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Study on the Degree of Rural Empty Nesters' Satisfaction with Life Quality Based on Ordered Logit – ISM Model

Huanan ZHANG*, Jin FANG, Hongxia BI

Shandong Agricultural University, Taian 271018, China

Abstract It is an ultimate objective to solve the rural supporting problems to improve life satisfaction of empty nesters in rural areas. Based on data of 546 empty nesters in rural areas, the factors influencing life quality satisfaction of empty nesters in rural areas are firstly analyzed using ordered logit model, and then the relationship between various influencing factors is analyzed using ISM. Study shows that health condition, degree of participation in cultural and sports activities, spouse status, family harmony degree, annual family income, degree of worry about life, degree of government and social care and pension mode, have a significant impact on the life quality satisfaction of empty nesters in rural areas. The degree of worry about life, degree of government and social care are surface direct factors; degree of participation in cultural and sports activities, family harmony degree, pension mode are intermediate indirect factors; health condition, spouse status and annual family income are deep root factors.

Key words Rural empty nesters, Life quality, Degree of satisfaction, Ordered Logit, ISM

1 Introduction

As of the end of 2014, the population aged 60 years or more reached 210 million in China, accounting for 15.5% of the total population, and the empty nesters occupied more than half of the elderly. Some experts expect that by 2030, the aged in China will be near 300 million and the proportion of households with empty nesters will reach 90%, which means that there will be more than 200 million of empty nesters. Therefore, the study on degree of rural empty nesters' satisfaction with life quality and its influencing factors not only helps to grasp the life quality status of rural empty nesters, but also helps to systematically explore the key factors restricting the degree of rural empty nesters' satisfaction with life quality. In recent years, the academic community has launched a wide range of studies on old-age problems concerning rural empty nesters. Yao Yinmei believes that the life quality of rural empty nesters in economically developed regions is not only below the average living standard of rural population, but also below the elderly living together with their children. Li Fang *et al.* point out alternative strategies and floating policies are two ways to protect the interests of the rural empty nesters currently and make floating and left-behind empty nesters have access to the appropriate supporting resource for the elderly. Lu Jianlan and Li Jianxin think there are significant differences in life satisfaction between empty nesters and non-empty nesters and the degree of empty nesters' satisfaction with life is low^[1-6]. To sum up, the existing researches lack in-depth analysis of the factors that affect the degree of rural empty nesters' satisfaction with life quality and their internal relations. Therefore, on the basis of relevant research results and question-

naire survey data in Shandong Province, this paper conducts systematic analysis of the factors that affect the degree of rural empty nesters' satisfaction with life quality and the mechanism, in order to provide theoretical support and practical guidance for enhancing the degree of rural empty nesters' satisfaction with life quality.

2 Theoretical analysis, variable selection and sample data

2.1 Theoretical analysis

2.1.1 Individual characteristic variables. Individual characteristic variables include gender, age, health condition and degree of participation in cultural and sports activities. In general, with age, the physiological function of rural empty nesters declines and the rate of chronic diseases increases, so they gradually lose confidence in life. Poor physical condition has seriously affected the enhancement of the degree of rural empty nesters' satisfaction with life quality. The rural empty nesters with higher degree of participation in cultural and sports activities will get more mental and physical pleasure, to a certain extent reducing the sense of loneliness and loss arising from "empty nest". Therefore, it is assumed that female rural empty nesters have higher degree of satisfaction with life quality than male rural empty nesters; the older rural empty nesters have lower degree of satisfaction with life quality; the healthier rural empty nesters have higher degree of satisfaction with life quality; the rural empty nesters participating in more cultural and sports activities have higher degree of satisfaction with life quality.

