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Analysis on High-yield Experience and Protective Measures of Wheat and Corn: A Case Study of Jieshou City in Anhui Province

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Abstract This paper summarized the experience in high yield of wheat and corn in Jieshou City and made a further study on the supporting measures for the high yield of wheat and corn on this basis.

Key words Wheat, Corn, High yield, Protective measures

Jieshou City has established a high-yield construction demonstration base consisting of 18 high-yield demonstration zones of 666.7 hm² and two renovated towns for wheat and corn production for the purpose of implementing the spirit of the documents on carrying out high-yield construction activities of wheat and corn issued by the Ministry of Agriculture and Provincial Agriculture Committee, promoting agricultural production of Jieshou City, improving the technical content of wheat and corn as well as the level of scientific farming, and improving the yield and quality of wheat and corn. Under the guidance of provincial and municipal agricultural sectors as well as the high attention and proper leadership of municipal committee and municipal government, the high-yield construction of wheat and corn has made remarkable achievements and the production of wheat and corn has achieved a new breakthrough in area and overall production through the joint effort of cadres and masses of the whole city.

1 Implementing high-yield construction of wheat and corn, showing significant effect in increasing yield and improving efficiency

Lying on the south end of Huang-Huai Plain and the northwest frontier of Anhui Province, Jieshou City has an agricultural acreage of 39 830 hm² with perennial wheat planting area of about 34 670 hm² and corn planting area of about 26 400 hm². In 2013, the average wheat yield per unit area was 7 560 kg/hm² and average corn yield was 8 679 kg/hm². After the establishment of the 18 high-yield demonstration zones of 666.7 hm² and two renovated towns, the high-yield construction area reaches 7 466.7 hm² in total. The average wheat yield per unit area has reached 9 187.5 kg/hm², and corn yield has reached 10 203.5 kg/hm².

1.1 Highlighting the advantages of high-yield construction demonstration zones In 2013, Jieshou City had established 9 city-level high-yield construction demonstration zones and core demonstration areas (10 of them were established by the Ministry

of Agriculture, and 8 of them were established by Jieshou City itself) and two renovated towns in Jiangwa Village of Zhuanji Town, Chenpingying Village of Taomiao Town, Zhaozhuang Village of Taomiao Town, Zhanglou Village of Quanyang Town, Wanglieqiao Village of Quanyang Town, Jianglou Village of Tianying Town, Dalu Village of Guangwu Town, Liuciao Village of Guangwu Town and Chenglou Village of Lucun Town respectively, covering a total area of 7 466.7 hm². The average wheat yield per unit area has reached 9 187.5 kg/hm², and corn yield has reached 10 203.5 kg/hm². In the meantime, a batch of typical high-yield villages and high-yield plots has emerged. For example in Liuciao Village of Guangwu Town and Chenpingying Village of Taomiao Town, wheat yield per unit area has reached 10 497 kg/hm² and 10 719 kg/hm² respectively, and corn yield per unit area has reached 11 665.5 kg/hm² and 11 356.5 kg/hm² respectively. After the site acceptance of provincial expert group, the wheat yield in Chenpingying Village of Taomiao Town has reached 10 861.5 kg/hm² in 2014. For this, it has won provincial-level prizes and has received awards from provincial leadership.

1.2 Improving the production of wheat and corn and consolidating the goal of "Yield Over One Ton" of wheat and corn in the whole city In 2013, corn planting area of the whole city was 26 400 hm², which is 2 700 hm² more than the previous year (23 700 hm²). Suffering from natural hazards including the worst drought and high temperature in years, wheat yield per unit area had reached 7 560 kg/hm² through the promotion of high-yield construction activities of wheat and corn and the joint efforts, showing an increase of 54 kg/hm² from the previous year; the average corn yield per unit area was 8 679 kg/hm², showing an increase of 748.5 kg (9.4%) from the per unit yield of 7 930.5 kg/hm² in 2012; the total output was 229 000 000 kg, showing an increase of 30 000 000 kg (15.0%) from the total output of 199 000 000 kg in 2012. The goal of "Yield Over One Ton" of wheat and corn per 666.67 m² has been achieved for two consecutive years. In 2014, average wheat yield in the planting area of 34 670 hm² had reached 8 097 kg/hm². The high-yield research and construction has produced more significant effect in increasing production. After the site acceptance of experts, the production per 666.

