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Research on Participatory Poverty Index in North Jiangsu

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Abstract In terms of current life style, living and production conditions and hygienic and educational condition, we select 8 indices, such as annual net income of farmers per capita, annual grain yield per capita, total power of agricultural machinery per capita, dropout rate of school children and so on, to establish index system of determining the poor village in North Jiangsu. By selecting Lianqun Village in Suining County of Xuzhou City, Mawa Village in Siyang County of Suqian City, Chuanxing Village in Guanyun County of Lianyungang City, Xiaozhu Village in Hongze County of Huai'an City, Fengda Village in Xiangshui County of Yancheng City as the representative villages, after the discussion and consultation of the masses and the village cadres of all villages, we get the measuring results of weight. Through the field survey, investigation and interview in the selected regions, we get the relevant data, and then we conduct standardization processing, so as to get the index value that can comprehensively reflect the characteristics of poverty. According to the index data that have been standardized, by using participatory poverty index formula for calculation, we get the values that can explain the poverty degree of the respondents. We sequence the representative poor villages in this region according to the poverty degree from high to low, and the result is as follows: Mawa Village, Lianqun Village, Chuanxing Village, Xiaozhu Village, and Fengda Village. It indicates that in terms of the operability of theory and technique, the participatory poverty index can better recognize the poor villages, so that it lays solid foundation for rationally and effectively using the limited poverty alleviation resources.

Key words Participatory poverty index, Poverty measurement, North Jiangsu, China

The researches on the problem of poverty have been for far too long. The concept of poverty is changing from a kind of simple economic poverty characterized by "relatively low income" and "shortage of indispensable living goods" to multi-dimensional and diversified human poverty characterized by "deprivation of rights and opportunities". Accordingly the measuring of poverty gradually evolves from purely measuring on the income to measuring on many indices. In terms of application of poverty line, World Bank, United Nations Development Program and other international institutions advance the concept of "measuring on poverty from many aspects", and further advance the index of monitoring poverty, namely "human poverty index" on the basis of this concept. Human poverty index provides quantitative tool for measuring poverty from many aspects. In terms of theory, the method of measuring on poverty from many aspects can effectively recognize the poverty group, so as to ensure the effective targeting of limited poverty alleviation resources. Be that as it may, due to the complexity and high cost of the method of measuring on poverty from many aspects, high requirements on the measuring ability and the strictness of mastering the basic data, put sand in the wheel of extensive application of it in the actual work. In addition, in practical operation, there are certain difficulties^[1-3].

For a long time, the poverty alleviation work in China is county targeting mechanism, but as the defects of county poverty alleviation mechanism loom large, the village poverty alle-

vation mechanism begins to be established, and the participatory poverty index provides the technological and methodological approach for realization of recognizing the poor villages. The development of participatory poverty index has changed the traditional model of measuring poverty from top to bottom, to let the poverty group participate, so in the process of measuring poverty, the main body function of the poverty group has been respected and realized. Participatory poverty index is an effective try of measuring poverty from bottom to top. The poverty alleviation work in North Jiangsu is always one of the key contents of rural work in Jiangsu Province, which has aroused the attention of some leaders and scholars^[4-5]. We adopt the calculation method of participatory poverty index, to research the determination of poor villages in North Jiangsu, which provides a new method for the recognition of poor villages in poverty alleviation work of North Jiangsu, so that it can use the limited poverty resources scientifically and rationally.

1 Index selection, data source and research method

1.1 Overview of the study area North Jiangsu, located in the common boundary of Jiangsu Province, Shandong Province, Anhui Province and Henan Province, junction of Yangtze River Delta Economic Zone and Bohai Economic Sphere, is the assembly place of railways, highways, waterways and other hubs in China, which has the geographical advantage of connecting the south and the north, and joining the east and the west together. North Jiangsu includes five provincial cities, namely Xuzhou, Lianyungang, Huai'an, Yancheng and Suqian, and there are 40 counties (cities, districts) in the aggre-

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gate. The total area of North Jiangsu is 52 300 km², accounting for 51.9% of that of whole Jiangsu Province; at the end of 2006, the total population of North Jiangsu was 32.28 million, accounting for 44.8% of that of Jiangsu Province.