2.1.2 Family characteristic variables. Family characteristic variables include spouse status, family harmony degree, annual family income and main source of income. For the rural empty nesters with spouse in good health, they are not taken care of by children, but they are together morning and night with their lovers, so that the psychological loneliness is reduced and the degree of satisfac-

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* Corresponding author. E-mail: 962944465@qq.com

tion with life quality is improved. If there is a more harmonious relationship between the family members, the happiness will be stronger and the degree of satisfaction with life quality will be higher. Economic conditions directly affect the rural empty nesters' clothing, food, housing, transportation and health, so it has a certain degree of influence on the physical and psychological perception of life quality^[7]. Due to old age and poor physical condition, rural empty nesters' ability to obtain income becomes worse, and if children can assume the daily expenses for empty nesters, it can reduce economic burden and help to improve the degree of satisfaction with life quality. Therefore, it is assumed that the empty nesters with spouse in good health have higher degree of satisfaction with life quality than the widowed or single empty nesters; if the relationship between family members is more harmonious, the degree of satisfaction with life quality will be higher; the higher the household income, the higher the quality of life satisfaction; the rural empty nesters supported by their children have higher degree of satisfaction with life quality than the empty nesters dependent on the minimum living allowance or farming income.

2.1.3 Cognitive characteristic variables. Cognitive characteristic variables include cognition of loneliness and cognition of degree of worry about life. Loneliness is the individual's unhappy experience when it lacks social networks, including small quantity and low quality of social relations, and long-term loneliness will inevitably reduce the life quality. Therefore, it is assumed that the

higher the cognition degree of loneliness, the lower the degree of satisfaction with life quality; the greater the worry about future life, the lower the degree of satisfaction with life quality.

2.1.4 Social relations variables. Social relations variables include the degree of government and social care, pension mode and neighborhood. The government and society give more care and help to rural empty nesters to let them feel atmosphere of respect and care for the elderly, which will help improve the degree of satisfaction with life quality. Community endowment can make empty nesters continue to live a retired life in their home, and the elderly service of community service agencies can largely meet the care needs of empty nesters^[8]. If the neighborhood relations are not handled properly, it will bring a lot of unnecessary trouble, thus affecting the normal life of rural empty nesters^[9]. Therefore, it is assumed that if government and society give more care to rural empty nesters, the degree of their satisfaction with life quality will be higher; community pension mode is easier to meet the comprehensive needs of the elderly than family pension mode and institutional pension mode; if there is harmonious neighborhood, the degree of satisfaction with life quality will be higher.

2.2 Variable selection According to the above theoretical analysis, this paper selects a total of 13 variables in four categories when establishing the econometric model for the factors influencing the degree of rural empty nesters' satisfaction with life quality (Table 1).

Table 1 Explanation of model variables and expected impact direction

Variable type	Variable name	Assignment and meaning	Expected direction
Individual characteristics	Gender	Male = 1; female = 2	+
	Age (years)	60 - 69 = 1; 70 - 79 = 2; 80 and above = 3	-
	Health condition	Poor = 1; average = 2; good = 3	+
	Degree of participation in cultural and sports activities	Never = 1; occasionally = 2; often = 3	+
Family characteristics	Spouse status	Widowed or without a spouse = 1; spouse in good health condition = 2	+
	Family harmony degree	Low = 1; middle = 2; high = 3	+
	Annual family income (yuan)	3000 and below = 1; 3001 - 6000 = 2; 6001 - 9000 = 3; 9001 and above = 4	+
	The main source of income	Minimum living allowance = 1; farming = 2; child support = 3	+
Cognitive characteristics	Cognition of loneliness	Never = 1; occasionally = 2; often = 3	-
	Cognition of degree of worry about life	High = 1; middle = 2; low = 3	+
Social relations	Degree of government and social care	Never = 1; occasionally = 2; often = 3	+
	Pension mode	Institutional pension = 1; family pension = 2; community home care = 3	+
	Neighborhood	Poor = 1; average = 2; good = 3	+

2.3 Data sources and samples

2.3.1 Data sources. The data are obtained through field surveys by the research group in February 2015. Based on full consideration of geographical location and economic development in Shandong Province, this paper uses stratified sampling method to hand out 600 questionnaires and get 546 valid questionnaires, with valid recovery rate of 91%.

2.3.2 Basic features of samples. Among 546 rural empty nesters interviewed, male respondents account for 51.40% and female re-

spondents account for 48.60%, with balanced sex ratio; the proportion of respondents aged 60 - 69 years, 70 - 79 years and over 80 years is 38.15%, 40.45% and 21.40%, respectively; in terms of health condition, 22.30% of respondents' self-assessment result is "poor", 26.84% of respondents' self-assessment result is "average", and 50.76% of respondents' self-assessment result is "good"; in terms of spouse status, the widowed or single respondents account for 43.52%, and the respondents with spouse in good health condition account for 56.48%; in terms of pension mode,

the proportion of respondents choosing "family pension mode", "community pension mode" and "institutional pension mode" is 58.15%, 32.25% and 9.60%, respectively.