67 m² has exceeded 700 kg.

1.3 Increasing rural income Before carrying out high-yield construction, the per unit yield was less than 6 000 kg. Through the launching of high-yield construction activities, the average corn yield per unit area had reached 8 679 kg/hm² in the area of 26 400 hm² in 2013. In the high-yield construction demonstration area, the average yield per mu had reached 10 570.5 kg/hm², showing an increase of 1 891.5 kg/hm². As calculated at the market price of 2.30 yuan/kg, benefit had been increased by 4 350.45 yuan/hm². For corn planting area of 26 400 hm² in the whole city, the income can be increased by 114 851 880 yuan.

1.4 Stimulating the enthusiasm of all sectors in the city in participating in high-yield construction activities of corn

Through the vigorous publicity and training of high-yield construction, people from all walks of life in the city have been motivated to participate in high-yield construction, including workers, business people, college students, political personnel and institution officers. They have joined the high-yield construction team of wheat and corn to make investments and rent land for carrying out high-yield construction activities. For example, Liu Dawei (college student) in Guangwu Town, Hu Zhonghua (businessman) in Bingji Town and Song Yu (businessman) in Wangji Town have transferred and rented land of more than 150 hm² respectively.

1.5 Promoting the development of land transfer and scale cultivation The government has introduced various preferential policies for high-yield construction and research, which promotes the high-speed land circulation in Jieshou City and the rapid development of large farmer households. Until now, there are 20 large farmer households of more than 66.67 hm² and over 700 farmer households of more than 6.67 hm². Land transfer area accounts for more than 70% of the agricultural acreage of the whole city.

1.6 Promoting the continuous improvement in the availability of technical measures During the high-yield construction activities of wheat and corn, the high-yield and high-efficiency target can only be achieved when various technical measures on high-yield cultivation of wheat and corn are integrated together to form a complete set.

1.7 Reversing the passive consciousness of farmers in adopting new technology Before carrying out high-yield construction activities, farmers are quite passive in adopting new technology, new varieties and new pesticides. Sometimes the new items are provided to them free of charge and even with certain amount of subsidies, but they are still very skeptical of the new things and are reluctant to adopt them. Through the publicity, training and on-scene observation of the high-yield construction activities, the idea of farmers has been changed from passively accepting new technology and knowledge to actively seeking for and adopting new technology. Furthermore, they begin to invite technicians to guide operation on the spot.

1.8 Expanding rural specialized organizations Due to the application of an integrated set of new techniques and new machin-

ery for high-yield construction, the development of rural specialized organizations has been promoted. Up to now, 474 cultivation specialized cooperatives, 148 family farms, 21 plant protection specialized cooperatives and 61 agricultural machinery cooperatives have been established.

2 Main experience and learning

2.1 Attention from the leadership constitutes strong support

In order to ensure the smooth running of high-yield construction activities of corn, the municipal government has issued three documents, namely *Notice on Adjusting the Leading Group for High-yield Construction of Wheat and Corn in Jieshou City*, *Notice on Carrying out the Implementation Plan for High-yield Construction Activities of Wheat and Corn* and *Notice on Evaluation Method for Construction of High-yield Demonstration Zone of Wheat and Corn in Jieshou City*. At the beginning of September, 2013 and the end of April of the next year, the municipal government held mobilization meetings for the promotion of high-yield construction activities of wheat and corn in Jieshou City in 2014. Mr. Liu Yujian, the Secretary of Municipal Party Committee and Mr. Li Lei, the Mayor, have made special deployment and organized technical trainings for the high-yield construction of wheat and corn. In addition, the municipal government has held the Symposium of Income Increase Plan for Farmers and the Autumn Harvest Preparation Meeting. In the meeting, Mr. Liu Yujian, the Secretary of Municipal Party Committee has made a further deployment and arrangement for the high-yield construction activities of wheat and corn. Later on, various towns have issued related documents successively for the promotion of high-yield research and construction of wheat and corn.

