XINJIANG COTTON PRODUCTION: STATUS AND ITS PROBLEMS

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ABSTRACT

Xinjiang has overall good natural ecological conditions with relatively high yield, large area and good quality of cotton. The cultivation scale of Xinjiang cotton-planting area has stabilized at around 2.0 million hm^2, and the total yield achieves approximately 4.1 million t. Xinjiang is one of the important producing areas of upland cotton and sea-island cotton in the world with perfect cultivation and management technology system, including "dwarf, dense, early" core technology and its supporting technologies such as film mulching, selection of appropriate cultivars, drip irrigation technology and fruit-cotton intercropping, which takes full use of local light, water and soil resources and overcomes the deficiency of ecological conditions in Xinjiang cotton fields, thus ensuring the achievement of high yield and stable yield of cotton in Xinjiang. Cotton planting technology system has important reference value for cotton production in other countries. The existing issues in Xinjiang cotton production, such as water shortages, severe natural disasters, rapid increase in cultivation costs and overdependence on chemical fertilizers should be solved by further popularization and improvement of water-saving irrigation techniques, disaster prevention measures and mechanized manufacturing technologies. Aiming at solving the drawbacks of existing cotton purchasing and storage policy, the new policy in 2014 will not only protect the interests of cotton farmers, but also improve the market competitiveness of the entire cotton industry in China, especially for the textile industry.

Key words Present status, Cotton production; "dwarf, dense, early" management; Supporting technologies; Existing problems

China is the largest producer, consumer and importer of cotton in the world. It is predicted that the harvest area of cotton in China will reach 4.4 million hm^2 during 2013-2014, which is reduced by 6.0% compared with last year; the total yield will reach 6.3 million t, which is reduced by 7.9% compared with last year. In 2013, the amount of cotton consumption in China is 7.84 million t, which is reduced by 29.4% compared with the peak period in 2007 with cotton consumption amount of 11.1 million t. According to statistics by Chinese Customs, the amount of imported cotton in China reached 5.14 million t in 2012 and 3.366 million t in 2013 although there was a substantial decline (21.7%) from January to October in 2013 compared with the same period of last year.

Xinjiang cotton-planting area is the most appropriate cotton-planting region in China, with the largest cultivation scale, the highest yield, the most advantageous ratio of output to input and the greatest development potential. At present, a large-scale high-quality upland cotton cultivation base has been constructed in China. Since 1993, total yield, per unit area yield, commodity export rate, transfer amount and per capita amount of cotton in Xinjiang have been ranked first in China for 21 consecutive years. In addition, Xinjiang is the only sea-island cotton-producing region in China and a major producing region of upland cotton and sea-island cotton in the world. Therefore, cotton production in Xinjiang has occupied an important position in China and has attracted wide attention of domestic and foreign experts.

In order to introduce the basic status of cotton production in Xinjiang to domestic and foreign counterparts, this paper summarized the present status of cotton production and supporting technologies in Xinjiang and analyzed the existing problems in cotton production, thereby providing basis for further development of cotton production in Xinjiang.

1 Present Status of Cotton Production in Xinjiang

1.1 Natural ecological conditions

1.1.1 Temperature and light conditions

Xinjiang cotton-planting area is located at latitude 36°0′-46°2′, belonging to mid-latitude regions. Presenting unique characteristics of inland arid irrigation, Xinjiang cotton-planting area is far from the sea, with dry climate, scarce precipitation, more sunny days, a few cloudy days, fewer rainy days, long duration of sunshine and high sunlight intensity; the annual sunshine duration is about 2 550 - 3 500 h and the sunshine percentage is 60- 80%, which is overall equivalent to the temperate cotton-planting area in Central Eurasia, but the heat resources can only meet the needs for growth and development of very early and early maturing cotton. Specifically, the southern regions of Xinjiang (Nanjiang) with good heat resources are suitable for planting sea-island cotton. Influenced by the increasing temperature in desert-oasis basin, effective accumulated temperature greater than or equal to 10 °C in most cotton-planting areas ranges from 3450 °C to 4500 °C, especially in the critical period of cotton growth and development --- flower and boll stage with high temperature, large diurnal temperature range and long sunshine duration, which is conducive to the accumulation of photosynthetic products and deposition of cellulose, thus creating a necessary natural environment for high-yield and high-quality cotton production in Xinjiang.