In recent years, the economic basis in regions of North Jiangsu has been significantly strengthened; the industrial economy develops dramatically; the industrial system has initially taken shape. A batch of characteristic and advantageous industries emerge, such as construction machinery in Xuzhou City, automobile in Yancheng City, medicine in Lianyungang City, steel in Huai'an City, wine making in Suqian City and so on; the tertiary industry develops rapidly, and provides a large number of jobs, which is a new economic growth point. Population of North Jiangsu is close to 50 percent of that of whole Jiangsu Province, but GDP of North Jiangsu only accounts for 20 percent of that of whole province, with GDP per capita lower than 50 percent of the provincial average^[5]. It can be clearly seen that the level of economic development and people's living standard in the regions of North Jiangsu are still relatively backward, thus the regions of North Jiangsu are still the key target of poverty alleviation work of Jiangsu Province.

1.2 Establishment of the index system

1.2.1 The index of poor village recognition. Using participatory poverty index to comprehensively reflect the poverty state of the survey areas and the poverty degree of poor villages, and constructing an index system that can comprehensively recognize the poverty state, is a key step, and the important guaran-

tee for choosing the poor villages precisely. We should choose a series of indices that can reflect the poverty state as far as possible. These indices should be concise, sensitive and typical but not overlapped. The selection of indices of poverty is not dreamed out, but based on certain scientific principles. First, we should refer to the literature data concerning poverty alleviation in China, and generalize several indices of measuring poverty. The indices determined at this step should be more than the indices in practical operation and use. In order to further screen and determine indices, first we should list all the indices that are once referred to by all the related researches^[6]; in order to make the indices more suitable for the local circumstances, then we should muster the county, township, and village officials and part of villagers to discuss which indices are most critical and most sensitive, so as to finally determine several key indices. The participatory poverty index is an effective try to measure poverty from bottom to top, so in the process of measuring poverty, the main body function of the poverty group is respected and realized. Therefore, on the basis of the preceding two steps, the poverty index system is finally determined through the field survey of personnel and interviewing the local villagers. The index system of determining the poor village in North Jiangsu by using the participatory poverty index (Table 1) can objectively reflect the poverty degree of the poor villages after field survey, interview, and statistical analysis, on the basis of the actual situation of economic developmental level in this region.

Table 1 The index system of determining the poor village in North Jiangsu

Index type	Index of poverty recognition	Connotation of index
Current life style	Annual net income of farmers per capita	The cash income obtained by the farmers per capita per year from various kinds of channels//Yuan
	Annual grain yield per capita	The total yield produced by the farmers per capita per year in their land//kg
	Farmers' Engel coefficient	The proportion of the total food purchased by the farmers per capita per year in total consumption of consumer goods//%
Living and production conditions	Total power of agricultural machinery per capita	The power of machinery used by the farmers per capita per year//kW
	The number of telephone ownership per 100 people	The number of telephone owned by per 100 people among famers (mobile telephone and landline phone)
Hygienic and educational condition	The number of occupational physician ownership per 1 000 people	The number of occupational physician owned by per 1000 people among famers
	Dropout rate of school children	The proportion of the children who cannot go to school in the primary school-aged children and secondary school-aged children//%
	Environmental pollution control and treatment expense	The expense of controlling and disposing with the environmental pollution in rural areas//Yuan

1.2.2 Determination of index weight. Participatory poverty index is obtained by integrating and arranging the comprehensive multi-index evaluation factors. The interpretation of poverty degree of the poor villages of all indices is different, so we need to conduct measurement on the weight of all indices. The method of determining the weight of comprehensive multi-index evaluation factors can be divided into subjective weighting method and objective weighting method in general. Among them, the subjective weighting method characterized by hierarchy analysis is relatively mature, but its objectivity is very poor; while the objective weighting method characterized by principal compo-

nent analysis and mean square deviation has strong objectivity^[7]. Due to the limitedness of poverty alleviation resources, purposefulness of poverty alleviation target and typicality of poverty alleviation target, in order to reduce the workload of gathering village-level data, from the map of basic competitiveness of China's county economy, we select 5 counties in North Jiangsu with the weakest competitiveness^[8], namely Suining County in Xuzhou City, Siyang County of Suqian City, Guanyun County in Lianyungang City, Hongze County in Huai'an City, and Xiangshui County in Yancheng City; then we use farmers' net income per capita to conduct second screening

