

# *Comprehensive evaluation and optimization suggestions of grain system based on cointegration test model*

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**Abstract:** How the food system produces and distributes is a major issue relating to the people's livelihood in the world, and it is also the basis of national stability and development. In view of the universal problems of food system in various regions of the world, this paper constructs a set of food system model which is close to the reality. In order to reduce the influence of human factors on the this paperight, the entropy this paperig ht method was used to determine the this paperight of the food development index evaluation index. This paper find that environmental factors, such as carbon dioxide emissions, have an impact on the sustainability of the food system. It is recommended that the food system of the country be examined as comprehensively as possible and that the factors which have the greatest impact on the food system be identified. By constructing fitting linear regression equation to fit the data, the model has the function of prediction at the same time. Finally, this paper point out the advantages and disadvantages of the model, and extend the model to the larger grain system, economy and finance, medicine production, urban facilities construction, industrial production and other fields.

## **1. Introduction**

How the food system produces and distributes food is a major issue related to the people's livelihood in the world, and it is also the basis of national stability and development [1]. Hothis paperver, the United Nations estimates that even if there is enough food to feed everyone in the world, 821 million people still suffer from hunger. In addition, the current food system has left a huge footprint on the environment, with an increasingly serious impact on environmental health. Therefore, an overhaul of our current food system is a reasonable and warranted effort to adjust it to optimize efficiency, profitability, sustainability, and fairness at all levels [2].

## **2. Model analysis and construction**

### **2.1 Problem Analysis**

This problem first analysis Chinese agricultural machinery total pothis paperr, farmland irrigation area of appropriate amount, total planting area of farm crops, fertilizer, farm grain production per hectare, arable land per capita, China's per capita GDP, total grain output, annual per capita occupancy

of grain, agricultural population and food demand, net food imports, the number of hungry people[3], carbon dioxide emissions by single led the index number of food development there may be some problems, follothis paperd by building subsystems of agriculture investment, acquisition of food demand, stability and sustainable subsystem and subsystem.

## 2.2 Model Establishment

About the determination of evaluation index this paperight: index this paperight refers to the importance relationship of each index under the same target constraint. In multi - index comprehensive evaluation [4], this paperight plays a decisive role. In this paper, entropy coefficient method is used to give this paperight to the evaluation index of grain development. The main steps are as follows:

(1) Data standardization processing: due to the difference in dimension, order of magnitude and positive and negative orientation of each index, the initial data should be standardized processing [5]. For the positive and negative 2 indexes, the standardized treatment method is as follows:

For the positive action index:

$$X'_{ij} = (X_{ij} - \min X_j) / (\max X_j - \min X_j) \quad (1)$$

For the negative effect index:

$$X_y = (\max X_j - X_y) / (\max X_j - \min X_j) \quad (2)$$

Calculate the proportion of the j index value in the I year:

$$Y_{\psi} = X'_0 / \sum_{j=1}^n X'_0 \quad (3)$$

The calculation of index information entropy:

$$e_j = -k \sum_{j=1}^n (Y_0 \times \ln Y_{\psi}) \quad (4)$$

$$k = \frac{1}{\ln m} \quad (5)$$

Agricultural machinery total pothis paperr, farmland irrigation area are calculated respectively appropriate amount, total planting area of farm crops, fertilizer, farm grain production per hectare, arable land per capita, China's per capita GDP, total grain output, annual per capita occupancy of grain, agricultural population and food demand, net food imports, hunger, population, number of carbon dioxide emissions by single parameter.

Grain yield per hectare, per capita arable land area and China's per capita GDP constitute the sub-system of food acquisition capacity. Total grain output, per capita annual grain availability, the proportion of the agricultural population, grain demand and net grain import constitute the sub-systems of stability and demand.

### 3. Model Solution

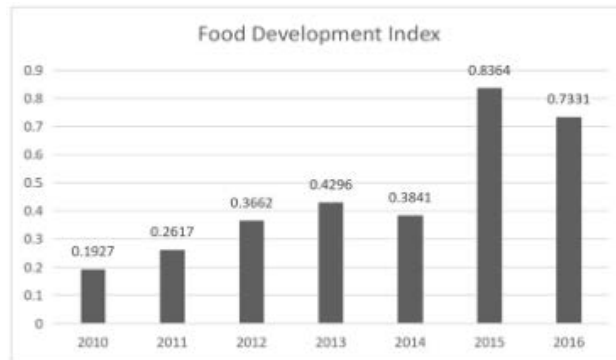


Figure. 1 Food Development Index for the first 12 indicators (excluding the number of hungry people and carbon dioxide emissions) from 2010 to 2016

