

Basically Realizing Modernization of "Agriculture, Rural and Farmers" in Western China: Definition, Evaluation and Forecast

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Abstract: To basically realize the modernization of "agriculture, rural and farmers" in western China by 2035 is the key goal to promote the development of western China. This paper constructs an evaluation index system and takes Japan and South Korea as the benchmark countries to analyze the modernization development of "agriculture, rural and farmers" in western China from 2015 to 2019. By using the Adaptive Recurrence Equal Dimension Gray Model, we predict whether the "agriculture, rural and farmers" in western China can basically achieve the modernization goal on time. The basic results show that the degrees of the modernization of agriculture, farmers and rural in western China are 62.14%, 47.52% and 52.73% in 2019, and the comprehensive index is 53.98%. From 2015 to 2019, the average annual growth rate is 0.04%, 7.40%, 5.39% and 3.91% respectively. Besides, the forecast result indicates that the comprehensive index will be 75.65% and the modernization of agriculture, farmers and rural in western China will be 65.56%, 75.29% and 82.6% in 2035. The existing problems include: insufficient agricultural development, low professional ability of the farmers, and the deficient rural governance ability. Therefore, western China should pursue agricultural development through science and technology, promote the transformation of farmers to professionalization and elitism, and improve rural governance capacity.

Keywords: western China; the basic realization of the modernization of "agriculture, rural and farmers"; Adaptive Recurrence Equal Dimension Gray Model

JEL Classification: Q01; Q18; Q58

1. Introduction

The basic modernization of "agriculture, rural and farmers" is a crucial part of achieving the long-term goals for 2035. The cultivated land area in western China accounts for 40.11% of the total national arable land area, and the number of rural employment accounts for 32.87%. It's a great strategic significance for China to realize the modernization of agriculture, rural areas and farmers in the western region as scheduled.

At present, although the modernization of "agriculture, rural and farmers" in western China has made great achievements under the western development strategy, there are still many problems to be solved urgently. In western China agricultural management is mainly decentralized, this is difficult for agriculture to form economies of scale (Luo, 2021). The farmers in general are poor and under-educated, lack vocational education and technical

training (Zhao, 2021). And the gap between urban and rural living standards is still large (Peng & Liu, 2020). These problems have become the key factors restricting the basic realization of modernization of agriculture, rural and farmers in the western region.

So, to what extent has the modernization of "agriculture, rural and farmers" in western China developed? How to evaluate it? What is the key factor hindering the modernization development of "agriculture, rural and farmers" in western China? Answering these questions will help to promote the development of the modernization of "agriculture, rural and farmers" in western China. It is crucial for western China to achieve the goal as scheduled.

Therefore, based on the data of western China from 2015 to 2019, this paper constructs the evaluation index system and takes Japan and South Korea as the benchmark countries to analyze the basic situation of the modernization development level of "agriculture, rural and farmers". On this basis, we use the Adaptive Recurrence Equal Dimension Gray Model to predict whether it will basically achieve the modernization goal on time and analyze the specific factors that hinder the development of agriculture, rural areas and farmers in western China.

2. Literature Review

2.1. *The Definition of the Modernization of "Agriculture, Rural and Farmers"*

In the relevant research on the definition of the modernization of "agriculture, rural and farmers", the scholars mostly discuss it from three aspects. In terms of agricultural modernization, Hong (2015) believes that the essence of agriculture modernization is the improvement of production efficiency, and the core is the scientific and technological progress. Chen (2018) argues that the modern agriculture should have developed infrastructure, advanced science and technology, efficient organization mode and perfect service system. And Yu (2018) proposes that the goal of agriculture modernization is to develop green productions for resource conservation and sustainable development. In terms of farmer modernization, Jiang and Li (2021) point out that farmer modernization includes modernization of farmers' material and spiritual life, modernization of farmers' comprehensive quality and modernization of farmers' labor skills. In terms of rural modernization, Wei (2020) believes that rural modernization should be the organic whole of rural industrial modernization, rural culture modernization, rural ecological modernization, rural governance modernization and farmers' life modernization.