2.2 Joint effort is the guarantee First is to combine policy implementation with materialized subsidies. In each demonstration zone, materialized subsidies are provided in addition to the earnest implementation of national preferential policies for farmers, thus to offer assistance in buying fine seeds, formulated fertilizer and mobile sprayers etc. and encourage them to apply fine feeds and good methods. Second is to combine production guidance with industrial management. In addition to vigorously promoting various demonstration zones to expand area and increase output, the development of large farmer households, grain specialized cooperatives and grain processing enterprises are also supported to encourage jointing between production and marketing and make-to-order production. The Municipal Finance Bureau has allocated funds of more than 1 500 000 yuan to offer policy-related subsidies at an average of more than 450 yuan/hm² for large farmer households of over 6.67 hm². Third is to combine the increase of production with the improvement in production capacity. On the one hand, guide each demonstration zone in integrating high yield production technologies to increase per unit yield; and on the other hand, collect project funds to strengthen infrastructure construction of each demonstration zone. Besides, place emphasis on the high-yield construction demonstration zone while launching the projects involving

modern agriculture, seed engineering, plant protection and formula fertilization by soil testing etc.

2.3 Responsibility definition is the fundamental First is to define and identify areas of responsibility. In the whole city, there are 9 demonstration zones, which are supported by the leadership from the Municipal Party Committee, Municipal Government and Agriculture Committee as well as 20 technicians to provide support and management according to respective responsibilities. In addition, each demonstration zone has been provided with a sign of format. Second is to advance the development of "10 000-mu Demonstration Zone" on the whole. Ensure earnest implementation of comprehensive technique measures for each "10 000-mu Demonstration Zone" and promote the organic combination of fine varieties and fine cultivating method with agricultural machinery and agronomy by means of strengthening supervision and guidance and conducting performance assessment according to the "five unified requirements", namely unified soil preparation for seeding, unified nutrient & water management, unified technical training, unified disease & pest control and unified mechanized harvesting. Third is to establish core technology demonstration areas. The municipal government is responsible for "10 000 – mu zones", townships are responsible for "1 000 – mu zones", and villages are responsible for "100 – mu zones". The performance of each area will be evaluated with clear division of responsibilities to each person. In the demonstration areas, new varieties, new fertilizers and new pesticides will be tested and demonstrated. In this way, farmers will be mobilized to increase corn yield per unit area relying on science and technology.

2.4 Publicity and training is the key First is to carry out farmer trainings extensively. Focusing on the main content of "one promotion, two increases, three reformations and four timely items" techniques and combining with new farmer trainings, formula fertilization by soil testing, modern agricultural construction as well as pest control and prevention, carry out technical training activities extensively for peasant households in villages relying on publicizing media including broadcasting, television and network etc. Second is to strengthen publicity vigorously. More than 20 slogans on high-yield construction have been developed, such as "Technical Solution for High-yield Cultivation of Wheat", "Promote One-Increase and Four-Reformation Techniques to Achieve High Yield and High Quality of Corn", and "Fine Variety with Fine Cultivating Method is the Priority for High-yield Construction of Corn". No less than 20 slogans on high-yield construction should be posted and set up in each demonstration zone. Strengthen the publicity of high-yield construction activities of wheat and corn, popularize the technical measures for increasing wheat and corn production, and create a favorable social atmosphere for high-yield construction of wheat and corn. According to statistics, more than 300 slogans have been posted and set up on the vital communication lines and in the villages of various towns. And over 40 pieces of publicity information have been released by news media at all levels and on the network. Third is to organize on-scene ob-

servation and exchange meeting in earnest. Four city-level site meetings on high-yield construction of wheat and corn have been organized and held successively. In these meetings, the responsible persons, members of comprehensive agricultural service station, model production units, large farmer households, specialized cooperatives, family farmers and other related personnel of each town were invited to the demonstration zones to observe on the scene. They have visited the demonstration zones like Liuciao Village in Guangwu Town and Chenpingying Village in Taomiao Toan, and have learnt advanced experience from them. In this way, their perceptual knowledge has been enhanced, thus to stimulate the production of wheat and corn in the whole city.

