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Study on Problems of Grain Production in Suburb under New Situations: A Case Study of Hanjiang District, Yangzhou

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Abstract Take Suburban Hanjiang District of Yangzhou as an example, based on the comprehensive analysis of total grain yield, yield per unit, planting areas and patterns over the recent years, present problems and constraints in this district under the background of continuous yield increase are pointed out and main approaches of high and stable grain yield in suburbs under new situations are studied, which provides references for grain production in the same type of regions.

Key words Grain production, Limiting factors, Approaches

Grain is the foundation for the survival of human beings as well as national economic development[1]. Recent years, under the impact of limiting factors like shortage in cultivated land and water resource, global warming as well as environmental deterioration, resources and environment pressure faced by grain supply increase steadily rise and provisionment is generally tense[2]. Central rural work conference and national agricultural work conference in this year require the working goal of keeping the grain yield of more than 500 million tons with all efforts. The "twelfth five-year plan" also points out that ensuring national food safety should be regarded as the primary target and agricultural comprehensive productivity should be improved. However, suburb is the transition zone of urban and rural areas with special geographical location. Suburban agriculture is different from the pure agriculture and its purpose is to serve the city, providing agricultural products like grain, vegetables, eggs, fish, poultry and milk needed in the city and playing a role as the vegetable basket[3]. How to ensure grain safety and supply, balance the contradiction between grain production and vegetable production, city development as well as urban greening with the limited land resource in suburbs is a pressing problem facing us. This article takes Hanjiang district of Yangzhou as an example to comprehensively analyze the grain production problems and put forward proposals for stable and increased grain production.

1 Basic situations of grain production in Hanjiang district

Hanjiang district, located in the peripheral zone of Yangzhou city in Jiangsu province and the south of Yangtze - Huai Plain, is one of the sources of South - to - North Water Transfer and belongs to the typical wheat-rice double cropping area. And its 13 agricultural towns have the cultivated land of around 22 thousand hm^2 collectively with the planting areas of rice and wheat achieving 19.3 thousand hm^2 and 14.7 thousand hm^2 respectively.

1.1 Grain crop production

1.1.1 Fluctuation of grain planting area The implementation of a series of benefiting-farmers policies like grain subside fully stimulates farmers' enthusiasm for grain growing throughout the district. According to the statistical data, rice planting area in this district was 19.36 thousand hm^2 in 2007 and increased to 19.43 thousand hm^2 by 2010. And the figure still stood at 18.85 thousand hm^2 in 2011 although it declined by 573 hm^2, accounting for 86% of total cultivated land throughout the district. However, wheat planting area remained constant at nearly 13.33 thousand hm^2 in this district with the lowest point of 13.11 thousand hm^2 in 2009 while the peak of 14.77 thousand hm^2 in 2010, representing certain fluctuations (Fig. 1).

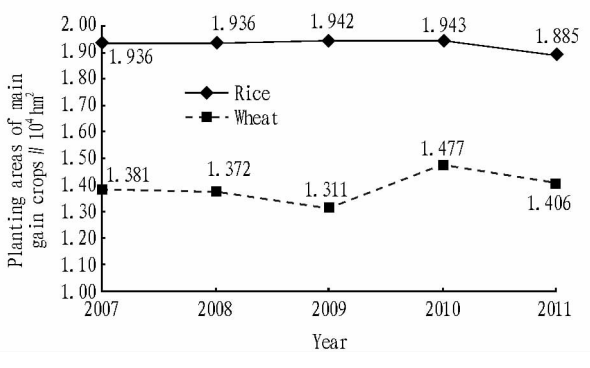

Fig. 1 Planting Areas of Main Grain Crops

1.1.2 Sustained growth of total grain yield The statistics suggest that total grain yield throughout the district in 2007 amounted to 231.8 thousand tones and increased to 238 thousand tones in 2008 with the increasing rate of 2.7%. And total grain yield in 2009 amounted to 240 thousand tones, increased by 1.3% compared with that in 2008. Till the end of "the eleventh five-year plan", total grain yield in this district arrived at 246.4 thousand tones with the increasing rate of 2.2% compared with that in 2009.