2.2. *The Evaluation of the Modernization of "Agriculture, Rural and Farmers"*

In recent years, scholars often adopt the multi-dimensional index comprehensive evaluation method, and there are two core problems in the evaluation process. One is how to determine the weight of the indicators, and the other is how to formulate the evaluation standards. In determining the weight, there are two methods: one is subjective empowerment, including Delphi, Hierarchical Analysis, etc.; the other is objective empowerment, including entropy, DEA, entropy TOPSIS, etc. Although the subjective empowerment method can reflect the importance of decision makers to different indicators, it has a certain arbitrariness and relatively poor objectivity. Relatively speaking, the objective empowerment method can solve the defects of subjective randomness.

3. Methodology

3.1. Theoretic Analysis

From a systematic perspective, the modernization of "agriculture, rural and farmers" is a unified organic whole. Agricultural modernization is the foundation. The realization of agricultural modernization means the improvement in agricultural production efficiency, increasing farmers' operating income and improving their qualities of life, and modern agriculture requires employees to master more advanced production technology and management means, forcing farmers to learn advanced agricultural knowledge and work skills, constantly improve their comprehensive quality and professional ability, and promote their modernization. In addition, modern agriculture not only pays attention to efficient production, but also to green production. The development of green agriculture will greatly improve the rural ecological environment, which is an essential link to the construction of building a modern countryside.

Farmer modernization is the core. Both agricultural modernization and rural modernization must be realized through continuous practice and innovation of modern farmers. With the high human capital, modern farmers have richer agricultural science knowledge and master more advanced agricultural production technology to continuously promote the development of agricultural modernization. The modern farmers with the high income and open thoughts will put forward the higher requests for their living environment, so as to promote the construction of a modern countryside with convenient life service and excellent ecological environment.

Rural modernization is the guarantee. Modern rural for farmer modernization provides a solid rear security. Modern rural areas which have the convenient life service facilities, perfect education and medical service system and high quality living ecological environment, not only can retain original farmers, and prompt its constantly to modern farmers, but also can attract other residents to settle in modern rural areas, attract quality talents for modern agricultural development, indirect reserve talents for agricultural modernization development.

Therefore, when evaluating the modernization of agriculture, rural areas and farmers in western China, we should choose a comprehensive method to evaluate the various aspects of the modernization development of agriculture, rural areas and farmers. The Multidimensional Index Comprehensive Evaluation Method is the most effective and accurate method for evaluation in this aspect. It can not only reflect the comprehensive results of each index, but also reflect the importance of different indicators according to the weight of the indicators.

So, this paper chooses the Multidimensional Index Comprehensive Evaluation Method to calculate the degree of the modernization of "agriculture, rural and farmers" in western China. In this process, determining the method of criteria for evaluation and the indicator weights is the most important thing. The modernization of "agriculture, rural and farmers" is a dynamic process, and the development characteristics of different regions are different. So only by determining a benchmark with the modernization level of "agriculture, rural and farmers" in the current

development stage can the development degree of the modernization of "agriculture, rural and farmers" be objectively and comparatively measured. Therefore, this paper chooses the Management by Objectives Evaluation Method to determine the evaluation criteria and choose the objective empowerment method to determine the indicator weights as mentioned above.

