






## The Appearance Design of Agricultural Product Packaging Art Style Under the Intelligent Computer Aid

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**Abstract.** As the economy develops, the sale of agricultural products changes from extensive model to intensive model. Packaging appearance carries the function of conveying agricultural product information, inducing consumption and spreading culture. In view of the limitations of the existing packaging of agricultural products, this paper focuses on the main consumer groups of agricultural products, constructs the framework of packaging design, based on the transmission of local agricultural products value and original ecological concept, constructs the overall model of computer-aided packaging design. Combined with the characteristics of agricultural products to carry out packaging design planning, including packaging materials and technology, packaging structure, visual design of packaging three aspects. In this paper, the computer-aided color design theory, the local characteristics and ethnic characteristics of agricultural products into the packaging design of agricultural products, and through the computer-aided color design performance packaging visual design through the visual arrangement of color, graphics, text three elements of a reasonable combination, accurate transmission of product information. In this paper, the intelligent design method is used to realize three-dimensional environment simulation of packaging appearance, and the dynamic characteristics of the structure and the color saturation test are tested to verify the feasibility of the model.

**Keywords:** Intelligent, agricultural packaging, artistic style, computer aided appearance design

**DOI:** <https://doi.org/10.14733/cadaps.2022.S3.164-173>

## 1 INTRODUCTION

Packaging of agricultural products is about to enter or has entered the circulation of agricultural products or processed products using a certain container or material to protect and decorate. In modern marketing, the requirements for commodity packaging are increasingly high, not only limited to the protection and carrying functions of traditional packaging, but also hope that through the improvement of packaging design, agricultural products can stand out from many agricultural products to win the favor of consumers and improve the competitiveness of agricultural products in the market. Under the new economic model, the packaging design of agricultural products is not limited to basic functions such as protection and portability, and businesses gradually focus on the brand culture and consumer psychology of packaging. By improving the external image of products, the added value of agricultural products can be further enhanced, so as to enhance the brand value of agricultural products. The packaging design of agricultural products in the new era is a distinctive and indirect characteristic image. In the packaging design of agricultural products, we should start with the market positioning, design strategy, sales mode, original ecological.

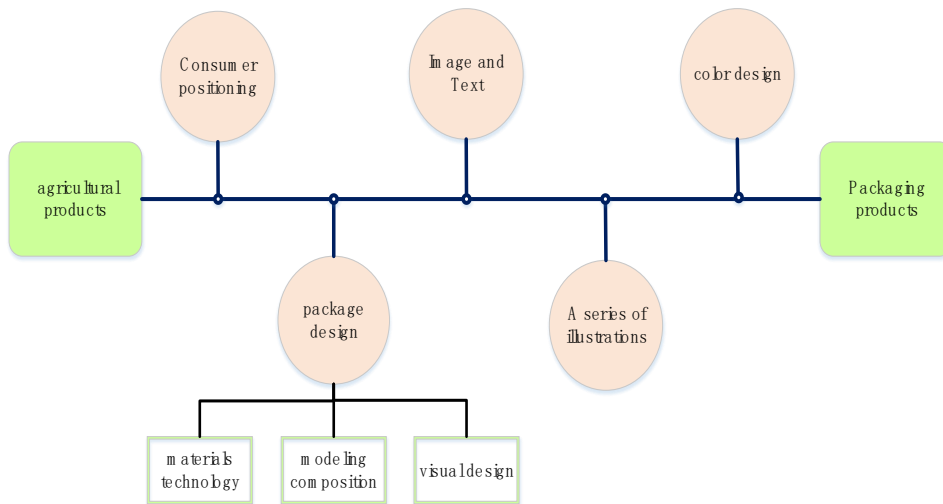
The research on agricultural products packaging at home and abroad is very mature, foreign businesses will be based on the characteristics of the market and consumer demand, gradually form a unique agricultural products packaging development model, agricultural products packaging in the design and function, the development is relatively perfect. Ng and Chan [1] put forward that the status of packaging of agricultural products in China is getting higher and higher in agricultural trade, and the improvement of packaging is an important method to upgrade the grade of agricultural products. He and Sun [2] put forward under the background of agricultural brigade fusion, agricultural product packaging design in urgent need of transformation from cultural transmission, product value, ecological concept, environmental protection concept, consumer psychology and other aspects, make the packaging and product combination, so as to enhance agricultural products brand image, promote modern agriculture sustainable development of agricultural products sales. Quan et al. [3] proposed leisure agriculture as a new mode to promote the development of agricultural industry, interrogated the traditional packaging of agricultural products, and proposed how to design valuable packaging of agricultural products. Jin and Yang [4] proposed that the development and research of packaging design of agricultural products with local characteristics would contribute to the development of rural economy and the implementation of rural revitalization policies. Liu et al. [5] proposed that Chinese traditional agricultural packaging should break through the status quo and systematically use new technologies, techniques and methods to enhance the added value and competitiveness of agricultural products.

