Restrictive Factors and Output Forecast of Green Development of Agricultural Industry Based on Gray System

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Abstract. This paper analyzes the characteristics of agricultural products from the perspective of agricultural production, farmers' income, adjustment of agricultural structure and environmental improvement, and analyzes the characteristics of agricultural products in Lanzhou area. Through data mining and empirical analysis, the regional agriculture (1) forecasting model of gray system with dynamic data processing, combined with the output data of lily in 2004-2003, the yield prediction is predicted and the fitting state is good and the error is small. Finally, combined with the relevant characteristics of the local characteristics of the agricultural industry to make reference, by changing the characteristics of agricultural production as the center of the mindset, and agricultural industrialization and organic combination, take the characteristics of efficient industrialization of agricultural products.

1. Introduction
With the continuous improvement of China's product market, Gansu characteristics of agriculture has been a very good development, a few regional characteristics of agriculture has formed a certain scale, in the current context of Lanzhou characteristics of agriculture - Lilium davidii var. Unicolor industry, for the sustainable development of Gansu characteristics of agriculture is of great significance. Through the study of yield prediction at home and abroad, we can find that scholars are very concerned about the research of yield prediction. These scholars think that it is very important to increase production. There are many types of models used in yield forecasting. However, there are two major shortcomings in the domestic and international production forecast: one, not fully taking into account the complexity of production and information collection is not systematic, so the predicted data sometimes with the real situation there is a big gap. And some models require high data requirements, which also make data collection, processing and analysis become very complex, costly is very high, such as the use of remote sensing technology for production forecast requires a very good technology and a lot of money.

2. General Situation of Lanzhou Agricultural Economy Development
Lanzhou is located in the northwest of China, north of Gansu Province, north and Wuwei City, bordering Silver City, east and Dingxi City border, south and Linxia Hui Autonomous Prefecture border, with a total area of 13085.6 square kilometers. Summer without heat, no cold winter, is the famous summer resort. The average annual sunshine hours for 2446 hours, frost-free period of 180 days, the average annual rainfall of 327 mm, mainly concentrated in the 6 to 9 months. Lilium davidii var. Unicolor has a history of more than 400 years and is now largely edible Lilium davidii var. Unicolor is introduced by Yang Wangui from Shaanxi Changwu, Binxian, used as royal tribute and
supplying some dignitaries. After 100 years of nurturing development, due to the unique natural ecological environment, Lilium davidii var. Unicolor is the only food sweet lily, Lanzhou City and even Gansu Province is the characteristic industry. Lilium davidii var. Unicolor is also a business card for Lanzhou.

Lilium davidii var. Unicolor is a variant of Lilium, also known as Lanzhou sweet lily, its scales thick and hypertrophy, white jade, delicate quality, taste sweet and soft, no bitter taste, is China's four lily line only edible lily, For ginseng in vegetables. Professor Kong Xianwu, a famous expert in plant taxonomy in China, commented: "Lilium davidii var. Unicolor is very sweet and has little fiber and no bitter taste, not only is it famous, but also the world's first." "Lilium davidii var. Unicolor A world" reputation. With the lily processing enterprises in recent years to build and development, lily deep processing has also become a lily industry development trend. Development lily production of fresh, dry, flowers, health care, medicines and even skin care products, has gradually unfolded. At present, the use of Lilium davidii var. Unicolor has developed dry lily, lily powder, lily canned, health tea, oral liquid, tablets, lily sauce, lily preserved fruit, medicinal mask, etc., have been formed scale. In particular, the use of sulfur-free technology into dry lily, is a natural pollution-free food. lily products can regulate the body immunity, beauty beauty, anti-fatigue. It is good for health of people with great pressure on life and is an excellent health food. Lanzhou utilizes tunneling lily dehydrated dry advanced production process, in the production process, do not add any food additives, do not carry out any bleaching treatment, the production of pure sulfur-free dry lily color natural yellowish, shiny, pure taste for today The most ideal dry lily production process. Enterprises and research institutes developed a vacuum packaging of fresh lily, dry lily, lily polysaccharide capsules, lily drinks, lily noodles, lily wine, lily vinegar and other products.