on all the administrative villages. Among the villages surveyed in whole North Jiangsu, we select the most typical villages which have the greatest recognition to the selected index system, to conduct research of poverty index. After statistical analysis, we select the following villages: Lianqun Village in Suining County of Xuzhou City, Mawa Village in Siyang County

of Suqian City, Chuanxing Village in Guanyun County of Li-anyungang City, Xiaozhu Village in Hongze County of Huai'an City and Fengda Village in Xiangshui County of Yancheng City. After the research and discussion of the village cadres and the masses, the weight test result can be seen in Table 2.

Table 2 The measuring result of weight of representative poor villages in North Jiangsu %

Index type	Index of poverty recognition	Lianqun	Mawa	Chuanxing	Xiaozhu	Fengda
Current life style		39	40	38	35	33
	Annual net income of farmers per capita	41	40	38	38	43
	Annual grain yield per capita	32	30	37	30	28
	Farmers' Engel coefficient	27	30	25	32	29
Living and production conditions		32	35	34	31	36
	Total power of agricultural machinery per capita	51	50	55	56	53
	The number of telephone ownership per 100 people	49	50	45	44	47
Hygienic and educational condition		29	25	28	34	31
	The number of occupational physician ownership per 1 000 people	38	36	35	32	35
	Dropout rate of school children	38	39	41	38	35
	Environmental pollution control and treatment expense	24	25	24	30	30

1.3 Data source and processing

1.3.1 Data source. According to the requirements of poverty index, we get the data we need, by field survey, on-the-spot investigation and interview in the selected areas. But in the process of obtaining the data, there are difficulties regarding region, statistical analysis of data, data absence and so on, in the actual survey. In research, part of data are the second-hand data from data record of management departments of counties and villages in North Jiangsu, such as equipment department, safety department, sanitation department, fire fighting department, personnel department, labor wages department, financial department, testing department, production department and so on. In addition, part of data are obtained from inquiry record of related statistical yearbook of all cities, therefore, the study data has certain dispersiveness. When collecting data, we should guarantee the authenticity, validity, objectivity, comparability and broad representativeness of data. We should screen the data and eliminate the unreliable data, but we also should ensure the integrity of data. As for the multitudinous data we get, first of all, we should conduct classification and aggregation on the data; then we process the data; in order to guarantee the authenticity, validity and representativeness of data, we need to retest the data when necessary.

1.3.2 Standardization processing of data. The recognition in-

dices of the poor villages reflect different contents, and the indices adopt different dimensions. In order to eliminate the impact of different data dimensions and different sizes of dimension on the calculation results, we need to conduct standardized processing on the original data^[9]. The data standardization we use in this research is just the indexation of statistical data. The indexation processing is to conduct the mathematical calculations on the basis of the difference between the maximum and minimum of indices, and the result is between 0 – 1, so as to solve the comparability of data. The specific formula is as follows^[10]:

$$z_i = \frac{x_i - x_{\min}}{x_{\max} - x_{\min}}$$

(1)

In the above formula, z_i is the standard fraction of index; x_i is the index value of one index in one village; x_{\max} is the maximum of one index amid all villages; x_{\min} is the minimum of one index amid all villages. Through the aforesaid standardization processing, the original data are all transformed into non-dimensional evaluation values of index, that is, all index values are at the same level of quantity, thus we can conduct comprehensive evaluation analysis^[11]. According to the relevant data from *Jiangsu Statistical Yearbook* in the year 2009^[12], by using formula 1, we calculate out the standardization processing result of all indices, which can be seen in Table 3.