1.1.3 Continuous growth of grain yield per unit. Recent years, with the promotion and popularization of high yielding and

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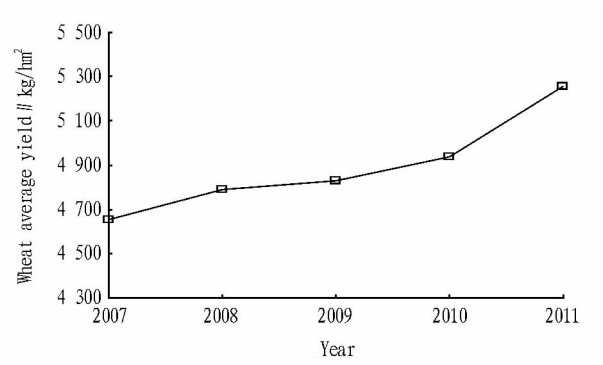

Fig. 2 Comparison of Wheat Yield Per Unit Between 2007 and 2011

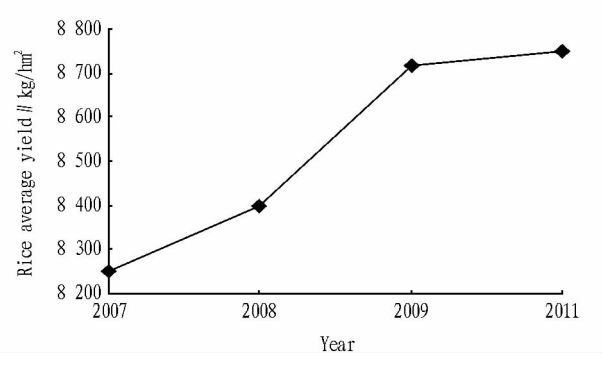

Fig. 3 Comparison of Rice Yield Per Unit Between 2007 and 2010

quality varieties as well as the comprehensive supporting of high-efficient and convenient planting technology, rice and wheat per unit yields in this district have been further enhanced. Per mu wheat yield increased from 4650kg/hm^2 in 2007 to 5256kg/hm^2 in 2011 with the four-year growth rate of 13% and yearly growth rate of 2.5% (Fig. 2). While rice per unit yield increased from 8250kg/hm^2 in 2007 to 8784kg/hm^2 in 2010 with the three-year growth rate of 6% and yearly growth rate of 1.96% (Fig. 3). The increase of per unit yield has provided a solid guarantee for the steady grain production throughout the district.

1.2 Planting patterns. In 2011, planting area of wheat in the district amounted to 14.1 thousand hm^2, among which area of shallow rotating hand broadcasting reached 13.4 thousand hm^2, accounting for 95% of total area. Area of both seed drilling and direct seeding arrived at 350hm^2 which accounted for 2.5% respectively in total area. And hand broadcasting took up the major position. However, planting area of rice amounted to 18.9 thousand hm^2, among which area of throwing transplantation arrived at 6.5 thousand hm^2 which accounted for 34% of total planting area. Area of mechanized transplanting reached 5.2 thousand hm^2, accounting for 28% in total area. Area of direct seeding rice was 4.1 thousand hm^2 and occupied 22% in total area while area of other planting methods like hand planting reached 3.1 thousand hm^2, taking up 16% of total planting area. With the implementation of " transforming direct seeding to mechanized transplantation", area of direct seeding rice declined from 5.4 thousand hm^2 in 2010 to 4.1 thousand hm^2 with the decreasing rate of 23.5%. While, area of mechanized transplantation increased from 1.2 thousand hm^2 in 2010 to 5.2 thousand hm^2 and still needs to be enlarged.

2 Main problems in grain production

2.1 Decline in grain planting area City development, infrastructure construction and agricultural projects like leisure and sightseeing occupy cultivated land. During the period between 2010 and 2011, planting area of wheat and rice decreased by 707hm^2 and 573hm^2 respectively. The proliferation of fertilizers and pesticides results in the hardening of cultivated land and decline in organic matter content as well as the ability of water and fertilizer reservation, which is not beneficial to the growth of crop root system and nutrition absorption and leads to a marked decline in basic productivity of cultivated land. Moreover, the quickening of urbanization increases the use of motor vehicles. Exhaust emission and sewage discharge in industrial park have exerted great dreadful impact on the quality safety of grain.

