Modes for Agricultural Land Protection in China

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Abstract The main problem of agricultural land protection in China is the single farmland protection mode insuring arable land area only by issuing indicators, which brings great pressure to farmland’s production and service function. Through establishing the corresponding relationship between food consumption structure and some land use types, this paper points out that there is asymmetry between farmland area and per capita food consumption structure in China in recent years. Based on the above study, the paper proposes four types for agricultural land production, namely subsistence, fairly well-off, ecological and discrete type. Finally, it concludes that establishing rational type for agricultural land protection and implementing diverse farmland protection modes is the trend of farmland protection in China in the future.

Key words Agriculture land, Protection, Mode

Since the founding of PRC China has paid more attention to farmland protection, and overall land use planning has been implemented in the form of indicators to protect farmland through laws and regulations since the 21st century. To realize the red line target of protecting 1.8 billion mu farmland, according to the overall indicator of farmland protection scale, arable land protected single rigidly in China, each province (autonomous region), municipality, region and town should be decomposed gradually to prevent farmland quantity and quality from decreasing. Under normal conditions, to reach the scale of cultivated land indicators, the area of garden plot, grassland, water surface for aquaculture and other land resources has been reduced, but it can not only make fruits, meet products, aquatic products and other daily necessities insufficient, but also increase the pressure of farmland production, namely so-called substitution effect. Therefore, through establishing the relationship between food consumption structure and some closely related land use types, we would try to build a suitable mode for protecting agricultural land in China, so as to provide scientific references for expanding the development of farmland protection in China.

1 Status quo of farmland protection scale and per capita food consumption structure in China in recent years

1.1 Relationship between food consumption structure and land use types According to the inherent laws of daily food structure and land use types producing the food, their relationship can be established (Fig. 1). As shown in Fig. 1, food structure requires that diversification protection of farmland should be carried out, and it is based on land use types which vary with food structure. Their relationship can be expressed in the form of mathematical set:

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\text{Food structure} = \{ \text{Grain, vegetables, fruits, aquatic product, meats, } \cdots, X_i \} = \{ \text{Farmland, garden plot, grassland, water surface for aquaculture, } \cdots, Y_i \} = \text{Land use types}
\]

Fig. 1 Relationship between food consumption structure and land use types

1.2 Changes in the consumption attitudes of urban and rural households during recent years As the improvement of people’s living level in China, people’s consumption attitudes have changed greatly. According to Fig. 2, the food consumption of urban and rural households showed a decreasing trend year by year after the reform and open to the outside world. From 1978 to 2007, Engel coefficient of urban and rural households reduced to the same degree, showing that Chinese household consumption structure of life developed toward diversification, that is, the demands of food and non-food life can be met to make people’s lives more rich and colorful.

1.3 Relationship between annual food consumption and farmland area per capita of urban and rural households

1.3.1 Relationship between annual grain consumption and farmland area per capita. The changing trends of annual grain consumption and farmland area per capita of urban and rural households were contrary. As shown in Fig. 3 and Fig. 4, annual grain consumption per capita of urban and rural households decreased gradually from 1998 to 2007, especially that of urban households. From Fig. 5, we can find that farmland area per capita of rural households increased obviously during 2000 – 2007.
1.3.2 Relationship between annual fruit consumption and garden plot area per capita. Seen from Fig. 6 and Fig. 7, annual fruit consumption per capita of urban and rural households went up year by year during 2002–2007. According to Fig. 8, garden plot area per capita of rural households increased gradually from 2000 to 2007, and the increase was lower than that of annual fruit consumption per capita.

1.3.3 Relationship between annual beef and mutton consumption and grassland area per capita. The results reveal that the changing trends of annual beef and mutton consumption and grassland area per capita of urban and rural households were contrary in recent years. As shown in Fig. 9, Fig. 10 and Fig. 11, annual beef and mutton consumption per capita of urban and rural households rose year by year from 1998 to 2007, while annual grassland area per capita in rural areas reduced from 2000 to 2007.

