air logistics carriers. Based on the discussion of the logistics status and existing problems of Hainan fruit outbound, this paper conducts a study on the evaluation index system of the selection evaluation of air cargo carriers. The main research results are as follows:

Firstly, starting from the characteristics of the aviation logistics, this paper analyses the status and future development direction of aviation logistics industry and the status and future development trend of Chinese aviation logistics enterprises

Secondly, the evaluation of carrier selection of Hainan Fruit Air can be carried out from the dimensions of "reliability", "responsiveness", "tangibility", "tangibility" and "accuracy".

Thirdly, an evaluation system suitable for the selection of air logistics carriers of fresh fruit products is constructed. The research of this topic is from the perspective of fruit suppliers to study how to establish the appropriate evaluation index system and choose the appropriate evaluation method

in the process of aviation logistics management, through the establishment of a complete set of logistics carrier evaluation index and standard to conduct a comprehensive and scientific evaluation of each airline company. Correct selection of air logistics carriers, effective management of air logistics carriers, and the use of objective ways to achieve fruit business objectives, enterprise logistics management will have far-reaching significance.

Fourthly, it lays a foundation for other enterprises to establish the promotion and application of the evaluation index system when selecting air carriers. Combining theoretical research with practical work, this paper analyses the characteristics of the air freight logistics transportation industry and establishes a set of evaluation indexes and methods for air logistics service providers suitable for the industry based on the development of our air freight logistics industry. The research results closely combined with practice are conducive to enriching the research on the evaluation of air logistics service providers and provide a case reference for related research in related industries.

### **8.2.2 Prospect**

Although the paper studies the selection of air logistics carriers, there is certain incompleteness in data collection and study of historical data because the Chinese air logistics service is still in its infancy. These defects will be changed with the continuous development of air logistics services in future research.

With the rapid development of the aviation logistics service industry, a more integrated and information-zed aviation logistics supply service network will gradually take shape, the service items of aviation logistics service will be further refined and increased, and the aviation logistics service industry will also undergo great changes. Future research on the selection of aviation logistics service providers will be developed in the following aspects:

First, the existing factors affecting the selection of air logistics service providers will be improved to adapt to the development of the economy and logistics industry.

Second, with the continuous development and innovation of mathematical methods, we can also try to apply the new mathematical model to the selection of air logistics service providers, in order to achieve a great theoretical breakthrough.

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