As a regional specialty of agricultural products, Lilium davidii var. Unicolor has been a hundred years of planting history, Lilium davidii var. Unicolor has a great resource advantage. In lily's main producing areas, lily cultivation to Gansu-based, Gansu Province is an important economic crops and advantages of industry. Lilium davidii var. Unicolor in Lanzhou, Gansu Province, Pingliang, Tianshui and other areas have a large number of wild lily, these areas are also very many people planted lily. According to statistics, as of 2007, Gansu Province lily planted area has reached 0.67 million hectares, the output value after the food, ranked second in planting. In recent years, Lilium davidii var. Unicolor has embarked on an industrial path. Lilium davidii var. Unicolor industrialization is the city's key development projects, but also the province's agricultural industrialization development of key projects, lily industry is an important pillar of Lanzhou rural economy, in recent years at all levels of government attaches great importance to, Lilium davidii var Unicolor entered the industrial development track, there is a good room for development. Products have been exported to the major cities and Hong Kong, Macao and Taiwan regions, and even exported to Southeast Asia, Japan, South Korea, the United States and other countries.

3. Prediction of Agricultural Production by Gray System Model at Home and Abroad

Gray system in the international academic field has been widely applied and developed. Europe and the United States and other countries, China Taiwan, Hong Kong and the United Nations and other domestic and international organizations have many well-known scholars engaged in gray system research and application. TamuraY and so on using gray dynamic model to load forecasting were studied. SallehuddinR and so on on the model of the data characteristics of the factors were analyzed. Yubin's gray system theory is used to predict the coal production in China. Due to the factors influencing the development of coal industry, it cannot be expressed by specific parameters, and it is in accordance with the gray forecasting model. The forecasting value is corrected and the forecast results are suitable for medium- and long-term Forecast, the coal industry is of great significance. Chen et al. applied the gray relational analysis method to analyze the influencing factors of grain production in Heilongjiang province. Based on the gray system theory, the paper analyzes the output of annual animal products in Sichuan Province by means of mathematical model. The relative error test of the prediction results, select the high degree of fitting data, used to predict the next few years
the output of livestock products. The forecast is used to guide the livestock production enterprises and farmers livestock production, to avoid the dynamic grasp of the livestock market are not allowed to produce economic losses. Qi Xuelong and so on that the fruit industry there is a certain degree of volatility and contingency, the existence of human error in the statistical process, should consider the seasonal factors, with the moving average method for several years in Shandong Province fruit production raw data optimization, according to gray system theory, The establishment of the model, the year and year of fruit production in Shandong Province were predicted. According to the literature, there are many researches on the gray correlation of grain yield, but there are still few studies on the characteristics of agricultural products.

4. Research Methods and Empirical Analysis

4.1. Gray GM (1,1) build and yield prediction

According to the statistics, we select the output data of lily in Lanzhou City from 2004 to 2013, and the yield data sequence is \( x_0 = [x_0(1), x_0(2), \ldots, x_0(10)] \). \( \lambda(k) \) can be obtained by formula

\[
\lambda(k) = \frac{x(0)(k-1)}{x(0)(k)} \quad (k \geq 2).
\]

Through the feasible interval \( e^{0.6065}, e^{1.6487} \) we can see that \( \lambda(k) \) is within the feasible range.

Start GM(1,1) modeling, accumulate the generated AGO sequence through the original sequence as follows:

\[
x' = [x'(1), x'(2), \ldots, x'(10)]
\]

By the following formula:

\[
B = \begin{bmatrix}
-1/2 & x(0)(1) + x(0)(2) \\
-1/2 & x(0)(2) + x(0)(3) \\
-1/2 & x(0)(3) + x(0)(10)
\end{bmatrix}
\]

\[
Y_n = \begin{bmatrix}
x(0)(2), x(0)(3), \ldots, x(0)(10)
\end{bmatrix}^T
\]

\[
\hat{a} = (a, b)^T = (B' B)^{-1} B' Y = \begin{bmatrix}
-0.0302 \\
42122.763
\end{bmatrix}
\]