The basic theory of color design and the method of design representation have formed a new research field due to the cross and fusion of color design with new technology and new disciplines. Digitization, integration, networking and intelligence are the inevitable development direction of computer-aided color design, and the leading direction of computer-aided color design research is inevitably the intelligent color design system with designer as the core [6]. At present, the use of packaging color of many agricultural products on the market does not conform to the psychological design of color, often just to meet the most basic needs of packaging protection products, in the use of color and design is very optional. The packaging of many agricultural products is crude, crude and aesthetic, not to mention can arouse the taste sense of consumers. In order to enhance the market competitiveness and market share, it is necessary to analyze the relationship between color, sensation and taste. The expression needs to use scientific and reasonable methods, so that the fresh and delicious food in the package can be transmitted to consumers through more perfect color.

## 2 INTELLIGENT COMPUTER PACKAGING SYSTEM FOR AGRICULTURAL PRODUCTS

### 2.1 Package Design Framework

The packaging of agricultural products should highlight the regional advantages, brand image, transfer the value of local agricultural products and the original ecological concept. At the same time, in order to solve the marketing problems, the positioning of consumers, products and sales channels should be analyzed in advance [7]. Combined with agricultural products to carry out packaging design planning, including packaging materials and technology, packaging structure, visual design of packaging three aspects. The selection of materials and processes should be based on the characteristics of agricultural products and in line with the principle of economic applicability and original ecology. The design of the shape and structure of the package should break the original directional thinking, highlight the characteristics of the product, and show it to consumers more intuitively. The visual design of packaging combines the three elements of color, graphics and text reasonably through visual arrangement to accurately convey product information. The specific design architecture is shown in Figure 1.



**Figure 1:** Package design frame drawing.

### 2.2 Design Flow

Packaging design process from the point of view of design to analyze the pattern of product packaging, packaging color, packaging structure, packaging materials. Taking into account the shelf effect and competitive advantages of product packaging, the advantages with similar products should be fully explored. Before the final production, be sure to print the sample, to ensure the correctness of the packaging structure, in order to facilitate modification. The design process is shown in Figure 2.

### 2.3 Consumer Market Research

With the continuous renewal of The Times, the main body of consumers is also changing, and the proportion of men and women in the consumer groups is changing. At present, the ratio of men to women in the consumer market is about 25.9% and 74.1%. This data shows that the main body of the consumer market is still female. In order to better serve the consumer groups, packaging design must start from the perspective of women. The new generation of consumers pay more attention to personality, appearance, fashion, emotional expression, and more pursuit of exquisite

life. The modern young generation of consumers have stronger spending power, so the consumer group is concentrated in the young consumers aged 20-45. This is shown in Figure 3.

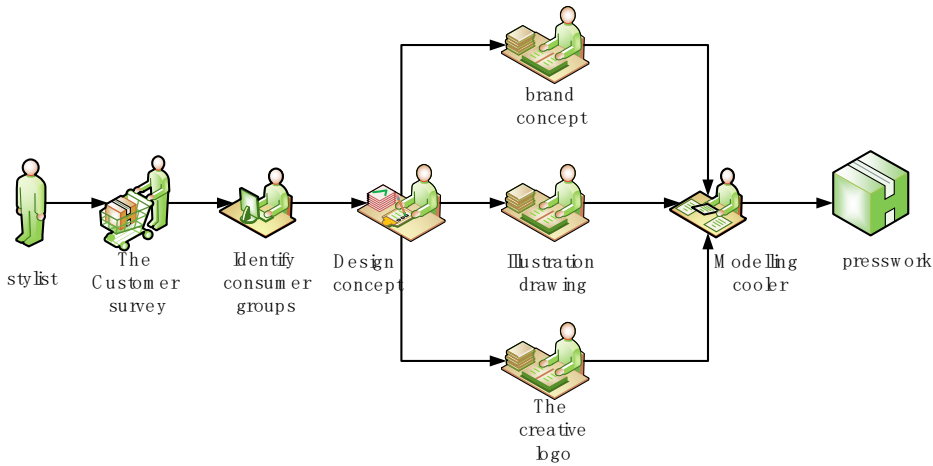


Figure 2: Design flow chart.