2.2 Imperfect agricultural infrastructure Investment in agricultural infrastructure has been strengthened in recent years and township water conservancy in riverside area has been largely improved. However, ditches and roads in some towns, especially in hilly area, are still to be improved. Weak anti-risk ability of agricultural production severely restricts further improvement of grain productivity throughout the district.

2.3 Deficiencies in planting patterns of grain crops Variety distribution of crops is inconsistent with a tendency of "being various, disordered and complex", which largely limits the grain production increase. Take rice as an example, planting area of indica rice in 2010 was 2.7 thousand hm^2, accounting for around 14% of total area while average per unit yield of indica rice was only 7447.5kg/hm^2, 1500kg/hm^2 less than that of japonica rice. Tillage and cropping system of grain production has changed gradually, especially excessive close rotation coherence exerts great impact on suitable sowing and limites the exertion of yield potential of crop variety. Relatively low mechanization level and extensive cultivation like hand broadcasting of wheat as well as direct seeding of rice have become the hidden troubles in high and stable yield.

2.4 Imperfect socialized service system of agriculture Talents in township agricultural technology promotion institutes are inadequate and employees with undergraduate diploma and medium professional title are eagerly required, which cannot satisfy the requirement of promoting advanced agricultural production technology. Relatively small amount of socialized service organizations of agriculture as well as peasant special cooperative organizations and low business ability as well as service quality of some members of cooperative organizations cannot fully satisfy farmers' need in seedling cultivation, rice transplanting and pest control.

2.5 Incomprehensive implementation of benefiting-farmers policy There are still phenomenons like insufficient policy propaganda, farmers's difficulty in getting grain production subsidies

and incomplete distribution of subside, which affects farmers' enthusiasm in grain production.

Moreover, with the large transfer of labor force, grain production has taken up a decreasing proportion in farmers' incomes[5]. Grain-growing farmers are generally with high age, who are weak in grasping advanced cultivation techniques and have relatively low grain production technology. Meantime, the current agricultural means market often has fake seeds, fake pesticide and fake fertilizer, which affects the stable and high yield of grain production to some extent.

3 Main approaches for high and stable yield of grain crops

Grain production is a priority in economic development and social stability. Opening up new situation of grain production based on the high yield needs not only comprehensive implementation of national rural work conference requirements to quicken the transform of agricultural development mode but also various measures to improve the comprehensive productivity based on the actual conditions of grain production in this district at an attempt to ensure the smooth achievement of grain production increase during the "twelfth five-year plan".

3.1 Strengthening the agricultural infrastructure construction High-standard farmland construction should be emphasized. Constructing high-standard cultivated land is the main method for improving agricultural comprehensive productivity and the guarantee for developing modern agriculture as well as promoting agricultural sustainable development. Based on the requirements of overall planning, separation and coordination, concentrated investment and joint promotion, planning of high-standard farmland construction should be conducted with full attention at an attempt to achieve 6 667 hm^2 of high-standard farmland at the end of the "twelfth five-year plan". Land reclamation should be actively conducted according to the requirements of Land Reclamation Regulation and the principles of scientific planning, adjusting measures to local conditions, comprehensive management, being economical and feasible as well as reasonable utilization. The reclaimed land should be first used for grain production and recovery of cultivated land capacity should be emphasized. Besides, planting patterns like crop rotation and straw returning should be actively implemented to transform fertilization concepts, decrease the use of fertilizers and increase organic matter contain of soil. Fields with relatively low land quality should be fallowed to increase the land productivity. Furthermore, construction of farmland water conservancy facilities should be strengthened. Recent years, the country and the provinces have increased water conservancy input. Farmland water conservancy infrastructure throughout the district should be steadily improved to promote basic farmland irrigation, effective utilization of water resources and flood control capacity, strengthen agricultural anti-risk ability and gradually reverse the situation of "relying on climate for food".