2.5 Relying on major producers is an important direction

The smooth implementation of high-yield construction of corn in Jieshou City and the achievement of intended target beyond expectation rely on the high-yield construction activities carried out by major production units, large farmer households and specialized cooperatives. The land circulation area of Jieshou City has reached 27 000 hm², accounting for around 70% of the agricultural acreage in the whole city. The major production units and large farmer households rent land at their own expenses. The implementation effect of various technical measures has a direct bearing on their income. Therefore, they have attached great importance to the full implementation of various kinds of technical measures.

2.6 Technology implementation is a guarantee The integration of various technical measures has a direct impact on the success or failure of high-yield construction. These technical measures are mutually complementary. In case that one of these measures is not fully implemented, the growth and development of corn will be affected, and the production will also be affected at the latter stage. Therefore, in order to achieve the target of high yield and harvest, various kinds of technical measures should be integrated together to form a complete set.

2.7 Financial services play the role of escort High-yield research and construction mainly rely on scale production units. Relatively speaking, the risks for them are greater and fund-raising is more difficult. Accordingly, Jieshou City has innovated rural finance and insurance services to escort for the operation of scale production units. It has taken the lead in introducing the *Implementation Plan of Innovative Financial Services for Eliminating Operation Risks and Promoting Rural Land Circulation* in the whole province, and has developed measures for its implementation. Raise the amount of agricultural insurance with portion of the premium compensated by financial subsidies. Provide pledge for insurance policy and promote the improvement in agricultural insurance with appropriate amount of interest subsidies provided by the government. In this way, collect financial capital to invest in the "Three Rural Issues" and eliminate the risks of scale operation. The insurance amount of wheat and corn has been increased from the original 270 yuan and 250 yuan to 500 yuan and 400 yuan as of October, 2013. The government will compensate for 50% of the additional insurance amount.

3 Safeguard measures

3.1 Strengthening organization and leadership In order to carry out high-yield construction activities of wheat and corn earnestly and promote the implementation of various technical measures, the Municipal Party Committee and Government of Jieshou City has established a leading group for high-yield construction of wheat and corn consisting of the responsible persons of the Party Committee and Government Office, Agriculture Committee, Finance Department, Water Supplies Bureau, Technology Division, Agricultural Machinery Department, Department of Forestry, Weather Bureau and other related units with Li Lei, the Mayor serving as the group leader and Liu Bo, the Deputy Mayor of Municipal Party Committee and Government, Wang Jian, Minister of Organization Department under Municipal Party Committee as well as Zhu Liangqiang, Deputy Mayor of Municipal Party Committee serving as deputy group leaders. This leading group is intended to coordinate and guide the "10 000 – mu High-yield Construction" of wheat and corn comprehensively. The Municipal Agriculture Committee has established a Technical Guidance Team with Wang Shujian, Director of Agricultural Technology Center serving as the team leader to provide technical guidance during high-yield construction and supervise the implementation of various technical measures. In addition, the Municipal Agriculture Committee has dispatched 20 special agricultural technicians to provide one-on-one technical guidance in the demonstration zones and villages.

3.2 Formulating implementation plan According to the planning and layout, the Agriculture Committee and Agricultural Technology Extension Center have organized related responsible persons and technicians to conduct consultation and analysis timely so as to formulate feasible implementation plan and technical solution for high-yield construction. For different towns, different soils, different soil fertilities and different farming and planting habits, the technicians have made repeated studies and have developed corresponding technical solutions and more detailed technical measures.