Table 1. The index system of modernization of "Agriculture Rural and Farmers" (Source: National Bureau of Statistics)

Guide Layer	Theoretical Layer	Specific Indicators(unit)	Direction
Agriculture Modernization	Modernization of agricultural industrial system	1Proportion of livestock production value (%)	+
		2Ratio of agricultural and sideline food processing industry to agricultural output value	+
		3Yield per unit area of melons and fruits (kg/ha)	+
		4Proportion of output value of agriculture, forestry, animal husbandry and fishery services (%)	+
	Modernization of agricultural production system	5Grain output per unit area (kg/ha)	+
		6Mechanization degree (set/100 square kilometers)	+
		7Fertilizer usage (kg/ha)	-
		8Pesticide application (kg/ha)	-
	Modernization of agricultural management system	9Agricultural labor productivity (yuan/per)	+
Farmer Modernization	Modernization of farmers' life	10Per person disposable income(yuan/per)	+
		11Per person consumption expenditure(yuan/per)	+
		12Engel's coefficient	-
		13Rural household car penetration rate (vehicles)	+
	14Proportion of rural poor (%)	-	
	Modernization of farmers' ideology	15Proportion of education, culture and entertainment expenditure (%)	+
	Modernization of farmers' professional ability	16Compulsory education popularization rate (%)	+
17Proportion of agricultural employees (%)	-		
Rural Modernization	Rural public service modernization	18Popularity of standard hardened roads in rural areas (%)	+
		19Rural Internet penetration rate (%)	+
		20Rural water supply penetration rate (%)	+
		21Per person domestic electricity consumption of rural residents(kWh)	+
		22Average number of village clinics per 1000 rural population (person)	+
		23Rural gas penetration rate (%)	+
		24Teacher student ratio of full-time teachers in rural junior middle schools	+
	Modernization of rural human settlements	25Domestic sewage treatment rate (%)	+
		26Domestic waste disposal rate (%)	+
		27Prevalence rate of harmless sanitary toilets (%)	+
		28Rural green coverage rate (%)	+
	Modernization of rural governance system	29Percentage of villages with village and town management institutions (%)	+
		30Percentage of villages where the secretary of the village party organization concurrently serves as the director of the village committee (%)	+

3.2. *The Index System Establishment*

The index system constructed includes 3 targets in grade 1, 9 targets in grade 2 and 30 in grade 3. The details are shown in Table 1 above.

3.3. *The Target Value Determination*

The basic modernization of "agriculture, rural and farmers" is a stage in the process of modernization. It is a further upgrading on the basis of the initial modernization, but its development level is not enough to reach the full realization of modernization. The fifth plenary session of the 19th pointed out that in 2035 the basic realization of socialist modernization vision including "per capita gross domestic product (GDP) reached the level of moderately developed countries", according to this standard, the selected 2035 "agriculture, rural and farmers" basic realization of socialist modernization vision for the per capita GDP of the current "agriculture, rural and farmers" modernization development level. However, there are many countries with per capita GDP reaching a moderately developed level, and there are differences in the resource endowment and production factors for the modernization development of "agriculture, rural and farmers" in different countries. This paper follows three guidelines when choosing benchmark countries:

- Rule 1: Select the benchmark countries according to the per capita GDP development level. According to the World Economic Outlook compiled by the International Monetary Fund (IMF), the median per capita GDP of the 39 developed economies in 2019 was \$43,603.01, and the arithmetic average was \$45,604.74. Therefore, countries with per capita GDP approaching \$43,000 were selected as benchmark countries.
- Rule 2: Select the benchmark countries according to the geographical proximity. Among these developed countries, Asian countries have a closer geographical distance and more similar natural resources to China. Therefore, this paper selects Asian countries as benchmark countries in the moderately developed countries.
- Rule 3: Select the benchmark countries according to the similarity in production factors. Among the moderately developed countries in Asia, Japan and South Korea have a more similar cultural origin, entrepreneurship, capital preference, and production technology level with China. Therefore, in the moderately developed countries in Asia, Japan and South Korea are selected as the benchmark countries.

According to the above three rules, the average level of Japan and South Korea in 2019 is selected as the target value of basically realizing the modernization of the "agriculture, rural and farmers" in the western region.