3.2 Transforming agricultural production modes Recent year, the provincial agricultural committee has put forward the "three rectification" of changing direct seeding to mechanized transplanting, changing indica rice to japonica rice and changing dry cultivation to water cultivation" as the effective measures to improve total grain yield in Jiangsu province. Direct seeded rice is easy to be loose and has relatively more weedy rice, which is not beneficial to the high and stable yield. Beside, indica rice yield is generally lower than japonica rice yield. Four varieties mainly promoted in Jiangsu province should be strictly followed in the hilly area to largely promote the process of changing indica rice to japonica rice, unify the variety distribution and ensure that mainly promoted japonica rice varieties can account for over 90% in the district. Taking the advantage of agricultural three new engineering and commercialized seedling cultivation project in Jiangsu province, precise and quantitative cultivation of machine-transplanted rice should be largely promoted and area of direct seeding rice is to be gradually decreased. Meanwhile, wheat drilling should be quickened and wheat precision seeding technology promoted to actively carry out the construction of soft-wheat production demonstration area in Jiangsu province. Agricultural technology integration, mechanization of labor process as well as informatization of production and management should be actively promoted. Land and fertilizer center in the district should promote green organic fertilizer and decrease the use of chemical fertilizers. Plant protection center in the district should largely promote the use of high-efficient chemical pesticide with low poison and low residue as well as biological pesticide. Crop center in the district should strengthen technological integrative innovation and promotion as well as application in fields like high efficient cultivation, soil testing and fertilizer recommendation, epidemic diseases prevention and control as well as agricultural water saving at an attempt to quicken the promotion of agricultural mechanization, promote the integration of agriculture machinery and agronomy and achieve 80% of comprehensive mechanization in the district.

3.3 Perfecting socialized service system of agriculture Township and regional agricultural technology promotion institutes should be perfected. Agricultural technology promotion system in grass roots is the essential carrier in the implementation of developing agriculture by relying on science and education and play an important role in improving farmers' ability of grain production. According to the relevant requirements in Agriculture Extension Law, talent introduction in agricultural promotion institutes, especially township promotion institutes, should be strengthened and personnel evaluation system perfected to establish the agricultural technology promotion system with reasonable structure, full equipment, perfect working stuff and vitality. Agricultural pest prediction and control center should be actively constructed at an attempt to strengthen the inspection and quarantine of pests and form quick response system to severe epidemic situation. Moreover, diversified agricultural socialized service system should be largely established and systematic prevention and control service of plant

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protection should be further promoted. Service work like commercialized seedling cultivation and mechanized transplanting is to be carried out throughout the district and professional guidance as well as technique training on attending stuff should be strengthened. Peasant special cooperative organizations, supply and marketing cooperatives, peasant brokers and leading enterprises should be supported to provide various kinds of production and management service.

3.4 Strictly implementing the country's benefiting-farmers policies Implementation of a series of benefiting-farmers policies, such as improved varieties subsidy, direct grain subsidy and agricultural comprehensive subsidies, actively promotes farmer's enthusiasm in grain production and stabilizes grain production area. Propaganda of benefiting-farmers policies should be strengthened through Hanjiang agriculture information network, mobile phone short messages, labeling posters and symposium to make sure that the subsidy principles and standards are understood by everyone. In addition, area verification should be carefully conducted through telephone survey and door-to-door interview. Peasant households with large subsidy area or those who are reported should be verified and adjusted by township workers in order to guarantee the implementation of subside and prevent false claim subsidy. Furthermore, subsidy area and subside announcement system should be strictly implemented with farmers' supervision to make sure the publicity, fairness and justice of benefiting-farmers policies.

3.5 Emphasizing agricultural technology training Science and technology is the first productivity. Promotion and application of advanced planting technology in the grain production history surely brings about the dramatic improvement in grain yield, therefore farmers should master and use advanced planting technology with all efforts. Grain production demonstration area with high yield should be first established and farmers can observe on site during the key sections of crop development to master advanced production technology. Besides, agricultural technology in-room project in Jiangsu province should be carefully carried out. One technique instructor are equipped in one village and connected with 10 demonstration households to cultivate 5 technicians and make sure that fine seeds and fine methods as well as technical points directly mastered by farmers.

3.6 Purifying grain production environment Fine seeds, pesticides and chemical fertilizers are the preconditions for grain production. Supervision on agricultural means market should be emphasized and agricultural law enforcement activities should be actively carried out. Agricultural comprehensive law enforcement stuff should be irregularly organized to concentratively manage the seeds, fertilizers and pesticides which are on sale. Inspection should be strictly enforced to purify agricultural means market, severely punish those incidents which may hurt farmers' benefits and guarantee fine agricultural means.

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