1.3.4 Relationship between annual aquatic product consumption...
and area of water surface for aquaculture per capita. According to Fig. 12, Fig. 13 and Fig. 14, annual aquatic product consumption per capita of urban and rural households increased year by year during 1998 – 2007, while the area of water surface for aquaculture per capita in rural areas went up firstly and then went down in 2000 – 2007.

In a word, there was an asymmetrical relationship between farmland protection scale and per capita food consumption structure in China in recent ten years. First, the changes of farmland area and grain consumption were contrary; second, the increase of garden plot area was higher than that of fruit consumption; third, the changes of grassland area and meat consumption were also contrary; fourth, the area of water surface for aquaculture increased firstly and then decreased, but aquatic product consumption went up gradually in recent years.

2 Construction of reasonable modes for agricultural land protection

According to the relationship between food consumption structure and some land use types as well as their status quo in recent years, it is demanded that China’s farmland protection must develop toward diversification, and to protect farmland better, we should construct reasonable modes for agricultural land protection, so as to serve economic and social development and people’s lives. Here, we established four basic modes, including subsistence, fairly well-off, ecological and discrete modes.

2.1 Subsistence mode Subsistence mode for agricultural land protection, a basic mode that has been implemented widely in China, aims to provide people for adequate food and clothing, meet the demand of increasing population for grain, maintain social and national stability. Moreover, it plays an important role in keeping
certain quantities of farmland in the primary stage of socialism even longer period, so the mode should be implemented continuously. It can be expressed in the form of mathematical set as below:

Subsistence mode = Farmland

2.2 Fairly well-off mode With the development of society and economy and improvement of people’s living level, China has stepped into well-to-do society, and people’s consumption attitudes have changed into meeting grain and other food consumption demands instead of only basic grain demand. Hence, to adapting to the change, land use structure should be adjusted to meet consumption demands, including garden plot, grassland, water surface for aquaculture producing fruits, beef and mutton, aquatic products respectively. Fairly well-off mode was a land use model built based on meeting people’s various demands, and it is expressed in the form of mathematical set as follows:

Fairly well-off mode = Farmland, garden plot, grassland, water surface for aquaculture

2.3 Ecological mode Ecological mode for agricultural land protection aims to meet people’s material and spiritual needs, and the latter includes landscape and other special environments. Therefore, the mode is a higher level mode for agricultural land protection based on subsistence and fairly well-off modes, and it can be expressed in the form of mathematical set as follows:

Ecological mode = Farmland, garden plot, grassland, water surface for aquaculture, ..., recreation site, Y

2.4 Discrete mode Based on subsistence, fairly well-off and ecological modes, discrete mode has been established due to uneven distribution of land resources and difference of economic and socio-cultural factors in various regions. There are great differences of land resources in the east, middle and west of China as well as in various provinces or regions, which is asymmetry with consumption structure, so we ought to conduct regional coordination and resource integration according to the differences and establish reasonable modes for agricultural land protection. In addition, due to economic and cultural differences, the concept of land use in ethnic minority areas is different from other areas, so reasonable modes for agricultural land protection should also be established according to local conditions. Discrete mode can be expressed as follows:

Discrete mode = Farmland | | Farmland, garden plot | | Farmland, grassland | | Farmland, water surface for aquaculture | | Farmland, ...

3 Conclusions

The results show that farmland protection should be in accordance with food consumption structure, and the scope protected should be adjusted according to food structure. In recent years, there was an asymmetrical relationship between farmland protection scale and per capita food consumption structure in China, and it is urgent to make farmland protection develop toward diversification. The subsistence, fairly well-off, ecological and discrete modes built in our study was suitable for the different developments of various regions, and they can promote farmland protection and relieve the pressure of farmland production. Hence, conditioned by land resources, establishing reasonable modes for agricultural land protection and diversifying farmland protection are the development trends of farmland protection in China in future.