

# Correlative Analysis of Yanbian's Primary Forestry Industry and Sub-industries

Xinning LI, Yufen XU\*

Agricultural College of Yanbian University, Yanji 133002, China

**Abstract** By selecting three indicators (timber cultivating and planting, timber harvesting, forest products), this paper uses grey relational degree to analyze the correlation between Yanbian's primary forestry industry and sub-industries. Results show that there is a decline in the relational degree of three indicators concerning Yanbian's primary forestry industry, but the relational degree of timber harvesting is still high and the relational degree of forest products is slightly increased.

**Key words** Primary forestry industry, Sub-industries, Grey relational degree, Yanbian

## 1 Introduction

The adjustment of industrial structure of forestry helps to speed up the transformation of economic development mode for Yanbian's forestry industry and achieve scientific development. However, in recent years, the available supply of forest resources in Yanbian has been far less than the market demand, and the long regeneration cycle of forest resources has made the forest area into the forest resource recovery period. A series of issues occur in the development of Yanbian's forestry industry, the development of leading industry dominating the region's economy has been limited, and the economic growth slows down or even moves backward. Domestic and foreign researchers have conducted some studies on the economic structure of resource-based regions and constraints on resource-based cities<sup>[1]</sup>. Therefore, this paper makes further analysis and concludes that it is particularly important to transform development mode of Yanbian's forestry industry to promote the sustainable development of forestry industry in Yanbian.

## 2 Methods and data sources

**2.1 Methods** The grey relational method is a quantitative analysis method to analyze and determine the degree of influence of factors or contribution of factors to main behavior based on the dynamic trend of the system. The closer the curve reflected, the higher the relational degree between the sequences<sup>[2]</sup>. This paper uses grey relational degree to study the correlation between Yanbian's primary industry and sub-industries.

**2.2 Data sources** Data used in this paper come from *Yanbian Statistical Yearbook*, and the comparison sequence and reference sequence are determined through further analysis of raw data. The relational degree between Yanbian's primary forestry indus-

try and sub-industries at different times is calculated, and finally different levels of correlation matrices between sub-industries are shown.

## 3 Relational analysis of Yanbian's primary forestry industry and sub-industries

(i) Determining reference sequence and comparison sequence. The reference sequence  $x_0$  in this paper is the output value of primary forestry industry in different periods, and the comparison sequence  $x_i$  is the timber cultivating and planting, timber harvesting and forest product output value in different periods. (ii) Dimensionless processing. The dimensionless processing is performed on reference sequence and comparison sequence (Table 1). (iii) Calculating difference value. The absolute difference value calculation is performed on reference sequence and comparison sequence (Table 2). (iv) Calculating minimum and maximum. From Table 2, it is found that  $\Delta_{\min} = 0$ ,  $\Delta_{\max} = 1.5524$ . (v) Calculating grey correlation coefficient  $\xi(X_i)$ . In the correlation coefficient formula,  $\rho$  is the discrimination coefficient, generally 0 – 1, usually taken as 0.5 (Table 3). (vi) Calculating grey. The correlation coefficient is further calculated (Table 4).

## 4 Analysis of results

Based on the above calculations, we draw the dynamic change figure about correlation between Yanbian's primary forestry industry and sub-industries. It can be seen from Fig. 1 that the relational degree of timber harvesting is relatively high, but it has been declining for a long period of time; the relational degree of timber cultivation and planting also shows a decreasing trend, but since the implementation of National Natural Forest Protection Project, the cultivation of trees has achieved initial success, as shown in the change during 2010 – 2011; the relational degree of forest products is lowest, but it will tend to rise for a long period of time.

**Table 1** Initial value of Yanbian's primary forestry industry and sub-industries

Year	Primary forestry industry	Timber cultivating and planting	Timber harvesting	Forest products
2009	1.0000	1.0000	1.0000	1.0000
2010	1.1194	0.7290	1.1216	1.1695
2011	1.3633	1.3428	1.2792	0.0221
2012	1.3366	2.1708	1.1839	0.0058
2013	1.5524	3.0118	1.0889	0.0000

Data source: Calculation of raw data.

**Table 2** Absolute difference value of Yanbian's primary forestry industry and sub-industries

Year	Timber cultivating and planting	Timber harvesting	Forest products
2009	0.0000	0.0000	0.0000
2010	0.3904	0.0022	0.0501
2011	0.0205	0.0841	1.3412
2012	0.8342	0.1527	1.3308
2013	1.4594	0.4635	1.5524

Data source: Calculation based on Table 1.

**Table 3** Correlation coefficient of Yanbian's primary forestry industry and sub-industries

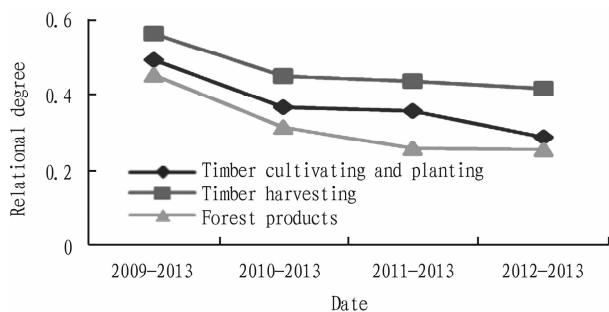
Year	Timber cultivating and planting	Timber harvesting	Forest products
2009	1.0000	1.0000	1.0000
2010	0.3995	0.4993	0.4844
2011	0.4935	0.4743	0.2682
2012	0.3252	0.4552	0.2692
2013	0.2577	0.3850	0.2500
Mean	0.4951	0.5627	0.4543

Data source: Calculation based on Table 2.

**Table 4** Relational degree matrix of Yanbian's primary forestry industry and sub-industries

Year	Timber cultivating and planting	Timber harvesting	Forest products
2009 – 2013	0.4952	0.5628	0.4544
2010 – 2013	0.3690	0.4535	0.3180
2011 – 2013	0.3588	0.4382	0.2625
2012 – 2013	0.2915	0.4201	0.2596

Data source: Calculation based on Table 3.

**Fig. 1** Relational degree between Yanbian's primary forestry industry and sub-industries

## 5 Conclusions and recommendations

Yanbian's primary forestry industry plays a certain fundamental role in the whole process of forestry development, and its development and changes directly affect secondary and tertiary forestry industries<sup>[3]</sup>. Yanbian has long relied on the most traditional timber harvesting to develop economy, which makes forest share decrease year by year and to a certain extent makes the growth of wood into the dormant period. The implementation of National Natural Forest Protection Project plays a positive role in Yanbian's forest development, but if the development mode is not changed, it will have negative effect on the future primary forestry industry, thus affecting the de-

velopment of three forestry industries. To effectively promote the future development of primary forestry industry in Yanbian, it is necessary to adjust the development structure of sub-industries of primary forestry industry according to Yanbian's actual conditions; transform the mode of economic development and strengthen timely cultivation and protection of forest resources so as to ensure sustainability of forest resources; effectively establish the forest ecosystem suitable for the development of Yanbian, so that the development structure of sub-industries in traditional primary forestry industry can be better improved and transformed; enhance the reasonable allocation inside primary forestry industry to better promote the development of primary forestry industry; actively take advantage of basic position of primary forestry industry to promote the coordinated development of secondary and tertiary industries, ultimately achieving overall long-term sustainable development of Yanbian's forestry industry.

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