3 Empirical analysis

3.1 Analysis of the influencing factors based on ordered Logit model

3.1.1 Model selection. Currently, the empirical researches on the factors that affect a certain variable to be explained mostly use a binary choice model, to define the variable to be explained as 0 and 1. In this paper, the assessment results on the degree of rural empty nesters' satisfaction with life quality are divided into three categories: "unsatisfied", "normal" and "satisfied". The traditional binary choice model does not apply to this, so this paper uses the ordered Logit model to analyze the factors that affect the degree of rural empty nesters' satisfaction with life quality. The basic form of ordered Logit model is as follows:

$$P(y=j/x_i) = \frac{1}{1 + \exp[-(\alpha_j + \beta x_i)]} \quad (1)$$

where y represents rural empty nesters' assessment of life quality, and the value is assigned to $y(j=1, 2, \dots, n)$; n is the number of rural empty nesters who assess the degree of satisfaction with life

quality; x_i is factor i ($i=1, 2, \dots, m$) that affects rural empty nesters' life quality; m is the number of influencing factors.

The cumulative model is established as follows:

$$\text{Logit}(P_j) = \ln[P(y \leq j)/P(y \geq i+1)] - \alpha_j + \beta x \quad (2)$$

where P_j is the probability of a certain degree to which rural empty nesters' satisfaction with life quality belongs; $P_j = P(y=j)$, $j=1, 2, 3$; x_1, x_2, \dots, x_m represent a set of independent variables; α_j is the intercept of the model; β represents a set of corresponding regression coefficients.

After the parameter estimation, the probability of occurrence in some specific cases can be obtained by the following formula:

$$P(y \leq j/x) = \frac{\exp[-(\alpha_j + \beta x_i)]}{1 + \exp[-(\alpha_j + \beta x_i)]} \quad (3)$$

3.1.2 Estimation results. This paper uses SPSS17.0 software to perform the statistical analysis on 546 samples based on ordered Logit model. Firstly, we consider all variables to estimate expression (3) and get the regression results (omitted). Secondly, based on the concomitant probability, we use the reverse screening method to gradually eliminate insignificant variables until all variables are statistically significant at the 10% level. The regression results are shown in Table 2.

Table 2 Ordered Logit regression results of the factors influencing the degree of rural empty nesters' satisfaction with life quality

Variable		Estimates	Standard deviation	Wald value
Dependent variable	Unsatisfied	5.187***	0.870	35.555
	Normal	8.447***	0.926	83.168
	Satisfied	11.634***	0.978	139.121
Independent variable	Health condition	0.438***	0.129	11.537
	Degree of participation in cultural and sports activities	0.672***	0.154	19.108
	Spouse status	0.472*	0.130	13.217
	Family harmony degree	0.262**	0.124	4.476
	Annual family income	0.391***	0.096	16.436
	Degree of worry about life	0.592*	0.157	14.150
	Degree of government and social care	0.218**	0.193	9.485
	Pension mode	0.806***	0.207	15.246
	Total chi-square of model	173.175	df	12.000
	-2 Log likelihood values	891.535	Sig.	0.000

Note: *, **, *** mean that it is significant at the 10%, 5% and 1% levels, respectively.

From the regression results in Table 2, it can be found that eight factors (health condition, degree of participation in cultural and sports activities, spouse status, family harmony degree, annual family income, degree of worry about life, degree of government and social care and pension mode) have statistically significant influence on the degree of rural empty nesters' satisfaction with life quality. In fact, the above-mentioned eight factors are independent and also interrelated, to form a hierarchical system of factors influencing the degree of rural empty nesters' satisfaction with life quality. The ordered Logit model can identify the eight factors, but it can not derive the relations and hierarchy between them. Therefore, we will use ISM to determine the relations and hierarchies between the above eight factors.

