

論文の内容の要旨

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論文題目 Sustainability of China's Grain Self-sufficiency
(中国における穀物自給の持続可能性)

With a drastic economic growth, substantial income increase and rapid urbanization over the last three decades, China's grain market has undergone a sustainable increase in the demand, particularly for feed grains driven by the growing demand for livestock products. These dietary changes, together with population growth, are projected to keep driving China's future grain demand. On the other hand, a decrease in arable land and lack of water resources, etc., contribute to the stress on the grain supply. Such challenges from both the demand and the supply sides of grain market give rise to concerns about China's grain security. Moreover, as the world's most populous country with 1.34 billion people, China plays a crucial role in the global supply-demand balance since it accounts for about 20% of global grain production and consumption. If China cannot maintain its grain basic self-sufficiency, the problem of "Who will feed China" (Brown, 1995) shall be not only an issue for the country but also a formidable question influencing the global grain security.

This thesis seeks to provide an analysis, from both the demand and supply sides, of whether China can achieve the sustainable self-sufficiency in grains—particularly for feed grains—in the near future. However, the aim of this research is not to project directly how much China's grain self-sufficiency rate will be in the future; instead, it aims to investigate the self-sufficiency problem by simulating possible impacts of China's increasing grain demand on the world price.

Chapter 1 gives backgrounds for this study from both theoretical and practical perspectives. Despite several important drawbacks in his analysis, Lester Brown's book has evoked widespread and intense discussions. His pessimistic projections, though seldom scientific, stimulate economists and even the Chinese government itself to reconsider the grain problems in China. Enormous projections on China's grain demand come out with a variety of results due to their varied assumptions, data sources and model structures. Reflected in China's grain policy, the Chinese government set their declared grain self-sufficiency goal at 95% in the two long-term plans in 1996 and 2008. According to official statistics, domestic grain production met 98% of grain consumption up to 2007, and the self-sufficiency rate of cereals as a whole amounted to 106%; in other words, a high degree of self-sufficiency was achieved.

In spite of this, China's grain problems are still faced with challenges and pressures. Although directly consumed food grains account for more than 50% of China's total grain demand, the proportion has been continually declining since the mid-1980s. In contrast, demand for feed grains has been growing to more than 30% of the overall grain demand in the 2000s and is projected to keep increasing due to the burgeoning livestock demand in the years ahead. China's grain self-sufficiency problem, in this sense, is essentially a problem of feed grains. Therefore, demand for livestock products need to be researched in detail in order to analyze the feed grain issue. This, in combination with an analysis of the supply side, shall contribute to the design of a supply-demand model of grains that can estimate the level of influence China has on global grain security. Previous studies in this field are reviewed, and methods, objectives and originalities in this study are clarified. The framework of this thesis is also introduced.

Chapter 2 provides an overall analysis on the changing direction of China's dietary pattern. By making principal component analysis (PCA) on food consumption data from 174 countries, it finds that China has been progressing for advanced diets by consuming less staple food and more meat, aquatic and dairy products for proteins. However, results of the PCA also show that China is not following the Western pattern of diet highly dependent on meats and dairy products such as the US and UK, but is moving towards the dietary pattern of East Asia's developed countries (regions) by consuming more fish and seafood like Japan, South Korea, Taiwan and Hong Kong; This finding is important because it poses the possibility of much less meat consumption contrary to some economists' assumptions.

In chapter 3, characteristics of China's food consumption are investigated in both urban and rural areas based on estimations of expenditure elasticities. As is well known, urban-rural gaps are significant in China. Clear distinctions exist between urban and rural

diets owing to differences in income levels, developmental stages, and lifestyles. It is essential to incorporate both urban and rural China into the analyses in order to have a complete and precise understanding of China's feed grain demand. In this chapter, the expenditure elasticities in both urban and rural areas are estimated through two methods, namely the double logarithmic function (DLF) analysis and the LA/AIDS (linear approximate almost ideal demand system) analysis.

Many results are common across the DLF and the LA/AIDS analyses. First, expenditure elasticities of most food items tend to decline in both urban and rural areas as the income increases. Second, the urban-rural gaps exist in food consumption, likely due to differences in the speed of economic growth and income level. On the whole, the expenditure elasticity is higher in rural China than in urban China for the same item. Third, similar dietary patterns and preferences are found between urban and rural areas. Estimations show that the Chinese people tend to consume more aquatic products than meats and poultry when their income increases; this pattern is different from the Western experience. Among meats and poultry, poultry is much more income elastic than pork, beef, or mutton. Moreover, among the livestock products, although the expenditure elasticities of beef and mutton are higher than that of pork, the expenditure share of pork is significantly larger than those of beef and mutton.

These results can be explained by China's dietary characteristics. Despite the influences China has felt from the Western diets over the last three decades that have led to higher consumption of milk and beef, the Chinese still regard aquatic products as premium foods, believe in the nutrient value of poultry, and retain pork as their predominant meat product. Compared with beef, the provision of aquatic products, poultry, and pork requires far fewer feed grains; this means that the increase in feed grains may be mild and thus leads to less stress on China's feed grain balance than the OECD projected.

Chapter 4 seeks to develop a supply-demand model of feed grains. To determine the demographic assumptions in the model related to population changes, previous studies in this field, including analyses of historical changes and projections for the future changes, are reviewed in detail.

Then in order to decide the assumptions concerning China's domestic supply capacity in the supply-demand model, detailed reviews of previous studies in this field are performed. In addition, original estimations are carried out in which area of arable land and yield are both taken into consideration.

Finally, a supply-demand model is built in chapter 4. Three scenarios are developed by assuming different expenditure elasticities for beef and pork consumption: the

expenditure elasticities for urban and rural China estimated in chapter 3, and another the OECD estimated and uses to make projections of China's grain demand in the AGLINK-COSIMO model. The simulation results show significantly different projections among these three scenarios. Compared with the scenario using the OECD expenditure elasticities, projections with the estimated expenditure elasticities for both urban and rural China in the present study yield a less rapid increase in China's feed grain demand and thus price of grains. According to this analysis, China is expected to sustain its demand for grains without jeopardizing world grain's supply-demand balance and leading to a global price boom. In conclusion, policy proposals are made in order to assist sustainable grain self-sufficiency in China.

Finally in chapter 5, conclusions of the whole thesis are summarized as follows:

First, China is not following and will not follow the Western dietary pattern as income increases. In the overall changing direction, it is found that rather than consuming large quantities of beef and dairy products for protein as some economists have envisaged, China is moving towards the pattern of East Asia's developed countries (regions) with preferences for aquatic products. Moreover, from analyses of expenditure elasticities, the Chinese people, in both urban and rural areas, are projected to spend their increased income on fish and seafood rather than poultry, beef or pork.

Second, the future increase in China's grain demand is expected to be manageable without breaking the world's grain supply-demand balance and leading to a price boom. In this sense, China is predicted to be able to achieve a sustainable self-sufficiency in grains in the near future. However, attention should be paid to several assumptions based on which these conclusions are reached, such as population growth at a medium rate, constant yield, and static economic growth predictions.