Compared with other cotton-planting regions in China, Xinjiang cotton-planting area has relatively small interannual variations of light, heat and water resources, which is also one of the major factors leading to stable cotton production in Xinjiang.

1.1.2 Water and soil resources

Xinjiang major cotton-planting area is composed of many plain oases and the cotton fields are mostly located in the piedmont alluvial plain. Despite scarce precipitation, mountain regions around the basin snow frequently and form permanent snow cover and glaciers due to the high altitude and low temperature. As temperatures rise, these permanent snow cover and glaciers melt and form river runoff in Xinjiang, which is really clean and non-pollution water as the major source of water for irrigation in Xinjiang major cotton-planting area. In addition, Xinjiang major cotton-planting area has abundant irrigative groundwater resources. According to a preliminary estimation, the river runoff and irrigative groundwater resources in Xinjiang can at least irrigate 3.2 million hm^2 cotton fields; in addition to water required for other crops and trees, ecological water and domestic water in cotton-planting area, water resources in Xinjiang can at least irrigate 1.8 million hm^2 cotton fields.

Xinjiang major cotton-planting area is a typical irrigation cotton-planting area. Therefore, the growth and development process of cotton can be artificially regulated by artificial irrigation according to the law of physiological water requirement of cotton plants, thus contributing to the high yield and stable yield of cotton. Furthermore, soils in Xinjiang major cotton-planting area are mainly composed of light loam, moderate clay and sandy soil, with deep strata, loose soil texture, flat land and broad appropriate cotton-planting regions. The area of appropriate cotton-planting regions accounts for about 35% of the entire agricultural areas in Xinjiang, and the area of reserve land resources for cotton production reaches approximately 4.0 million hm^2.

1.1.3 Diseases and insect pests

Xinjiang cotton-planting area encounters severe cold in winter, and the minimum temperature in most cotton-planting regions can reached below -20 °C, which is unfavorable for pest overwintering and proliferation, resulting in light diseases and insect pests. In addition, Xinjiang cotton-planting regions are distributed in many oases segmented by Gobi deserts. These Gobi deserts become natural isolation barriers to prevent explosive hazards caused by the spread of diseases and insect pests in different oasis. Survey shows that the incidence of cotton bollworm, cotton aphid and other pests in Xinjiang is light almost without large-area serious incontrollable situation. There are basically no boll diseases and no *Pectinophora gossypiella* or *Earias cupreoviridis* in Xinjiang cotton-planting area, which is conducive to improving the yield and quality of cotton and reducing the costs for plant protection and prevention.

1.2 Production scale

During 2012-2013, cotton cultivation area in Xinjiang was approximately 2.3 million hm^2, and the total yield reached 4.4 million t, accounting for more than 50% of the total yield of cotton in China first time. It is predicted that harvest area of cotton in Xinjiang during 2013-2014 will reach 2.2 million hm^2 and the total yield will reach 4.2- 4.3 million t. According to comprehensive analysis, the cultivation scale and total yield in Xinjiang cotton-planting area have been stabilized at around 2.0 million hm^2 and 4.1 million t.

1.3 Fiber type and quality

Currently, 98 % of raw cottons produced in Xinjiang are upland cotton and 2% are sea-island cotton; 85% of major cotton cultivars popularized in large scale in normal year ripe before frost. There are few fiber types in Xinjiang. Specifically, fiber quality indicators for upland cotton are: white color, excellent external quality, 2.5% span length ranges 28-30 mm, specific strength is 28.0-31 cN/tex, uniformity ranges 84.5-85.5%, micronaire value ranges 3.8-4.5, elongation rate ranges 6.8-7.9%, reflectivity ranges 75-87%, and yellowness below 7; fiber quality indicators for sea-island cotton are: 2.5% span length ranges 36-38 mm, specific strength is 41.8-47.71 cN/tex, uniformity ranges 85.1-89.4%, micronaire value ranges 3.7-4.2, elongation rate ranges 6.8-8.8%, and reflectivity ranges 74-78%. Xinjiang sea-island cotton presents long and thin fibers, good uniformity, few neps and impurities, good ginning quality and moderate intensity, which is more suitable for spinning of 150s super high count yarns. Most textile enterprises in China produce super high count yarns using high-quality Xinjiang sea-island cotton. However, dyeing effect of high count yarns produced by Xinjiang sea-island cotton is poorer than Egyptian cultivars, which is mainly due to the general maturity, mercerization degree and elasticity of Xinjiang sea-island cotton.