As well as through the MATLAB software can be developed gray number \( a = -0.0302, |a| \leq 0.3 \), endogenous control variable \( b = 42122.763 \), gray model to meet the \( |a| \leq 0.3 \), suitable for long-term forecast. At this time according to the model to calculate the event response function is:

\[
x^{(0)}(k+1) = x^{(0)}(1) - \frac{b}{a} e^{-b} + \frac{b}{a} e^{b} = 144183.477 e^{-0.0302} - 1394793.447
\]

The predictions of the original sequence are obtained by combining the formula \( x^{(0)}(k+1) = x^{(0)}(k) + \lambda^{(0)}(k) \), as shown in Table 1.
Tab.1 Untreated GM(1,1) Forecast and Residual Test

| Year | Raw yield /t | Forecast production /t | Absolute error /t | Relative error /% |
|------|--------------|------------------------|-------------------|------------------|
| 2004 | 47 040       | 47 040                 | 0                 | 0                |
| 2005 | 46 536       | 44 206                 | -2 330            | 5.0              |
| 2006 | 44 250       | 45 560                 | 1 310             | 3.0              |
| 2007 | 44 382       | 46 956                 | 2 574             | 5.8              |
| 2008 | 50 325       | 48 395                 | -1 930            | 3.8              |
| 2009 | 55 087       | 49 878                 | -5 209            | 9.5              |
| 2010 | 47 776       | 51 406                 | 3 630             | 7.6              |
| 2011 | 50 350       | 52 981                 | 2 631             | 5.2              |
| 2012 | 48 407       | 54 604                 | 6 197             | 12.8             |
| 2013 | 63 253       | 56 277                 | -6 976            | 11.0             |
| 2014 |              | 58 002                 |                   |                  |
| 2015 |              | 59 779                 |                   |                  |

Fig.1 Comparison of original and GM(1, 1) predicted yields

As can be seen from Table 1 and Figure 1, although the requirements of the forecast test can be met, the accuracy of the prediction accuracy is not very high with the original data. Therefore, in this paper, the moving average method is used to optimize the original data, and the average of the time series is calculated by time-by-step movement, and the calculation result is arranged as a new dynamic sequence method. In this process to determine the number of items moving average is very important, because the number of items directly affect the number of smoothing the number of items, the more the number of items more smooths effect, otherwise smaller. When the individual data is seasonal, the seasonal factors should be taken into account to determine the number of moving averages.

The number of moving averages is 2, and the original data columns in Table 1 are averaged to generate new raw numbers. Using the previous method can be a = -0.03826, endogenous control variable b = 42356.66, combined with the above formula to calculate the forecast data in Table 2, and according to this data Figure 2. It can be seen from Figure 2 that the optimized data curve is smoother than the original curve, and the general trend is still consistent with the original curve, and the smoothness of the trend curve is related to the prediction accuracy.
Tab.2 Optimized GM(1, 1) Forecast and Residual Test

| Year | Raw yield /t | Optimize production /t | Forecast production /t | Absolute error /t | Relative error /% |
|------|--------------|------------------------|------------------------|-------------------|------------------|
| 2003 | 47 040       | 46 788                 | 46 788                 | 252               | 0.5              |
| 2004 | 46 536       | 46 316                 | 45 002                 | 752               | 1.7              |
| 2005 | 44 250       | 47 354                 | 46 788                 | 2 376             | 5.4              |
| 2006 | 50 325       | 48 582                 | 45 002                 | -1 743            | 3.5              |
| 2007 | 55 087       | 51 431                 | 50 477                 | -4 610            | 8.4              |
| 2008 | 47 776       | 49 063                 | 52 446                 | 4 670             | 9.8              |
| 2009 | 50 350       | 49 379                 | 54 492                 | 4 142             | 8.2              |
| 2010 | 48 407       | 56 617                 | 56 120                 | -4 210            | 16.6             |
| 2011 | 63 253       | 58 826                 | 61 120                 | -3 294            | 7.0              |
| 2012 | 50 350       | 49 379                 | 54 492                 | 4 142             | 8.2              |
| 2013 | 63 253       | 58 826                 | 61 120                 | -3 294            | 7.0              |
| 2014 | 50 350       | 49 379                 | 54 492                 | 4 142             | 8.2              |