Table 3 Standardization result of index value of representative poor villages in North Jiangsu

Index of recognition	Lianqun	Mawa	Chuanxing	Xiaozhu	Fengda
Annual net income of farmers per capita	0.02	0	0.03	1	0.28
Annual grain yield per capita	0	0.19	0.54	1	0.52
Farmers' Engel coefficient	0.89	1	0.12	0	0.39
Total power of agricultural machinery per capita	0	0.02	0.17	1	0.15
The number of telephone ownership per 100 people	0.27	0.09	0.82	0	1
The number of occupational physician ownership per 1 000 people	1	0.38	0.75	0	0.50
Dropout rate of school children	1	0.42	0.57	0.83	0
Environmental pollution control and treatment	0.09	0	0.27	0.42	1

1.4 Research method The calculation formula of participatory poverty index is as follows^[6]: $PPI = 20 \times ((I_i \times w_{jk}) \times w_j = 20 \times [w_1(I_1 \times w_{11} + I_2 \times w_{12} + I_3 \times w_{13}) + w_2(I_4 \times w_{21} + I_5 \times w_{22} + I_6 \times w_{23}) + w_3(I_7 \times w_{31} + I_8 \times w_{32})]$ (2)

In the above formula, PPI is participatory poverty index; 20 is constant; I_i is the value of 8 poverty indices, $i=1-8$; w_j is the weight of each type of index, $j=1-3$; w_{jk} is the second-level weight of 8 poverty indices, $k=1-3$. $w_1 + w_2 + w_3 = 1$; $w_{11} + w_{12} + w_{13} = 1$; $w_{21} + w_{22} + w_{23} = 1$; $w_{31} + w_{32} = 1$.

2 Results and analysis

By using the calculation formula of participatory poverty index, we get the poverty index calculation results of five representative villages in North Jiangsu. For example, the participatory poverty index of Lianqun Village in Suining County of Xuzhou City is as follows:

$$PPI = 20 \times [0.39 \times (0.41 \times 0.02 + 0.32 \times 0 + 0.27 \times 0.897) + 0.32 \times (0.51 \times 0 + 0.49 \times 0.273) + 0.29 \times (0.38 \times 1 + 0.38 \times 1 + 0.24 \times 0.09)] = 5.564$$

According to the data in Table 3, by using formula (2), we can get five non-dimensional values, namely the participatory poverty index of five poor villages. Through comparing the five participatory poverty indices, we can conduct the sequencing of poverty degree on the five representative villages, so that we can allocate the limited poverty alleviation resources to all poor villages rationally according to proportion and need. Thus, it has broken with the previous irrational behavior that we determine the poor villages only according to GDP or GDP per capita, without taking into account many influencing factors.

Sequencing of the poverty index and poverty degree of representative poor villages in North Jiangsu can be seen in Table 4.

Table 4 Sequencing of the poverty index and poverty degree of representative poor villages in North Jiangsu

Village	Poverty index	Sequencing of poverty degree
Mawa	6.198	1
Lianqun	5.564	2
Chuanxing	5.501	3
Xiaozhu	4.824	5
Fengda	4.989	4

3 Conclusion and discussion

Through establishing poverty index system of representative poor villages, determining the weight of indices, conducting standardization processing on the data, and formula calculation, we get the sequencing of poverty degree of representative poor villages, and provide scientific basis for allocating poverty alleviation rationally. It can be clearly known that in terms of theory and operability of technology, participatory poverty index can better recognize the poor villages, and lay solid foundation for the work of poverty alleviation, which is the good first step of the work of poverty alleviation. Be that as it may, in the practical application, we will encounter many problems as follows. First, the recognition of poor villages is just the overture

of the work of poverty alleviation, and poverty alleviation is the focus. The specific implementation of the work of poverty alleviation is restrained by the poverty alleviation resources, poverty alleviation ability and the quantity of poor villages. As a matter of fact, the quantity of poor villages, to certain extent, is restrained by the amount of poverty alleviation resources, and certain amount of poverty alleviation resources directly affect the poverty standard within certain geographical area. Clearly, we should not solely use the participatory poverty index, but consider the poverty alleviation resources and poverty alleviation capacity of the region. Second, when the participatory poverty index is finally calculated out, in theory, we should allocate certain amount of poverty alleviation resources for poverty alleviation according to the sequencing of poverty index, but in the practical operation, it is not the case. Under certain circumstances, we may give priority to solving the poverty of the poor villages with the urgent indices, so that we upset the poverty sequencing that is conducted by using the participatory index calculated by formula. Third, the application of participatory poverty index needs to involve the related village cadres and the masses, so it has strong subjectivity to some extent, which will directly affect the data collection. Therefore, the research, application and effectiveness of participatory poverty index in North Jiangsu is yet to be practised and improved.

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