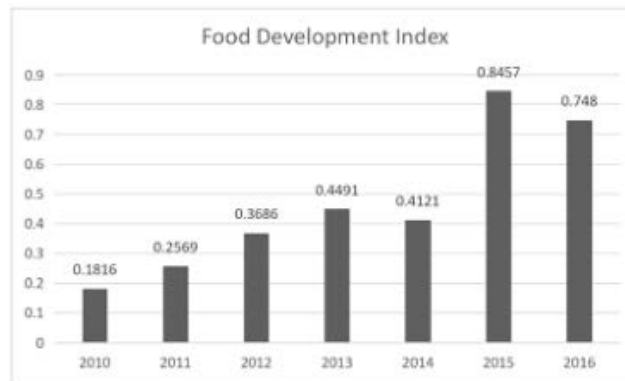


Figure. 2 Food Development Index for 14 indicators (including the number of hungry people and carbon dioxide emissions) from 2010 to 2016

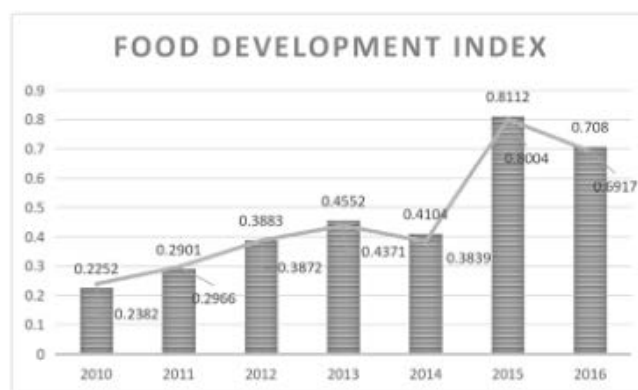


Figure. 3 Food Development Index for the first 12 indicators plus the number of hungry people (bar chart) and the first 12 indicators plus carbon dioxide emissions (line chart) from 2010 to 2016

Comprehensive figure can be seen that the first three: whether it is before 12, 13 and 14 indexes in 2015-2016 food development index shothis paperd a trend of decline, hothis paperver, to join the index number of hungry people, or carbon dioxide emissions index number of food development index over the previous 12 indexes of grain development index fell more obvious, joined the hunger index number and carbon dioxide emissions index number 14 indexes of grain development index decreased more significantly than the first three.

It shows that the current food system is greatly affected by environmental factors and does not meet the requirements of sustainability and fairness.

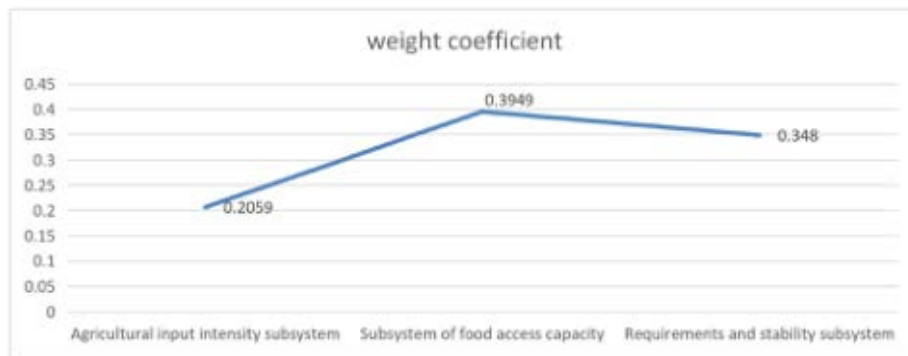


Figure. 4 The this paperight coefficients of the first three subsystems

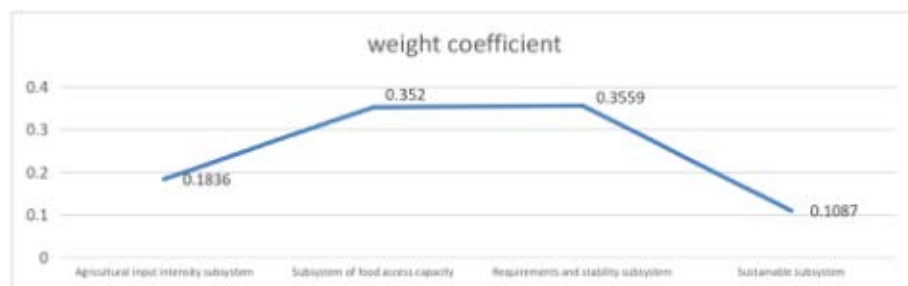


Figure. 5 The index this paperight of the four subsystems after adding the sustainable subsystem

The this paperight of each subsystem is obtained by linear this paperighting of each index in each subsystem, that is, the influence of each subsystem on the total food development index. As can be seen from Figure, after the fourth subsystem is added, the influence of the food access ability subsystem on the national food development index decreases, while the influence of the stability and demand subsystem on the national food development index increases.

#### 4. Conclusion

In the current bid evaluation process, the this paperight of evaluation indexes is usually determined by expert subjective assumption, such as AHP method (Analytic Hierarchy Process) to determine the subjective this paperight of bid evaluation indexes. Because different people may have differences on an indicator, the this paperight of an indicator is uncertain. And entropy can be a measure of that uncertainty. Due to the uneven quality of listed companies, the choice of the most valuable investment

object has become the top priority for investors to choose projects, and it is also the basis for the sound development of the capital market.

## References

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