3.4. *Evaluation Methods*

First, Indicator consistency processing. Due to the difference in the index direction of specific indicators, this paper uses the reciprocal consistency to treat the reverse index into the positive index. Second, the data is dimensionless for processing. This paper follows the method of 2019 by Liu et al. (2019), standardizing the specific indicators by the Z-score method, and then the standard normal cumulative probability value of the standardized

data is found, and the data is converted into a range between 0 and 1. Third, determine the index weight. In order to maximize the differences between the evaluated objects, the weight is determined by the "vertical and horizontal direction" and the grade expansion method.

3.5. Data Source

This paper selects the sample data of 12 provinces in western China from 2015 to 2019. For individual missing data, refer to the practice of Di and Hu (2020), choose the data with the closest year of the same index to replace. The sample data are all obtained from the 2016-2020 China Statistical Yearbook, China Rural Statistical Yearbook, China tertiary Industry Statistical Yearbook, China Science and Technology Statistical Yearbook, China Education Statistical Yearbook, China Environmental Statistical Yearbook and China Household Survey Yearbook.

The average level of Japan and South Korea in 2019 is selected as the target value of the basically realizing the modernization of the "agriculture, rural and farmers" in western China. Most data come from World Bank NAOCD, ILO, FAO, WDI database, OECD OLIS database, and Wind database. But some data from Japan and South Korea are not available due to differences in statistics or national policies. This target value is to draw on the research results of the research group of the Rural Economic Research Department of the Development Research Center of The State Council in 2020 by Research Group of the Rural Economic Research Department of the Development Research Center of the State Council et al. (2021), or is to calculate the level of 2035 according to the average target of the Rural Revitalization Strategic Plan 2018-2022, formulated by the state.

4. Results

4.1. Specific Indicators Analysis Results

From 2015 to 2019, the specific indicators of modernization of agriculture, rural and farmers in western China are shown in Table 2. In 2019, among the nine specific indicators of agricultural modernization in western China, one index is above 90%, 3 between 80-90%, two between 60-80%, three under the 60% including agricultural labor productivity, output value of agriculture, forestry, animal husbandry, fishery and service industry, and pesticide application. Low agricultural labor production efficiency in western China is mainly due to natural conditions such as terrain, precipitation. Agricultural production and operation is difficult to form the scale, it causes surplus agricultural labor forces, and low demand of large agricultural machinery tools, that limit the modern science and technology in western China agriculture, makes the western region in the process of agricultural modernization shows the characteristics of labor production efficiency is low.

Among the eight indicators of farmers' modernization, in 2019, one indicator is above 90%, 2 are between 60-80%, and 5 are below 60%, among which the per capita consumption expenditure of farmers accounted for less than 10%. The improvement to farmers' consumption level is closely related to increasing farmers' income. From the perspective of income structure, the income source of rural residents in western China in 2019 is mainly

Table 2. The degree of realization of specific indicators of "Agriculture, Rural and Farmers" modernization in Western China from 2015 to 2019