In Xinjiang cotton-planting area, cottons are mostly collected with manual method and mechanical method. There are no significant differences between these two methods, but manually collected cottons present "three-yarn" (anisotropic, profiled and heterochromous fiber) issues.

2 Supporting Technologies for Cotton Production in Xinjiang

2.1 "Dwarf, dense, early" management mode

With "early" as the center, cotton field management in Xinjiang aims to establish "dense, dwarf" groups, which is commonly known as "dwarf, dense, early" planting management mode. The specific content is as follows:

2.1.1 "Dwarf"

Irrigation and fertilization in cotton fields should be reasonably controlled, to prevent excessive vegetative growth and formation of "tall, large, empty" plants caused by excessive use of water and fertilizer. To achieve the dwarf target, reasonable management of water and fertilizer is required, such as appropriately postponing initial irrigation, adjusting irrigation amount, timely early topdressing, controlling the application amount of nitrogen fertilizer at mid-late stage and timely early topping and pruning, combined with chemical regulation using mepiquat chloride to promote timely the transition from vegetative growth to reproductive growth and obtain compact dwarf plants with short internode length of the main stem and fruiting branch length. In Xinjiang drip irrigation cotton fields, the plant height of upland cotton is controlled at below 85 cm and that of sea-island cotton is controlled at below 115 cm.

2.1.2 "Dense"

Based on the characteristics of arid climate and short frost-free period in Xinjiang, high-yield groups with high cultivation density, even distribution and uniform growth should be bred by rational close planting, to ensure great leaf area index in cotton fields and make full use of solar energy at early growth stage, thereby laying foundation for boll setting at early and middle stage. Therefore, high density planting is an important approach to improve cotton yield.

In general, the number of harvested cotton plants in southern Xinjiang cotton-planting region is 172.5-225.0 thousand plants /hm^2, and that in northern Xinjiang cotton-planting region (early maturing cotton district) is 202.5-240.0 thousand plants /hm^2, with the average row spacing ranging 30.0-42.5 cm and average plant spacing ranging 9.0-11.5 cm.

The planting density in cotton fields should be set greater under conditions of heavier sandy soil and poorer heat resources, fertilizers and water supply, otherwise the planting density should be set smaller. In addition, the quality of seeds and precision sowing should be improved, to ensure dense and uniform distribution of cotton plants in cotton fields.

2.1.3 "Early"

According to the climate characteristics of short frost-free period and relatively inadequate heat resources in Xinjiang, a series of "early promotion" measures should be adopted to accelerate the growth process of cotton, thus achieving the requirements of "seedling generation in April, budding in May, flowering in June, boll setting in July and harvesting in August". The specific measures are: ① selecting early maturing varieties adapted to local conditions and appropriately early sowing before April 20; ② early intertillage. Immediately carrying out shallow intertillage after sowing

can not only improve earth temperature and soil aeration condition, but also clear weeds and promote early seedling emergence and seedling raising; ③ early chemical regulation. From late May to early June, 7.5-22.5g/ hm^2 mepiquat chloride (Mepiquat 1,1-Dimethyl piperidinium, known as DPC) is sprayed, to ensure stable and health growth of cotton at seedling stage and bud stage. Timely spraying mepiquat chloride can regulate the vegetative and reproductive growth of cotton plants; ④ early topdressing. From late May to early June, combined with chemical regulation, boll fertilizer is applied before initial irrigation in conventional irrigation fields and drip-applied with initial irrigation in drip irrigation fields, to ensure soil fertility in cotton fields; ⑤ early watering. Cotton fields, especially early in sandy cotton fields with poor water and fertilizer retention capacity, can be watered initially at the end of May; ⑥ early topping. Cotton topping is completed before July 20 in southern Xinjiang cotton-planting region and approximately 10 d earlier in northern Xinjiang cotton-planting region, to reduce ineffective buds and avoid wastage of nutrients; ⑦ timely spraying ripener ethephon. In late- maturing cotton fields, the ripening agent is sprayed on around September 25 in southern Xinjiang cotton-planting region and appropriately earlier in northern Xinjiang cotton-planting region, to accelerate the maturity of cotton bolls developed at late stage; ⑧ timely cutting off the water supply and early harvesting, to ensure the rate of blossom before frost achieving above 85 %; ⑨ adhering to the pest prevention principles of "early investigation, early adopting measures" and trying to complete some preventive measures before sowing.