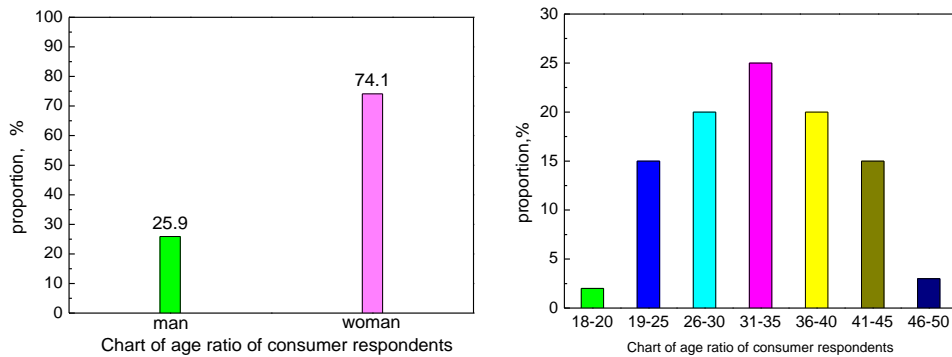


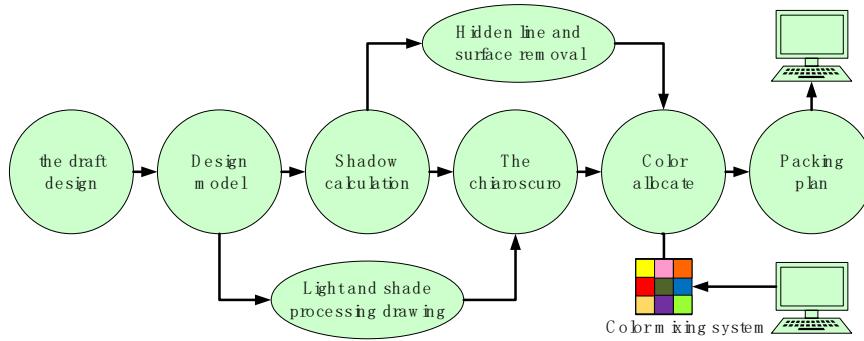
Figure 3: Statistical chart of male/female ratio of consumers and age of respondents.

2.4 General Model of Computer Aided System

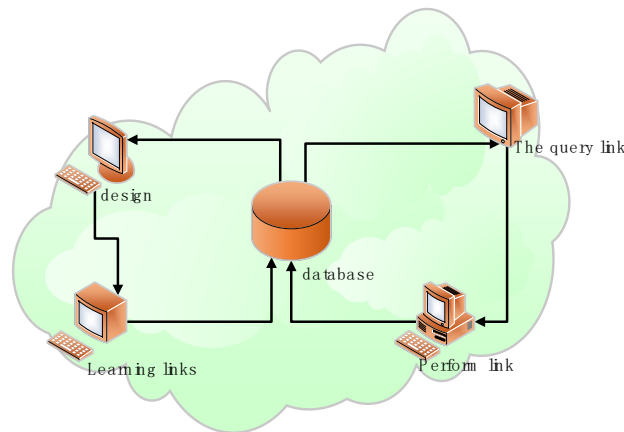
The computer aided packaging design meets the requirements of protection performance, publicity art performance, use performance, economy and realization of protection performance. The overall system includes pattern model, hidden line and surface elimination, shadow calculation, light and shade processing, sales environment simulation and texture simulation, and the relationship between the six parts is shown in Figure 4.

2.5 Machine Learning System

The computer-aided packaging design system should conform to the intelligent function and make comprehensive use of some new technologies and achievements in the field of artificial intelligence, such as machine learning, rough set theory, artificial neural network technology, etc. Machine learning has been successfully applied in other fields [8]. The basic model of a machine learning system is shown in Figure 5.