Specific Indicators(unit)	2015	2016	2017	2018	2019
1Proportion of livestock production value (%)	80.81	84.77	79.78	77.60	81.02
2Ratio of agricultural and sideline food processing industry to agricultural output value	17.07	15.79	25.40	45.68	68.78
3Yield per unit area of melons and fruits (kg/ha)	94.14	94.58	94.83	95.28	97.78
4Proportion of output value of agriculture, forestry, animal husbandry and fishery services (%)	40.22	38.89	39.95	39.90	39.03
5Grain output per unit area (kg/ha)	83.20	83.35	83.81	85.93	86.88
6Mechanization degree (set/100 square kilometers)	71.73	71.78	74.80	71.92	72.03
7Fertilizer usage (kg/ha)	99.28	97.87	99.29	95.15	89.86
8Pesticide application (kg/ha)	56.56	57.04	52.42	47.84	44.65
9Agricultural labor productivity (yuan/per)	12.48	13.09	13.61	14.78	15.79
10Per person disposable income (yuan/per)	8.58	9.34	10.22	11.18	12.33
11Per person consumption expenditure (yuan/per)	5.86	6.40	6.98	7.63	8.39
12Engel's coefficient	64.29	66.77	69.77	74.21	74.36
13Rural household car penetration rate (vehicles)	29.88	35.88	39.30	43.34	48.51
14Proportion of rural poor (%)	5.78	7.43	10.23	20.49	53.59
15Proportion of education, culture and entertainment expenditure (%)	88.91	91.00	91.10	93.73	94.51
16Compulsory education popularization rate (%)	65.40	65.63	68.76	69.04	69.61
17Proportion of agricultural employees (%)	9.03	9.24	9.46	9.65	9.91
18Popularity of standard hardened roads in rural areas (%)	31.28	35.43	37.39	41.03	43.00
19Rural Internet penetration rate (%)	16.22	21.52	29.89	42.53	51.58
20Rural water supply penetration rate (%)	70.65	72.59	84.07	88.52	91.81
21Per person domestic electricity consumption of rural residents(kWh)	30.05	31.72	34.43	36.65	39.82
22Average number of village clinics per 1000 rural population (person)	71.67	71.03	75.35	79.68	82.09
23Rural gas penetration rate (%)	24.08	24.59	29.56	28.65	32.13
24Teacher student ratio of full-time teachers in rural junior middle schools	53.29	52.54	52.36	50.91	50.81
25Domestic sewage treatment rate (%)	12.86	13.07	18.47	24.97	25.92
26Domestic waste disposal rate (%)	58.47	67.91	67.54	66.00	73.66
27Prevalence rate of harmless sanitary toilets (%)	60.07	62.15	65.92	67.06	69.33
28Rural green coverage rate (%)	14.16	14.98	15.38	15.91	17.63
29Percentage of villages with village and town management institutions (%)	70.17	73.37	73.06	73.74	74.60
30Percentage of villages where the secretary of the village party organization concurrently serves as the director of the village committee (%)	38.75	37.37	32.44	30.20	27.96

¹Source: Calculated by the author.

family operating net income. Therefore, the key to farmers' modernization is to improve farmers' ability in agricultural production and operation to increase the income of agricultural production and operation. From 2015 to 2019, although the proportion of agricultural employees in western China is increasing year by year, the growth rate is slow. In 2019, the realization degree of this

index was only 9.91%. It reflects that with moderately developed countries as the target, there are still a large number of redundant labor forces engaged in agriculture in western China, and the training speed of high-quality agricultural talents is very slow. In the future, the western China should intensify efforts to cultivate talents who can master advanced agricultural labor skills, and improve the professional ability and cultural quality of farmers.

Among the 13 specific indicators of rural modernization, 1 indicator is achieved above 90% in 2019, 1 is between 80 and 90%, 3 are between 60 and 80%, and 8 are less than 60%. From 2015 to 2019, most indicators showed a rapid growth trend. These significant improvement of the living conditions of rural residents is due to the country's increasing attention to the construction of beautiful countryside. However, in the modernization of the rural governance system, the proportion of the target between the village party secretary and the director of the village committee is decreasing year by year, with only 27.96% in 2019. Central file no. 1, 2019 pointed out that the problem of the urban and rural factors flow and unreasonable allocation of public resources are still outstanding. To reshape the new urban-rural relations, we need to implement the village party secretary through legal procedures as director of the village committee, guide its rural service.

4.2. Comprehensive Indicators Analysis Results

The realization degree of the comprehensive modernization index of "agriculture, rural and farmers" in western China from 2015 to 2019 is shown in Table 3.