3.2 Structural analysis of the influencing factors based on ISM Interpretative structural model, referred to as ISM, is a

method developed by Warfield for the analysis of the structural problems of complex socio-economic system. It has been widely used in the relevant field in recent years^[10-12]. ISM is a conceptual model based on qualitative analysis, which uses clear conceptual structure graph to indicate the correlation and hierarchy between the various elements of the system. It is an effective structure target analysis method. According to ISM, we perform the structural analysis of the factors that affect the degree of rural empty nesters' satisfaction with life quality. (i) Establishing the logical relationship between factors. Based on the estimation results of ordered Logit model, this paper uses $S_1, S_2, S_3, S_4, S_5, S_6, S_7$ and S_8 to represent rural empty nesters' health condition, degree of participation in cultural and sports activities, spouse status, family harmony degree, annual family income, degree of worry about life, government and social care and pension mode, respectively. On the

basis of discussion and consultation with relevant experts and scholars, the logical relationship between the above eight influencing factors is given, as shown in Fig. 1. "N" indicates that the row factors have a direct or indirect impact on the column factors while "U" indicates that the column factors have a direct or indirect impact on the row factors.

U	U	U	U	U	U	U	U	S_0 The degree of rural empty nesters' satisfaction with life quality
N	0	N	0	N	0	N	N	S_1 Health condition
0	0	N	U	0	U			S_2 Degree of participation in cultural and sports activities
N	0	0	0	N				S_3 Spouse status
0	0	N	U					S_4 Family harmony degree
N	N	N						S_5 Annual family income
U	0							S_6 Degree of worry about life
0								S_7 Care of the government and society
								S_8 Pension mode

Fig. 1 The logical relationship between the influencing factors

(ii) Establishing the adjacency matrix. According to the logical relationship between the influencing factors shown in Fig. 1, we use equation (4) to give the adjacency matrix R between the factors. "1" indicates that there is impact; "0" indicates that there is no impact.

$$r_{ij} = \begin{cases} 1 & S_i \text{ and } S_j \text{ are related} \\ 0 & S_i \text{ and } S_j \text{ are not related} \end{cases} \quad i, j = 0, 1, \dots, k \quad (4)$$

(iii) Calculating the reachability matrix. Using formula (3) and Matlab7.0 software, we get the reachability matrix of influencing factors (M) by the adjacency matrix R .

$$M = \begin{matrix} S_0 \\ S_1 \\ S_2 \\ S_3 \\ S_4 \\ S_5 \\ S_6 \\ S_7 \\ S_8 \end{matrix} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

$$M = (R + I)^{\lambda+1} = (R + I)^{\lambda} \neq (R + I)^{\lambda-1} \neq \dots \neq (R + I)^2 \neq (R + I) \quad (5)$$

where I is the unit matrix, $2 \leq \lambda \leq k$. The Boolean algorithm is used for matrix exponentiation.

(iv) Determining the hierarchy between factors. Firstly, we calculate the highest feature set (L_1) with a multilevel hierarchical structure based on equation (6).

$$L_1 = \{S_i | P(S_i) \cap Q(S_i) = P(S_i); i = 0, 1, \dots, k\} \quad (6)$$

where $P(S_i)$ is the set of all factors that can be reached from factor S_i in the reachability matrix; $Q(S_i)$ is the set of all factors that can reach factor S_i in the reachability matrix. Namely:

$$P(S_i) = \{S_j | m_{ij} = 1\}, Q(S_i) = \{S_j | m_{ji} = 1\} \quad (7)$$

where m_{ij} and m_{ji} are the factors of reachability matrix M .

Secondly, by deleting the rows and columns that the factors in L_1 correspond to from the original reachability matrix M , we get matrix M' ; by conducting formula (7) and (6) operation on M' , we get the factors in the second layer L_2 ; by removing the rows and columns that the elements in L_2 correspond to from M' , we get matrix M'' ; by conducting the same operation on M'' , we get the factors in the third layer L_3 ; in a similar manner, we get the factors in all layers. According to the above method, we first get the factor at the highest level $L_1 = \{S_0\}$ from reachability matrix M , and then get $L_2 = \{S_6, S_7\}$, $L_3 = \{S_2, S_4, S_8\}$ and $L_4 = \{S_1, S_3, S_5\}$ according to the method of determining the factors in other layers. Finally, according to the classification results of factors, we rearrange the rows and columns of reachability matrix M to get the hierarchy matrix of the factors influencing the degree of rural empty nesters' satisfaction with life quality (B).