3.3 Refining the division of responsibilities In order to produce substantial effect in high-yield construction, the municipal leaders have taken the lead to take charge of various towns with the main responsible persons of these towns serving as the responsible persons of the "10 000 – mu High-yield Construction Demonstration Zone"; and the township cadres take charge of various villages. Similarly, technicians of city-level Agricultural Technology Extension Center are responsible for various towns, and the technicians of the comprehensive agricultural service station of these towns are responsible for various villages. Ensure that the city-level and township-level technicians can provide on-site guidance and ensure the full implementation of various technical measures. In this way, the high-yield construction has achieved initial results.

3.4 Making rational site selection and layout In 2013, 18 wheat and corn high-yield construction demonstration zones of 666.67 hm² (10 of them were established by the Ministry of Agriculture, and 8 of them were established by the city itself) had

been established in Zhuanji Town, Guangwu Town, Lucun Town, Tianying Town, Quanyang Town and Taomiaotown respectively according to the unified requirements of the Ministry of Agriculture in combination with the practical situation of Jieshou City. In the meantime, 40 corn demonstration zones of 66.67 hm² had been established in Wangji Town, Dongcheng Street, Guangwu Town, Lucun Town and Jinzhai Town *etc.* respectively. In addition, over 100 demonstration fields of 6.67 hm² had been established in 18 township streets. These demonstration zones have been closely centralized and grouped and have produced favorable demonstration effect due to convenient transportation, fertile soil, high-level of scientific farming of farmers and large planting scale.

3.5 Promoting key technology Focus on the "technology on improved variety selection, formula fertilization by soil testing, deep ploughing & scarification, scientific planting as well as comprehensive disease, pest and weed control" and the technology on "improved variety selection, formula fertilization by soil testing, simulcasting of seed & fertilizer, comprehensive disease, pest & weed control, rational close planting and delayed harvest". That is to say, promote special high-yield varieties of wheat and corn, increase planting density rationally, change single fertilizer to formula fertilization by soil testing, and change the manual harvest of corn to mechanical harvesting. Sow seeds according to soil moisture conditions, irrigate soil, apply fertilizer and control the diseases, insect pests and weeds in a timely manner. Research on the weak links of key technology, strengthen the implementation of technical measures, expand technical coverage and improve technology utilization.

3.6 Highlighting model demonstration In the high-yield construction activities, Jieshou City continues to adopt the practice of "laying special stress on three fields", gives full play to the model driving and technology radiation effect, and promotes extensive production. The main responsible persons of the city, towns and villages take charge of the "10 000 – mu Demonstration Zones", "1 000 – mu Demonstration Areas" and "100 – mu Command Fields" respectively. Over 60 site meetings have been held on scientific planting, drought control for seedling protection, chemical weeding, additional seed and head sprouting fertilization successively. Especially in the drought relief work, the principal leaders of municipal government have held site meetings specific to corresponding zones, thus to ensure full implementation of various technical measures.

3.7 Paying special attention to the foundation work Strengthen supervision over "four conditions" and improve the level of field management. Regulate the supervision over "four conditions" including seedling condition, soil moisture condition, disaster condition and disease & pest condition from the beginning of summer planting in Jieshou City according to the requirements of the Provincial Agriculture Committee. Accomplish "Five Tasks", including personnel assignment, point fixing, time setting, responsibility definition and regular consultation. Ensure that special personnel report and release information on schedule, which

lays a reliable foundation for the implementation and guidance of wheat and corn field management technology.

3.8 Strengthening publicity and training Strengthen the publicity on high-yield construction and transform passive acceptance into whole staff participation. Highlight the significance and urgency of "high-yield construction" measures and publicize "high-yield construction" technology by means of broadcasting, television, network, bulletin board, compact disc, audio tape, farmer trainings and text messages. The Agriculture Committee and Agricultural Technology Center of Jieshou City have organized 5 propaganda cars, which have provided over 100 publicity activities on "high-yield construction", "scientific drought control", "gap filling with seedlings", "chemical weeding", "additional seed fertilization" and "additional head sprouting fertilization" in various towns and villages. In addition, they have recorded 5 televised speeches, publicized over 20 network reports and provided over 90 technical and special trainings for over 100 000 trainees. Over 400 000 propaganda posters on "high-yield cultivation techniques of wheat", "one-spray and three-prevention techniques", "high-yield cultivation techniques of corn", "key management techniques for field management of maize seedling" and "corn field management techniques in July" have been posted and distributed in the high-yield construction demonstration zones, on vital communication lines, in the markets as well as in villages. The atmosphere of full participation in high-yield construction and full attention towards high-yield construction has formed in the whole city.