It is worth noting that, in "dwarf, dense, early" cultivation technology system, appropriate technical indicators of cotton field management should be selected in accordance with local water and fertilizer supply situation, light and heat conditions and cultivation and management levels. In "dwarf, dense, early" cultivation system, "dwarf" is the prerequisite and "early" is the purpose. "Dwarf" creates conditions for "dense" to play group advantages and reduce the waste of light, heat and water resources, thereby laying the foundation for achieving high yield in Xinjiang cotton-planting area. "Early" is not only an inevitable choice under unique natural ecological conditions in Xinjiang, but also the common purpose for the implementation of various technical measures. In short, "dwarf, dense, early" is the core technology system to achieve high yield, high efficiency and high quality in Xinjiang cotton-planting area, which provides basis for the development of other supporting technologies.

2.2 "Dwarf, dense, early" supporting technologies

2.2.1 Film mulching

As the key technology to realize "all seedlings sown once" and high yield of cotton, film mulching technology has been adopted in all the major cotton-producing regions of Xinjiang. Film mulching technology has significant temperature raising and moisture conservation effect and can suppress surface alkali efflorescence, effectively

reduce weeds in cotton fields, decline production costs, improve soil microbial activity, accelerate transformation of available nutrients in soil, increase the survival rate of seedlings to above 88%, enhance physiological functions of cotton roots, promote early budding and flowering, ensure high consistence of the blooming and boll setting stage of cotton to local light, heat, water conditions, extend the high-energy synchrotron period of cotton, and create conditions for early bearing of pre-summer bolls and multiple bearing of summer bolls.

Film mulching technology has been applied for cotton cultivation in Xinjiang cotton fields, including one film-four rows (four rows of cotton plants cultivated with one film), one film-five rows, one film-six rows, one film-eight rows and a variety of cultivation modes. Films with width of 120, 140, 145, 150, 160, 180, 184 and 230 cm has been popularized and applied in cotton production, especially those with width of 120, 145, 180 and 230 cm. The thickness of films is above 0.008 mm. For convenient recovery, films with thickness of above 0.01 mm are promoted to be used by agricultural technology promotion department.

2.2.2 Selection of appropriate cultivars

In addition to early maturing, high yield, disease resistance, high quality and other basic conditions, cotton varieties suitable for cultivation in Xinjiang should have well developed vegetative organs, stable growth and development, compact plant type, medium to small leaf area, tough and upward leaves and other characteristics, thereby ensuring good transparency of cotton fields, which is conducive to avoiding the occurrence of closure phenomenon in fields under high density conditions. There are 5-8 bolls in an individual cotton plant. The whole growth period of southern Xinjiang cotton varieties lasts 135-145 d and that of northern Xinjiang cotton varieties lasts 128-135 d. In normal years, the percentage of harvested seed cotton before frost reaches 85%.

In southern Xinjiang cotton-planting region, Xinluzhong 36, Xinluzhong 37 Xinluzhong 42, Xinluzhong 47 and Xinluzhong 54 are major popularized upland cotton varieties; Xinhai 21, Xinhai 24, Xinhai 35 and Xinhai 36 are major popularized sea-island cotton varieties. Cottons planted in northern Xinjiang cotton-planting region are all upland cotton varieties, such as Xinluzao 36, Xinluzao37, Xinluzao 41, Xinluzao 48, Xinluzao 50 and Xinluzao 57. Cotton varieties mentioned above are all adaptive to film- mulching high- density cultivation mode. Genetic quality indicators of upland cotton varieties mentioned above are: 2.5% span length above 29 mm, specific strength above 27.0 cN/ tex, uniformity above 84.5%, micronaire value reaches approximately 4.3, elongation rate above 6.8%, reflectivity above 75%, and yellowness below 7. Genetic quality indicators of sea-island cotton varieties mentioned above are: 2.5% span length above 37 mm, specific strength above 42.0 cN/ tex, uniformity above 85.1%, micronaire value reaches around 4.0, elongation rate above 6.8%, and reflectivity reaches approximately 76%.

2.2.3 Integrated control of diseases and insect pests

Pest hazards in cotton fields should be effectively prevented and controlled by adhering to the plant protection policy of "aiming at prevention, comprehensive prevention and control", making full use of agricultural practices to achieve "improving benefits and controlling harms" effects, and reasonably combining biological control, chemical control and scientific application of pesticides, thereby effectively controlling the occurrence of dangerous pests.