**Figure 4:** System overall model.



**Figure 5:** Basic model of machine learning system.

### 3 PACKAGING DESIGN OF AGRICULTURAL PRODUCTS

#### 3.1 Material and Process Design

In the design of packaging materials and processes, materials with obvious regional characteristics can be selected to break the original directional thinking and form a novel and unique new style by weaving and assembling raw materials. Universal packaging produced on the market is also a good choice. Packaging here often has a feature that there is a large area of space for visual design [9]. Nonwoven fabric is a kind of nonwoven fabric, which is a new type of fiber products directly formed by various fiber mesh forming methods and consolidation technologies using polymer slice, short fiber or filament. Cartons are more reasonable and high-grade, suitable for gifts. Cartons printed on the outside of the product information to play a promotional role.

#### 3.2 Modeling and Structural Design

The modeling should be designed according to the attributes of agricultural products and the market demand. The inside and outside structure and shape of the package should be reasonable and appropriate, and the visual presentation should be beautiful. With the development of economy and the advancement of technology, consumers' consumption patterns have been profoundly changed [10]. Origin direct sales, online sales, group shopping and other ways to

shorten the distance between products and consumers. Due to the increase of product brands and the increasingly fierce competition, the personalized packaging shape of agricultural product packaging can quickly attract the attention of consumers, bring consumers visual enjoyment and gain consumers' recognition.

The design of packaging structure refers to the design of the internal and external structures of packaging. According to the function and design requirements, different packaging materials and related auxiliary materials are selected, and the internal and external structures of packaging containers are designed with certain technologies and design methods. Reasonable setting of packaging structure, can better display the characteristics of the product, convenient for consumers to buy and take. The research and development of new environment-friendly materials can save costs, make it recyclable and improve the brand image. Product characteristics mainly include the quality of the contents and the maximum size of the appearance. For packaging design, the key is the allowable stress of packaging. In order to ensure that it will not be damaged during normal work, the working stress must be limited within the allowable stress range. The allowable stress of packaging is based on the test strength. Its calculation formula is as follows:

$$\mathfrak{R} = \sum_{k=1} kx + \sum_{j=2} jx + L \times \frac{p}{a} \quad (1)$$

Because the size of each component has not been determined, so in the beginning of the design can only be determined size.

$$L = \sum 2R + 2 \times L_0 \quad (2)$$

$$H = \sum 2R + \frac{L_0 + 5}{2} \quad (3)$$

$$N = \sum 2R + 2 \quad (4)$$

### 3.3 Visual Element Design

With the increase of the types of agricultural products, simple packaging is difficult to convey all the detailed information of agricultural products to consumers, but consumers can get the information, quality and production date of the products through packaging. Pictures can be used to understand the appearance of the product, and text can be used to increase consumers' understanding of the product. The packaging strategy to highlight the image of agricultural products is to convey product information by showing the way of external appearance.

The particularity of agricultural products determines that the pattern design of the packaging should more strictly and accurately express the basic attributes of the products, highlight the advantages of the products, meet the aesthetic needs of consumers, but also show the unique integrated style of the countryside. In the process of design, the expression method of graphic visual language can be used for reference, and local cultural characteristics can be integrated into it to improve the connotation of graphics. The packaging appearance should conform to the overall visual unity, with ideological connotation and formal beauty rules. The pattern design of agricultural products packaging mainly includes three kinds: brand logo graphics, product image auxiliary graphics and decorative graphics. Brand logo graphics reflect the cultural connotation of the pastoral complex, which is to maintain a long-term unified image of the brand and cannot be changed at will. Product image auxiliary graphics and decorative graphics can be designed according to the characteristics of the product, which can highlight the characteristics of the product and reflect the brand culture through different techniques and forms of expression. In the design to break the single way of painting, we should give full consideration to the combination of traditional technology and modern design, reflect the fashion of the product personality, but also retain the traditional cultural characteristics. It is mainly expressed in three ways: abstract, concrete and decorative figures.

### 3.4 Representational Graphic

The figurative figure in the packaging of agricultural products is extracted from the natural form and has distinct image characteristics. It is the concentration and refinement, generalization and simplification of the real object, highlighting and exaggerating its essential factors. Abstract graphics are usually represented by geometric graphics, this kind of design modeling is simple and has profound connotation to give people a strong sense of modern and visual impact. The characteristics of pastoral agricultural products can be extracted and summarized with points, lines and surfaces to express the personality and unique charm of the products.