$$B = \begin{matrix} S_0 & S_6 & S_7 & S_2 & S_4 & S_8 & S_1 & S_3 & S_5 \\ S_0 & \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \\ S_6 & \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \\ S_7 & \begin{bmatrix} 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \\ S_2 & \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \\ S_4 & \begin{bmatrix} 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \end{bmatrix} \\ S_8 & \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \end{bmatrix} \\ S_1 & \begin{bmatrix} 1 & 1 & 0 & 1 & 1 & 1 & 0 & 1 & 0 \end{bmatrix} \\ S_3 & \begin{bmatrix} 1 & 1 & 0 & 1 & 1 & 1 & 0 & 0 & 0 \end{bmatrix} \\ S_5 & \begin{bmatrix} 1 & 1 & 0 & 1 & 1 & 1 & 0 & 0 & 1 \end{bmatrix} \end{matrix}$$

(v) Establishing the interpretive structural model. S_0 is in the first layer; S_6 and S_7 are in the second layer; S_2 , S_4 and S_8 are in the third layer; S_1 , S_3 and S_5 are in the fourth layer. It forms an influencing factor chain with a logical relationship. Using the directed edge to connect the factors in the adjacent layers and the same layers, we get the relationships and hierarchies between the factors influencing the degree of rural empty nesters' satisfaction with life quality, as shown in Fig. 2.

4 Discussions

4.1 Analysis of direct factors in the surface layer The regression coefficient of degree of government and social care is 0.218, and it is statistically significant at the 5% level, indicating that the degree of government and social care has a significant positive impact on the degree of rural empty nesters' satisfaction with life quality, consistent with theoretical expectation. It is found that in the regions with higher degree of government and social care, the social atmosphere of respecting the elderly is better, the building degree of grass-roots facilities for the elders is higher, and the rural retirement community development is better, so the degree of rural empty nesters' satisfaction with life quality is higher. The regression coefficient of degree of worry about life is 0.592, and it is statistically significant at the 10% level, indicating that the degree of worry about life has a significant positive impact on the degree of rural empty nesters' satisfaction with life

quality, consistent with theoretical expectation. In the survey, it is found that 78.52% of empty nesters are most worried about the future life support. The possible reason is that owing to the continued implementation of various rural social security policies, the rural minimum living security system, pension insurance and co-operative medical care policy can basically meet empty nesters'

daily life needs, but they are still worried about their future life support. As the factor having a direct impact on the degree of rural empty nesters' satisfaction with life quality, the degree of worry about life is also affected by three indirect factors (degree of participation in cultural and sports activities, degree of family harmony and pension mode).