The major diseases and insect pests in Xinjiang cotton-planting area are cotton aphid, cotton bollworm, spider mites, seedling rot disease, *etc*. In addition, sea-island cottons in Xinjiang are also severely harmed by fusarium wilt and leaf spot. During the prevention and control process of various diseases and insect pests, biological control should be promoted rather than chemical control. In chemical control, biological agents or pesticides with low toxicity, low residues and low application amount should be applied covertly.

In order to achieve biological control of diseases and insect pests, a variety of "improving benefits and controlling harms, comprehensive prevention and control" measures are adopted, such as autumn ploughing and winter irrigation, which can reduce the overwinter survival rate of bollworm pupae. In addition, cotton bollworms can be prevented by planting maize trapping zone, placing sex pheromone and poplar branches to lure moths and other artificial methods to capture larvae. Furthermore, breeders should scientifically arrange cultivation structure to ensure appropriate development scale of cotton and create good rest and nutrition sites for natural enemy insects, thus better playing the role of natural enemy insects in pest control. To reduce the pressure of pest control at late stage, "early investigation, early prevention" measures should be implemented, and insect sources should be eradicated before sowing, especially for cotton aphid and cotton bollworm. Planting disease-resistant varieties, paddy-upland rotation and reasonable reverse cropping are also effective measures to solve diseases and insect pests.

2.2.4 Drip irrigation technology

The area of existing drip irrigation cotton fields in Xinjiang is above 1.2 million hm^2. Pressurized drip irrigation is the mainly used technology that is combined with film mulching technology to form the unique under-film drip irrigation technology in Xinjiang cotton fields, which is a novel water-saving irrigation technology combining advanced drip irrigation with film mulching cultivation technology to increase the ground temperature, reduce water evaporation and decline deep percolation, thus realizing comprehensive effects of water saving and yield improvement.

By using this novel drip irrigation technology, irrigation water passes through the douches on the main pipe, branch pipe and irrigation capillary in a pipeline water

supply system, transforms into droplets, and slowly, evenly, regularly, quantitatively infiltrate developing roots of cotton, thereby realizing local irrigation within the range of cotton roots. In drip irrigation, corresponding soluble fertilizers can be applied according to the growth of cotton to maintain loose soil texture and the best state of water and fertilizer supply in main cotton root region, which can save water, fertilizer and labor, decline the lever of salt and alkaline and improve crop yield.

Under-film drip irrigation system is mainly composed of water source project, initial pivot, water distribution network, water droppers and plastic film. After the installation of under-film drip irrigation system, by using the special seeder for drip irrigation cotton fields, the sowing of cotton seeds is completed by a serial of operations including drip irrigation tape laying, film spreading and seed sowing under the traction of a tractor. Typically, two or three drip irrigation tapes were laid under each film, *i.e*., one film-two tapes or one film-three tapes. Before initial irrigation, branch pipes and auxiliary pipes are paved artificially on the surface and are connected to the main pipe; irrigation capillary inlets are connected to the corresponding branch pipes and corollary equipments. The initial drip irrigation is generally conducted on May 25 - June 15. Specific water cutting-off time is set in accordance with soil fertility and water conservation capacity, autumn temperature conditions and growth of cotton plants. In general, water is cut off on around September 10 in the sothern Xinjiang.

During the whole growth period, cotton plants are drip-irrigated 8-12 times, and those in sandy soil are drip-irrigated 1-2 times more, with the irrigation amount of 225 m^3-300 m^3/hm^2 each time; in late irrigation cotton fields, the initial irrigation amount could be increased to 300 m^3-375 m^3/hm^2; the drip-irrigation amount during the whole growth period is 2 625 m^3-3 300 m^3/hm^2.

2.2.5 Fruit-cotton intercropping

The main fruit tree species in Xinjiang are apricot, jujube, grape, walnut, pear, apple, pomegranate and almond, *etc*. Fruit-cotton intercropping is quite common in Xinjiang, especially for fruit trees with small trunks, but this intercropping pattern is not suitable for fruit trees with large trunks and high planting density. Appropriate plant spacing and row spacing should be reasonably designed in field planting for fruit-cotton intercropping.