3.9 Establishing a long-term mechanism A "six-in-one" long-term mechanism has been established. In each demonstration zone, 1 leader has been elected and over 10 model households have been fostered. A complete set of high-quality techniques suitable for high yield of corn the local situation has been developed. In addition, a farmers' specialized cooperative has been established, a professional service team for crop protection has formed, and leading enterprises such as Fengxu Seeds Company and Xiangyun Wheat Flour Factory have been introduced here, which lays a solid foundation for increasing rural income stably and achieving the target of high-yield construction of corn.

3.10 Innovating upon service pattern During high-yield construction, foster large model households, establish specialized cooperatives, explore new forms and new methods for agricultural technology services, give play to the driving effect of the leading enterprises on agriculture industrialization, and implement the operation mode of "technology + enterprise + base + peasant household". Apply the key technologies in the high-yield construction and in the agricultural production of demonstration areas by means of materialized subsidies. Ensure unified application of various techniques through unified fund raising, unified purchase of agricultural materials as well as unified technical specification. Besides, specialized cooperatives of agricultural machinery and corn protection *etc.* have been established in Jieshou City so as to provide unified services on industrialization specific for the high-yield demonstration fields. Ensure the "7 unified applications" of

field management techniques and make sure that the high standard is enforced in the high-yield construction demonstration zones.

3.11 Increasing policy support The funds allocated by superior departments for high-yield construction have been applied for the high-yield construction of wheat and corn in full. In addition, the funds for formula fertilization by soil testing, drought relief funds allocated by superior departments as well as the construction funds for high-yield and high-efficiency "10 000-mu ton-grain field" have also been integrated for high-yield construction. Over 1 500t controlled-release fertilizer for wheat and corn, over 30 000 bags of herbicide and other related agricultural materials have been purchased for the high-yield demonstration zones and core demonstration areas of wheat and corn, ensuring the full implementation of key technical measures. Drought relief funds of over 10 000 000 yuan have been compensated for the high-yield construction zones and key demonstration areas of wheat and corn. Besides, the Municipal Finance Bureau has set up an agricultural incentive fund of 1 500 000 yuan, in which 300 000 yuan is used to substitute subsidies with rewards in high-yield construction.

3.12 Conducting regular inspection and guidance Strengthen supervision and assessment, and provide rewards and punishments according to the performance. According to the *Evaluation Method for High-yield Research and Construction of Wheat and Corn* in Jieshou City, the seeding progress, seedling management, chemical weeding, additional fertilizer application, drought control for seedling protection, comprehensive disease & pest control and the implementation of "7 unified applications" will be evaluated in the staged assessments, thus to offer staged rewards and provide rewards and punishments according to the performance. Moreover, the high-yield construction activities have also been listed in the scope of annual assessment by the government.

4 Existing problems and recommendations

The high-yield construction of wheat and corn has achieved favorable results, but there are still some problems, which are mainly reflected in four aspects. First is that some towns are lack of awareness and have a poor sense of services; second is that there is a serious lack of funds for high-yield research and high-yield construction; third is that farmland is not equipped with adequate infrastructure and has inadequate capacity for resisting natural disasters; fourth is that agricultural technology teams keep shrinking, which has a certain impact on the high-yield construction of wheat and corn. In order to promote the in-depth implementation of the high-yield construction of wheat and corn, we recommend strengthening the construction of agricultural technology extension system and increasing the funds for high-yield construction of wheat and corn.

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