Table 3. The realization degree of comprehensive indicators of "Agriculture, Rural and Farmers" modernization in Western China from 2015 to 2019 (%)

Year Indicators	2015	2016	2017	2018	2019
Agriculture Modernization	62.03	62.17	62.96	61.96	62.14
Farmer Modernization	35.71	37.39	39.17	42.14	47.52
Rural Modernization	42.73	44.87	47.76	50.03	52.73
"Agriculture, Rural and Farmers" Modernization	46.31	47.75	49.72	51.25	53.98

On the whole, the comprehensive index in western China in 2019 increased by 7.67% compared with 2015, with an average annual growth rate of 3.91%. The growth rate showed a growing trend, which reflects that the modernization of "agriculture, rural and farmers" in western China is improving. Among the comprehensive indicators, the highest is agricultural modernization in 2019 is 62.14%, but it only increases 0.11% compared to 2015, with an average annual growth rate of 0.04%; Farmer modernization in 2019 is 47.52%, up 11.81% from 2015 and an average annual growth rate is 7.40%, rural modernization is 52.73% in 2019, up 10% from 2015, with an average annual growth rate of 5.39%.

5. Forecast Analysis

5.1. Forecast Method

This paper uses Adaptive Recurrence Equal Dimension Gray Model to predict the modernization of "agriculture, rural and farmers" in western China. GM (1,1), which is the basic

model, accumulates the complex data to generate regular series. In the modeling process, the results of the next stage are continuously reflected. After many cycles, the whole model gradually tends to improve. However, GM (1,1) model is mainly suitable for the prediction of short-term data, and it is difficult to make long-term prediction, because it does not consider its dynamic variability when setting the gray parameter estimation value in the algorithm, resulting in the longer the prediction dimension, and the lower the prediction accuracy.

The idea of dimensional complement is using GM (1,1) model, calculating the known series to get the predicted value, and then adds the new prediction value to the known series, deletes the most backward data in the sequence, to ensure that the dimension of the sequence does not change, and then with the new sequence as the next prediction of the original sequence. And then repeat the above process, until complete the prediction target.

5.2. Prediction Model Accuracy Test

The forecast results and forecast errors of the modernization of "agriculture, rural and farmers" in western China in 2015-2019 are shown in Table 4. The average relative error is 0.39%, the forecast accuracy is 99.61%, the posterior difference ratio is 0.0788, less than 0.5, which meets the requirements of the gray prediction model accuracy test. That means, the model prediction effect is good.

Table 4. Model prediction of the comprehensive indicators of "Agriculture, Rural and Farmers" modernization in Western China from 2015 to 2019¹

Year	Actual Value	Estimate Value	Absolute Error	Relative Error
2015	46.31	46.31	0	0
2016	47.75	47.67	0.08	0.0017
2017	49.72	49.61	0.11	0.0022
2018	51.25	51.64	-0.39	-0.0076
2019	53.98	53.75	0.23	0.0042

Note: Calculated by the forecast value calculation formula of the GM (1,1).

5.3. Forecasting Result

The predicted results are shown in Table 5. Among the indicators of agricultural modernization, three of them reach 100%, and 2 reach 60-70%, 4 are under 60%. That means, according to the current level of agricultural development in moderately developed countries, the problems of low output value of agriculture, forestry, animal husbandry and fishery service industry, excessive use of chemical fertilizers and pesticides, and low agricultural labor productivity mainly exist in western China.

In the term of farmer modernization, four indicators reach 100%; 1 reaches 90-100%, 3 under 60%, which are per capita disposable income, per capita consumption expenditure and the proportion of agricultural employees. That means, the main problems in the process of the basic modernization of farmers in western China are their low income level, insufficient consumption capacity and too high proportion of agricultural practitioners.

There are 13 indicators in rural modernization dimension, 9 indicators reach 100%, 1 is between 80-90%; 3 are below 60%. That means, the main problems in the process of rural

Table 5. Predicted score of the basic modernization of "Agriculture, Rural and Farmers" in Western China in 2035 (%)