## 4 COMPUTER AIDED COLOR DESIGN

When customers choose the packaging of agricultural products, the first thing they pay attention to is the overall collocation of the packaging, and color undoubtedly occupies a more important proportion in the packaging design. In color painting, there is a step called toning. Everyone makes a different color, even though they all use the same paint. The perception and understanding of colors are perceptual and vague. Industrial design needs color that is stable, single, reliable, and reflects the cognitive characteristics of the group. Industrial design requires accurate reproduction, so that the product and its packaging appear exactly the same color.

### 4.1 The Establishment of Color System

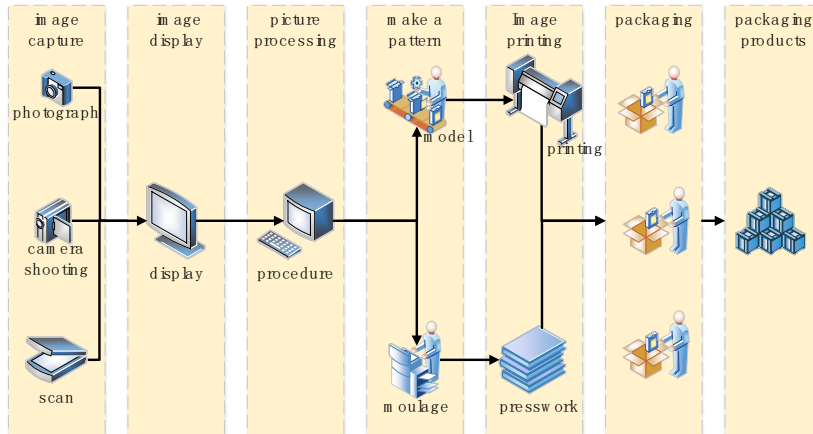
The quantification of color is mainly the establishment of the Keating color system. The three elements of color are hue, lightness, purity, respectively, to express. Color is represented by three-dimensional variables: establish a coordinate system with three axes perpendicular to each other, and call it color space. Any point in the color space can represent a certain color corresponding to it. In the above formula, represents the main wavelength of the color light, X, Y and Z are the units of the parameters of the three elements respectively, and are the values of the three coordinates of the point respectively.

### 4.2 Color Standardization

The chromaticity system is the representation mode of light colors, red, yellow and blue are the three primary colors of light colors. And in the printing industry are cyan, magenta, yellow, black ink color, each color is expressed as a percentage. The three primary colors of light are calculated by superposition, superposition together to be brighter. Light is superimposed, while paint absorbs light. Therefore, the three primary colors of pigments are the colors of the three primary colors that can absorb light. The three primary colors of printing are blue, fine and yellow, namely C, M and Y, which are the complementary colors of R, G and B. Viewers and scanners process colors based on additive coloring, while printing equipment uses a subtractive coloring system based on four colors. The process of image color printing is shown in Figure 6.

### 4.3 Computer Aided Drawing Technology

At present, the computer aided drawing software is divided into vector map and bitmap. Corel Draw Graphics Suite is the representative of vector drawing software and Adobe Photo shop is the representative of bitmap drawing and bitmap image processing software. Computer-aided drawing technology provides functions that are not available in traditional design. The shift design function of color design software Color Master is also called logical color design function. Can make the image color under the intelligent control of the software, the relative position of the image color unchanged, the hue ring is freely rotated, complete the design of the image on the color, its characteristic is to ensure the original image design coordination rate under the premise of color redesign.