At present, due to the strong adaptability, high drought tolerance, salinity tolerance, cold resistance and easy field cultivation and management, jujube has become the major fruit tree species in Xinjiang with the largest planting area of about 0.4 million ha. Jujubes have small leaves, leading to low shading and good ventilation in jujube-cotton intercropping fields. Jujube- cotton intercropping is the main fruit-cotton intercropping pattern in Xinjiang, with the planting area of approximately 0.25 million hm^2. In jujube- cotton intercropping fields, the plant spacing of jujubes is 1.5-2 m, the row spacing is 3-4 m, and the theoretical planting density is 1 250-2 222 plants/ hm^2;

to ensure the long-term intercropping for cotton, the row spacing should be set at above 4 m. Jujubes are planted with the same row spacing, and the plant spacing is commonly set at 1.0, 1.2 or 2.0 m in production. Cottons on a wide film are planted in the middle of the 4 m row spacing. In general, eight rows of cottons are planted on a 2.3 m wide film. After sowing of cotton, it should be ensured that the jujube rows are in the middle of two films.

2.2.6 Measures for prevention and control of natural disasters

In Xinjiang, the unusually cold spell in early spring can be solved by timely mulching, and the dust storms at early growth stage of cotton can be solved by strengthening construction of Xinjiang oasis ecological windbreaks and consolidation of shelter belts in cotton fields after sowing. The hail damage in summer can be forecasted by radar and solved by artificial hail suppression method; insect pests in cotton fields can be controlled through implementation of the "improving benefits and controlling harms, comprehensive prevention and control" principle and cultivating pest- resistant varieties. The temperature in Xinjiang declines early at late growth stage of cotton, which can be solved by planting early maturing varieties, timely early sowing, early intertillage and other measures to promote early cultivation.

3 Existing Problems in Cotton Production of Xinjiang

3.1 Water shortages, general ecological conditions and frequent natural disasters in Xinjiang

Compared with other major cotton producing countries in the world, the light and heat resources in China are generally less than the United States, India, Australia and other major cotton producing countries. Furthermore, Xinjiang cotton region belongs to typical desert oasis agricultural regions with extremely fragile ecological environment and is susceptible to dust storms, drought and water shortage. In addition, cotton and other crops with high water consumption in main cotton fields of Xinjiang present relatively large planting proportion, and the water requirement periods of these crops are very concentrated, resulting in perennial seasonal cotton shortage in many cotton-planting counties and significant yield reduction in many cotton fields. Objectively speaking, lack of water resources is the biggest obstacle for further development of cotton production in Xinjiang.

In recent years, Xinjiang encounters frequent and severe abnormal weather that causes more difficulties and risks for cotton production. For instance, the light and heat resources were poor in early 2013, and the drought, high temperatures and hail damage in summer, early frost at late stage in northern Xinjiang cotton fields and severe spider mites harm in southern Xinjiang produced extremely adverse impacts on cotton production in Xinjiang.

3.2 Rapidly increasing cost and declining efficiency of cotton cultivation in Xinjiang

Currently, due to the rapid increase of labor costs in China, and the high transportation costs and inconvenience in cotton cultivation and management of Xinjiang that is located in northwest China, labor costs at peak stage of cotton field management in Xinjiang become even higher, presenting a tense situation. The average labor cost in Xinjiang cotton fields is 25-35 $/d, and the cost for cotton cultivation and management (preparation before sowing, sowing, field management, harvest and storage, excluding opportunity cost of land, taxes, cotton ginning) in Xinjiang cotton fields achieves above 4000.0 $/hm^2, but the management cost in many foreign cotton producing regions is lower than 2750.0 $/hm^2. Cottons produced in Xinjiang have no price advantage, and the planting benefit of cotton in Xinjiang cotton fields is correspondingly reduced with the rapid increase of labor costs.

3.3 Great impact of imported cotton and severe market volatility

According to statistics by Chinese Customs, the amount of imported cotton reached 5.14 million t in 2012 and 3.366 million t during January-October 2013 despite the large reduction (21.7%) compared with the last year. Due to the massive imports of raw cotton and yarns, extremely high prices of cotton in China and significantly reduced application amount of domestic raw cottons, raw cotton stocks in national repository reaches above 11 million t. Furthermore, in recent years, annual seed cotton prices present a difference of 2-5 yuan / kg, which is not conducive to the stable development of cotton industry.