Specific Indicators(unit)	Score
1Proportion of livestock production value (%)	60.00
2Ratio of agricultural and sideline food processing industry to agricultural output value	100.00
3Yield per unit area of melons and fruits (kg/ha)	100.00
4Proportion of output value of agriculture, forestry, animal husbandry and fishery services (%)	40.14
5Grain output per unit area (kg/ha)	100.00
6Mechanization degree (set/100 square kilometers)	69.01
7Fertilizer usage (kg/ha)	57.39
8Pesticide application (kg/ha)	11.74
9Agricultural labor productivity (yuan/per)	44.21
10Per person disposable income (yuan/per)	52.95
11Per person consumption expenditure (yuan/per)	34.65
12Engel's coefficient	100.00
13Rural household car penetration rate (vehicles)	100.00
14Proportion of rural poor (%)	100.00
15Proportion of education, culture and entertainment expenditure (%)	93.12
16Compulsory education popularization rate (%)	100.00
17Proportion of agricultural employees (%)	14.30
18Popularity of standard hardened roads in rural areas (%)	100.00
19Rural Internet penetration rate (%)	100.00
20Rural water supply penetration rate (%)	100.00
21Per person domestic electricity consumption of rural residents(kWh)	100.00
22Average number of village clinics per 1000 rural population (person)	100.00
23Rural gas penetration rate (%)	100.00
24Teacher student ratio of full-time teachers in rural junior middle schools	41.22
25Domestic sewage treatment rate (%)	100.00
26Domestic waste disposal rate (%)	100.00
27Prevalence rate of harmless sanitary toilets (%)	100.00
28Rural green coverage rate (%)	40.75
29Percentage of villages with village and town management institutions (%)	81.75
30Percentage of villages where the secretary of the village party organization concurrently serves as the director of the village committee (%)	5.85

modernization in western China are the low ratio of rural compulsory education, the low green coverage rate and the imperfect rural governance system.

The predicted scores of the basic modernization of "agriculture, rural and farmers" in western China from 2020 to 2035 are shown in Table 6. From the prediction results, we find that without external intervention and continuing to develop according to the current trend, it will not achieve the basic realization of the modernization goal in 2035.

On the whole, the comprehensive index is only 75.65% in 2035, and the average growth rate is 2% from 2020 to 2035. The agricultural modernization in western China grows the slowest, the average annual growth rate of 0.34%. According to the current growth trend, only 65.56% of agricultural modernization in western China by 2035. The modernization of farmers grew the fastest, the average growth rate of 2020 to 2035 is 2.79%. By 2035, the modernization

of farmers will be 75.29%. The average growth rate of rural modernization will be 2.59% from 2020 to 2035, In 2035, the realization degree of rural modernization will be 82.60%.

Table 6. Predicted Score of the Comprehensive Indicators of the Basic Modernization of "Agriculture, Rural and Farmers" in Western China from 2020 to 2035 (%)¹

Year	Agriculture Modernization	Farmer Modernization	Rural Modernization	"Agriculture, Rural and Farmers" Modernization
2020	62.29	49.83	56.22	56.18
2021	62.54	57.00	59.61	59.72
2022	62.92	58.76	62.34	61.50
2023	63.36	60.63	64.53	63.10
2024	63.99	62.44	66.68	64.72
2025	64.83	64.40	69.13	66.57
2026	65.89	66.51	71.16	68.34
2027	67.20	67.76	72.68	69.73
2028	67.05	68.49	74.30	70.59
2029	66.79	69.27	76.04	71.48
2030	66.49	70.10	77.80	72.39
2031	66.23	70.99	79.49	73.30
2032	66.01	71.95	80.81	74.07
2033	65.82	72.99	81.55	74.63
2034	65.67	74.10	82.27	75.20
2035	65.56	75.29	82.60	75.65