**Figure 6:** Image color printing process.

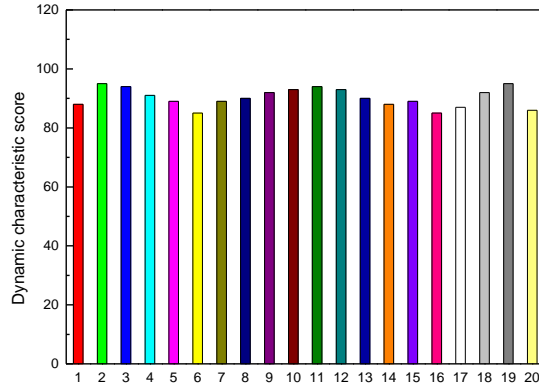
#### 4.4 Packaging Design Composition

Packaging design composition is a complete picture that combines the trademark, graphics, text and color on the display surface of the package. The combination of these four aspects constitutes the overall effect of the packaging. Commodities design composition elements trademark, graphics, words and colors are used correctly, appropriately and aesthetically, can be called excellent design works. Trademark is a kind of symbol, is the symbol image of enterprises, institutions, commodities and facilities. Trademark plays a very important role in product packaging design. Logo design is inspired by the combination of graphics and letters to communicate with the public in a concise and lively graphic language. The selection of packaging pattern elements should conform to the characteristics of products, and reasonable use of concrete graphics, abstract graphics, decorative graphics. The selection of color should be combined with the standard color used by the complex to form a unified style with the personality of the product itself. The text part highlights the features of the product, and conveys the product information correctly through reasonable visual arrangement. The packaging of agricultural products with rich design forms, accurate information expression, diverse styles, green environmental protection and unique style has become a highlight. Embodied advocate freedom, with the idea of auxiliary graphics with purpose and functionality. Orderly graphic combination and arrangement usually can quickly attract the attention of consumers, more intuitive by consumers, thus generating emotional communication.

#### 4.5 System Model Test

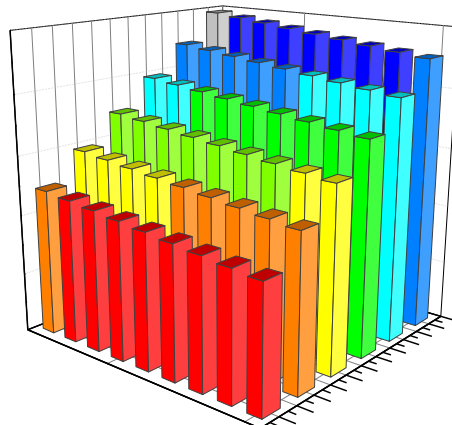
Test evaluation is a comprehensive analysis of the design results from all levels and angles to optimize and select the design results. The main tests are structural dynamic characteristic test and color saturation test. As package design involves both technology and art, the evaluation of package design needs to be coordinated and unified in both aspects. In order to meet the basic functions and expand the brand culture concept, we add visual decoration in the appearance design to highlight the product characteristics. 20 samples were selected to test the dynamic characteristics of the structure, and the test results were shown in Figure 7.





**Figure 7:** Dynamic characteristic test of structure.

Quantitative and rational processing of agricultural product packaging color is the key to appearance design, in order to try to get rid of the perceptual and fuzzy state in the use of color. The test results of color saturation calculated by superposition of three primary colors are shown in Figure 8.



**Figure 8:** Color saturation test.

## 5 CONCLUSION

Agricultural product packaging design is the most intuitive embodiment of the brand image, will directly face consumers, a regular brand packaging can obtain the trust of consumers, affect the psychological feelings of the consumer and purchase desire. Packaging appearance as its important physical carrier and image carrier, according to the brand image and its own characteristics of the extension of packaging design. In the design of agricultural products packaging, according to the local characteristics and cultural connotation of the creation, the use of unique resources to reflect their own brand characteristics, into the brand is conducive to improve the grade of agricultural products. In this paper, the packaging design of agricultural products from the material and process design, modeling and structural design visual elements, color aspects of research. In terms of vision and arrangement, starting from the three design elements of pattern, text and color, according to the theory of computer-aided color design, the expression technique of computer-aided color design for agricultural products packaging was formulated. Set up the frame of computer aided packaging design of agricultural products, and

discuss the process of computer aided packaging design in detail. This paper analyzes the characteristics of standard color, and uses three primary colors to mix industrial color, combined with computer aided drawing technology, draw package design composition. Solve the problem of poor traditional identification of agricultural products, improve packaging appearance design, process and style of outer packaging to make agricultural products stand out, gain the favor of consumers, improve the competitiveness of agricultural products in the market.

## 6 ACKNOWLEDGEMENT

The Art Key Project of Shandong Province (2017) "Research on the promotion of brand design in the brand construction of agricultural products in Shandong Province" (201706247)

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