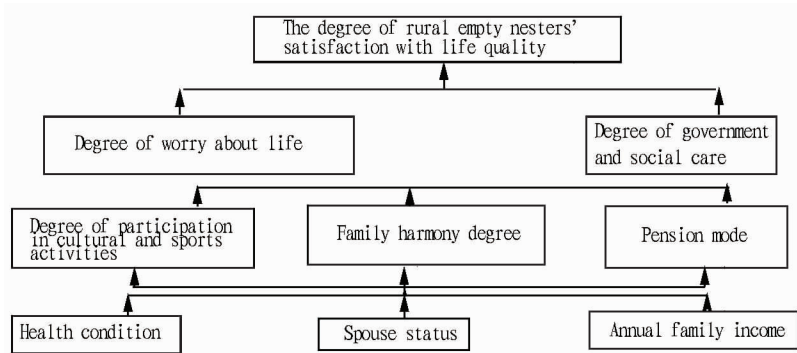


Fig. 2 Relationships and hierarchies between the influencing factors

4.2 Analysis of indirect factors in the middle layer The regression coefficient of degree of participation in cultural and sports activities is 0.672, and it is statistically significant at the 1% level, indicating that the degree of participation in cultural and sports activities has a significant positive impact on the degree of rural empty nesters' satisfaction with life quality, verifying the hypothesis of this article. On the one hand, through participation in cultural and sports activities, it can eliminate the anxiety and loneliness of empty nesters due to inactivity and idleness; on the other hand, during the participation in cultural and sports activities, it improves their physical fitness, slows the rate of aging of bodily functions, and scatters the worries about life. The regression coefficient of family harmony degree is 0.262, and it is statistically significant at the 5% level, indicating that family harmony degree has a significant positive impact on the degree of satisfaction with life quality, but the impact is relatively small, consistent with theoretical expectation. If rural empty nesters have harmonious and enjoyable family atmosphere, the degree of their satisfaction with life quality is still high although children are not around. The regression coefficient of pension mode is 0.806, and it is statistically significant at the 1% level, indicating that pension mode has a significant positive impact on the degree of rural empty nesters' satisfaction with life quality, verifying the hypothesis of this article. The survey shows that due to the influence of traditional concept of rural care for the aged, more than 90% of empty nesters tend to choose home-based care for the aged and community pension mode; the rural empty nesters choosing institutional pension mode has lower degree of satisfaction with life quality than those choosing home-based care for the aged and community pension mode. As the factors having an indirect impact on the degree of empty nesters' satisfaction with life quality, degree of participation in cultural and sports activities, family harmony degree and pension mode are also affected by three deep root factors (health condition, spouse status and annual family income).

4.3 Analysis of deep root factors The regression coefficient

of health condition is 0.438, and it is statistically significant at the 1% level, indicating that health condition has a significant positive impact on the degree of rural empty nesters' satisfaction with life quality, verifying the hypothesis of this paper. Good health condition is a prerequisite for high quality standard of living, and an important guarantee for rural empty nesters' life quality. The regression coefficient of spouse status is 0.472, and it is statistically significant at the 10% level, indicating that spouse status has a significant positive impact on the degree of rural empty nesters' satisfaction with life quality, consistent with theoretical expectation. Due to lack of child's companionship and care, the widowed or single empty nesters have greater loneliness and sense of loss than the empty nesters with spouse in good health condition, so the degree of satisfaction with life quality is also reduced. The regression coefficient of annual family income is 0.391, and it is statistically significant at the 1% level, indicating that annual family income has a significant positive impact on the degree of rural empty nesters' satisfaction with life quality, verifying the hypothesis of this article. People have long regarded the level of income as the primary indicator to measure life quality, and income can ensure rural empty nesters' happy life in their later years.

5 Policy recommendations

(i) The government and society should increase propaganda of showing respect for the old, so that the whole society forms a social atmosphere of "filial piety". (ii) It is necessary to vigorously develop the rural economy, encourage young migrant workers to return home to start business, and focus on improving villagers' income and rural empty nesters' self-support ability. (iii) It is necessary to increase investment in health care for rural empty nesters to enhance the level of urban and rural social security, and give full play to the important role of community health institutions in

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1980s to 1990s, the stable sugar production in recent years has precisely reflected the bottlenecks facing sugarcane planting and sugar production. So it is necessary to meet domestic sugar demand through import. (ii) The sugarcane land will face competition on many factors. When some crops have higher benefits than sugarcane, farmers will abandon the cultivation of sugarcane in the soils with good conditions for planting. In Java and other densely populated areas, sugarcane land is also facing the occupation and expropriation for urbanization, so sugarcane can only be transferred to the land without irrigation conditions or barren land for planting. (iii) The sugar production and technical departments still have a large room to improve production efficiency, and improvement of efficiency will bring more returns to sugarcane processing industry and sugar industry. (iv) As the areas out of Java Island reclaim new sugar plantations and establish large sugar companies, the national sugar production capacity increases, and the domestic sugar demand gap will be reduced accordingly. (v) In view of the current difficulty in achieving self-sufficiency in

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primary health care and preventive health care. (iv) It is necessary to increase capital investment in cultural and sports infrastructure in rural areas and actively carry out various types of activities to enrich the spiritual life of the rural empty nesters. (v) It is necessary to establish and improve the social security system for rural empty nesters to earnestly safeguard and protect the legitimate rights and interests of rural empty nesters.

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sugar, the government is considering providing incentives to attract domestic and foreign investors to invest in Indonesia's sugar industry. The competent sugar enterprises in China can consider using the opportunity of sugar revitalization in Indonesia, to seek cooperation with the country in terms of sugarcane planting technology, sugar production and processing mechanic equipments.

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