6. Discussion

This paper expands the existing research from the following aspects: First, most scholars focus more on the importance of agricultural modernization and rural modernization, such as Tu (2023) and Zhou (2023). They often put the modernization of farmers in a secondary position, or even missing, ignoring the modernization of farmers is an essential part of agricultural modernization and rural modernization. This paper puts forward the modernization of "agriculture, rural and farmers" is a unified organic, proposes that the realization process is divided into three stages: preliminary realization of modernization, basic realization of modernization and comprehensive realization of modernization. Second, the modernization of "agriculture, rural and farmers" is a dynamic process, and the development characteristics of different regions are different, only by determining a benchmark in line with the modernization of "agriculture, rural and farmers" in the current development stage can it be objectively and comparatively measured. However, there are few academic researches on how to determine the benchmark of the modernization of "agriculture, rural and farmers". This paper uses the management of objectives evaluation method, according to the three guidelines, chooses Japan and South Korea as the benchmark countries. Third, scholars always choose GM (1,1) to do prediction when the time range of data is so short (Liu, 2022). But it's difficult to do the long-term prediction by GM (1,1) because as the predict gap widens, the prediction accuracy will decrease. This paper selects gray adaptive isodimensional complemented prediction model to overcome this problem in order to improve the accuracy of the prediction results.

7. Conclusions and Recommendations

7.1. Conclusions

In this paper, the following three conclusions are drawn: Firstly, in 2019, the comprehensive index of modernization of agriculture, rural and farmers in western China was 53.98%, The realization degree of agricultural modernization was 62.14%, The degree of modernization realization of farmers was 47.52%, rural modernization was achieved to 52.73%, the average growth rate from 2015 to 2019 were 3.91%, 0.04%, 7.40% and 5.39%. Secondly, according to the current trend of modernization of agriculture, rural and farmers in western China, the modernization goal cannot be achieved in 2035. The forecast results show that the realization of modernization in western China in 2035 is 75.65%. The modernization of agriculture, farmers and rural are 65.56%, 75.29%, 82.6%. That means, the biggest problem is the modernization of the agriculture. Thirdly, combined with the specific indicators in the western region in 2035, the problems in agriculture are low agricultural fishery services output ratio, unreasonable use of pesticides and fertilizers and low agricultural labor productivity, farmers modernization problem is that farmers' low disposable income, insufficient consumption ability and agricultural workers ratio, rural modernization problem is rural compulsory education resources still does not reach the designated position, low green coverage and rural governance ability remains to be improved.

7.2. Recommendations

Based on the conclusions of this research and combined with the current situation of agricultural development in China, the policy recommendations of this paper include the following three aspects:

1. Increase support for agriculture, forestry, animal husbandry, fishery and services, and extend the agricultural industrial chain. In the era of digital economy, western China should play the advantages of digital technology, with the help of agricultural service organizations to provide professional, scale services, realizes centralized and unified production, unified processing, unified sales as the integration of the whole industry chain, promote agriculture, forestry and fishery service value is steadily increased. And controlling the use of agricultural chemical fertilizers and pesticides and developing green agriculture, continuing to make science and technology enable agricultural modernization and improve agricultural labor productivity is important as well.
2. Try to raise farmers' agricultural operating income and increase their income level and consumption capacity. The government can help farmers by vigorously cultivating leading agricultural enterprises and supporting industries with characteristics, brand cultivation, marketing and other aspects. Meanwhile, promote the professional development of farmers and train the elite agricultural labor force also are urgent matters. Such as promoting the western region farmers to professional, elite transformation, reducing agricultural redundant personnel, at the same time selecting skilled use of agricultural professional skills, with agricultural modernization management knowledge of agricultural talents, to improve the farmers' professional ability, optimize the agricultural labor force.

3. Intensify rural greening construction and build a beautiful countryside in western China. By the introduction of professional and technical personnel, give financial subsidies, with the construction team with strong business ability to carry out the rural greening project in the western region, the integration of social capital resources, to provide technical protection for rural greening and financial construction work.

7.3. Limitation and Prospects

This paper still has limits that can be break in the future. Such as, choosing the Japan and South Korea as the benchmark countries make the evaluation more accurate, but actually there are many different situations between western China and them. Is there better benchmark? If so, how to find it? Based on this paper, the backward agriculture is the biggest problem in the process of the modernization of "agriculture, rural and farmers" in western China, but what is the key driving force to promote the modern development of agriculture? How to inspire it? Answering these problems will be the next step to do in the future.

Conflict of interest: none

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