3.4 Overdependence of high yield cotton fields on chemical fertilizers

Large-area high yield of cotton is realized in Xinjiang cotton fields. However, inputs of chemical fertilizers in these cotton fields are generally large, more than 525 kg/hm^2 urea, 400 kg/hm^2 diammonium phosphate or chemical fertilizers with equivalent nitrogen or phosphorus contents are applied in some cotton fields, and the continuous cropping duration is very long, resulting in the deterioration of soil physical and chemical properties in these cotton fields. In order to achieve high yield, fertilizer inputs are still gradually increasing, but the overall productivity of cotton fields is significantly reduced.

3.5 Disadvantages in national cotton purchasing and storage policy

The fundamental purpose of existing national cotton purchasing and storage policy of China is to protect the interests of cotton farmers by purchasing cottons at high prices, but the government intervention in the market also causes damage to the interests of cotton textile enterprises. Specifically, cotton prices in China are significantly higher than in the international market by 1000 $/t maximally. Although cotton farmers are protected by the purchasing and storage policy, no effective supporting measures are

developed for the textile enterprises. Textile raw materials (raw cottons) are bought at the protection prices, but textiles are priced exactly according to the market, coupled with internal devaluation and external appreciation of RMB, volatility and uncertainty in U.S. and European economies and other factors, the production cost of textiles is extremely high since 2011, which significantly impacts the competitiveness of Chinese textile products. In addition, the textile and garment industry exhibits continuous weak external demand, sluggish final consumption and low consumption in advanced economies without obvious signs of improvement. Especially, small textile enterprises without quotas are facing serious losses. Thus, the textile industry will be inevitably significantly weakened.

Cotton industry, including research and development of seeds, cultivation, cotton purchasing, processing, textile manufacturing and textile product marketing, should be protected by the government *via* effective measures, to take into account the interests of all sectors and ensure the healthy development of cotton industry. However, the existing national cotton purchasing and storage policy only focuses on protecting the interests of cotton farmers by purchasing upland cottons at high prices, while sea-island cotton growers are not under protection, and no appropriate measures are developed to protect the entire cotton industry. With the decline of the cotton industry, protecting cotton planting industry is of low social and economic significance.

At present, the Chinese government has sought the views of different parties and studied the successful experience of other countries in subsidies to farmers. It is estimated that a new policy with reference to U.S. cotton subsidy policy will come out by the next year before cotton sowing, which will particularly focus on target price subsidy policy, to ensure that cotton prices are mainly determined by the market , especially for the cotton subsidy policy in Xinjiang, which shall not only protect the interests of cotton farmers and take into account the interests of all aspects in the cotton industry, but also improve the market competitiveness of the entire cotton industry in China, especially for the textile industry

4 CONCLUSIONS

Based on analysis of per unit area yield, planting area, total yield and quality situation of Xinjiang cottons, it is clear that Xinjiang has overall good natural ecological conditions with relatively high yield,large area,and good quality of cotton. it is confirmed that the cultivation scale of Xinjiang cotton-planting area has stabilized at around 2.0 million hm^2, and the total yield achieves approximately 4.1 million t. Cotton production in Xinjiang has been at the advanced level in the world, which is inextricably linked with the large-scale popularization and application of advanced cultivation and management techniques in Xinjiang, including "dwarf, dense, early" core technology and several its supporting technologies such as film mulching,

selection of appropriate cultivars, drip irrigation technology and fruit-cotton intercropping, thus taking full use of local light, water and soil resources and overcoming the deficiency of ecological conditions in Xinjiang cotton fields. Furthermore, the construction of ecological areas with oasis windbreaks and shelter belts should be strengthened to ensure the achievement of high yield and stable yield of cotton in Xinjiang.

The issues in Xinjiang cotton production, such as water shortages, severe natural disasters, rapid increase in cultivation costs and overdependence on chemical fertilizers, should draw attention of agronomists and the government. Water-saving irrigation techniques,disaster prevention measures, and mechanized manufacturing technologies, should be further popularized and improved. Aiming at solving the drawbacks of existing cotton purchasing and storage policy, a new policy with reference to foreign successful experience will be developed by the next year, especially for the cotton subsidy policy in Xinjiang, which shall not only protect the interests of cotton farmers and take into account the interests of all aspects in the cotton industry, but also improve the market competitiveness of the entire cotton industry in China, especially for the textile industry

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