Fig.2 Original data, Untreated GM(1,1) Forecast and Optimized GM(1,1) Forecast

From Table 2, the relative error of the prediction model is not more than 20%, the vast majority in 10%, the average relative error of 6.79, fitting accuracy $P = 1 - \bar{P} = 93.21\% > 80\%$, which shows the error is small, the trend is stable, according to residual test The standard can be measured by residual test.

$$\min \min_{x} \left( x^{(1)}(k) - x^{(0)}(k) \right) = 0, \max \max_{x} \left( x^{(1)}(k) - x^{(0)}(k) \right) = 109.80$$

can be obtained by the formula. Take the resolution of 0.6, which can be predicted correlation coefficient, and through the calculation of the degree of relevance $r = \frac{1}{n} \sum_{i=1}^{n} \eta(k) = 0.6344 > 0.6$, so through the correlation test.

The standard deviation of the original data $S_1 = 5714.85$, the absolute error of the standard difference $S_2 = 1634.45$, the mean square error ratio $C = S_2/S_1 = 0.286 < 0.35$, $|e_i| < 5714.87$, according to Table 3 shows the relative error of 1.0%, prediction accuracy As well.

Tab.3 prediction precision grade

| Prediction accuracy level | P   | C   | Relative error /% |
|--------------------------|-----|-----|-------------------|
| Good                     | >0.95 | <0.35 | 1.0              |
| Qualified                 | >0.80 | <0.50 | 5.0              |
| Reluctantly               | >0.70 | <0.65 | 10.0             |
| Unqualified               | ≤0.70 | ≥0.65 | 20.0             |
4.2. Result analysis
The gray system model is used to predict the yield of lily in Lanzhou city. The results of the test can be verified, the study predicted that the error is small, the forecasting effect is good. Forecast data can be used to provide some reference data for Lanzhou area development and growth lily. For the mechanized operation, the wrong season sowing, fine processing and other means to provide a reliable theoretical basis for sophisticated agricultural products. In this study, the model data of the gray system GM (1, 1) model is small, and the short-term yield forecast is more accurate. Therefore, after the article, the output of Lanzhou County in 2004-2013 is the initial data. Year lily production forecast, from the prediction results, the prediction accuracy is very high, the relative error of 6.79%, the fitting effect is very good, can be a good Lanzhou county lily production to predict and judge. However, during the prediction process, the external factors often fluctuate frequently, which will cause the internal parameters of the model to change, resulting in lower prediction accuracy. Therefore, the model is used to modify the model by using the modified method of data smoothing average processing, so that the prediction model can reflect the variation law of Longshan lily more accurately.

5. Conclusion
At present, Lilium davidii var. Unicolor industrial development has formed the town of Lilium davidii var. Unicolor as the center of the west orchard town, radiating the entire southern mountainous situation. At the same time, lily deep processing of product development has made progress, the basic form of planting, storage, processing, marketing, research and development of one-stop industry pattern. At the same time, leading enterprises and farmers signed a contract, linked into a whole. The farmers in accordance with the requirements of enterprises planted, enterprises responsible for technical guidance and product quality monitoring. The government should establish an effective incentive mechanism to guide enterprises, especially leading enterprises to operate integrity, casting Lilium davidii var. Unicolor brand reputation. However, Lanzhou City has lily's processing enterprises more than 100, the number of enterprises, small scale, weak anti-risk ability; individual business credibility is not high. Due to the lack of strong leading enterprises, the province hundreds of lily processing business brand is more chaotic. In the acquisition of lily each other after the price increase, processing and sales are each pressure level, the price of vicious competition phenomenon. Which led to lily in recent years the market price instability, quality decline, the brand effect is not obvious, seriously hampered the Lilium davidii var. Unicolor industry development.

Lilium davidii var. The development of Unicolor industry should be market-oriented, in accordance with the "layout of the regionalization, production base, brand name, management standardization, business integration, social services, quality pollution-free" development ideas. In the government's macro-control and leading enterprises continue to grow and develop. The enterprises, departments and individuals should pay attention to the problems that arise in the development of the industry of Lilium davidii var. Unicolor, learn from the mistakes, and seriously improve the past deficiencies in the course of future development. In the constant innovation, Lilium davidii var. Unicolor industry continues to develop healthily.

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