The PRESENT AND PAST STATUS OF ELS COTTON PRODUCTION IN China

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Abstract: Xinjiang is the sole ELS cotton producing area in China. ELS cotton is derived from central Asian-Egyptian type Sea Island cotton. In Xinjiang Uygur Autonomous Region, cultivation area, per unit area yield and total yield of ELS cotton are relatively high and show a short-term sharply fluctuating upward trend. Currently, annual cultivation area, per unit area yield and total yield of ELS cotton in China are approximately 10 × 10^4 hm^2, 1200 kg/hm^2 and 12 × 10^4 t, respectively. Specifically, total yield of ELS cotton in China accounts for a quarter of total yield of long-staple cotton (including L.STPL in Egypt) and one-third of total yield of ELS cotton (excluding L.STPL in Egypt) in the world. In China, common genetic quality indicators of ELS cotton cultivars are: 2.5% span length above 36 mm, specific strength above 41.0 cN/tex, uniformity above 85.0%, micronaire value around 4.2, elongation rate above 6.8%, reflectivity around 76%. In Xinjiang cotton planting region, many excellent ELS cotton cultivars have been bred successfully, and "short, dense, early, mulching, dripping" supporting measures have been developed. The remarkable fluctuation of cotton production in Xinjiang is mainly due to varying cotton price and demand. In addition, policies, natural disasters and production costs also have a greater impact on cotton production.

Key words: ELS cotton; Previous; Area; Per unit area yield; Total yield; Quality; Influencing factors

1. INTRODUCTION

ELS cotton is an excellent cotton variety. Currently, ELS cotton is widely cultivated in Xinjiang Uygur Autonomous Region which has become the largest cotton planting region and the sole ELS cotton producing area in China. ELS cotton had been large-scale cultivated in Turpan (eastern Xinjiang), Bayingolin, Kashgar and Aksu (southern Xinjiang), but it was replaced with other varieties in Kashgar, Turpan and Bayingolin subsequently. At present, in Xinjiang Uygur Autonomous Region, Sea Island cotton is mainly cultivated at 39°31'-41°27' N, including Awat County, Aksu City, Shaya County and regimental farms of No.1 Agricultural Division, and the annual cultivation area is about 10 × 10^4 hm^2. Specifically, Awat County is the only planting region of ELS cotton in Xinjiang, which is located in the middle of the Eurasian continent(Cui, J. P. et al., 2014).

The cotton planting region is far away from the sea, dry and rainless, with large evaporation amount, dry air, annual average rainfall of 83.9 mm and average evaporation amount of 1 760.5 mm, thereby becoming a typical oasis agricultural area. In addition, Awat cotton planting region is rich in light resources, with annual sunshine duration of about 2 750 h, sunshine percentage of 60%-70%, ≥10 ℃ effective accumulated temperature of 4 147-4 658 ℃, frost-free period of 205-239 d. Moreover, temperature fluctuates significantly in spring and autumn with a distinct phenomenon of "late spring coldness" and declines rapidly in autumn; the heat resources can meet the requirements for growth and development of early-maturing ELS cotton. Therefore, Awat cotton planting region is generally equivalent to a temperate cotton planting region. At the belling stage of ELS cotton, Awat cotton planting region exhibits excellent heat resources, high temperature, great daily temperature difference and significant desert edge effect, which is conducive to photosynthate accumulation and cellulose deposition. In addition, Awat cotton planting region has unique characteristics of inland arid irrigation, where cotton fields are irrigated artificially, resulting in strong controllability of cotton growth and development. Due to these unique natural ecological conditions and management features, Awat cotton planting region has become a typical large-scale growing area of early-maturing, high- yield and high- quality ELS cotton in the world.

This paper aimed to analyze dynamic changes of cultivation area, per unit area yield, total yield and quality of ELS cotton in Xinjiang Uygur Autonomous Region over the years and summarize factors influencing ELS cotton production in China, thus clarifying the present and past status of ELS cotton production in China, which put forward corresponding countermeasures for sustainable development of ELS cotton production in China and provided reference for ELS cotton production in other countries.

2. Dynamic analysis of the development of ELS cotton production over the years

According to official statistics, ELS cotton has been cultivated in large areas of Xinjiang Uygur Autonomous Region for 61 years. Overall, the cultivation area, per unit area yield and total yield of ELS cotton show a fluctuating upward trend, or even a short-term sharply fluctuating upward trend.

2.1 Cultivation area

Based on analysis of annual average cultivation area of ELS cotton in different years, it is found that annual average cultivation area of ELS cotton in the 1950s, 1960s, 1970s, 1980s, 1990s, 2000-2009 and 2010-2015 reached 0.067 8 × 10^4 hm^2, 1.353 ×

10^4 hm^2, 1.997 × 10^4 hm^2, 3.565 × 10^4 hm^2, 2.542 × 10^4 hm^2, 8.416 3 × 10^4 hm^2 and 7.751 7 × 10^4 hm^2, respectively. Specifically, annual average cultivation area of ELS cotton in 2000-2009 and 2010-2015 was relatively large, and that in the 1950s reached the minimum. In addition, annual average cultivation area of ELS cotton in the 1990s and 2010-2015 was reduced remarkably compared with that in the previous time period; annual average cultivation area of ELS cotton in other time periods increased in varying degrees, especially in 2000-2009.

By comparing the differences between cultivation areas at the beginning and in the end of each time period, dynamic changes in annual average cultivation area of ELS cotton were further analyzed. The results indicate that annual average cultivation area of ELS cotton in the 1990s was reduced by 0.553 3 × 10^4 hm^2, while that in other time periods increased by 0.0197 5 × 10^4 hm^2-0.654 2 × 10^4 hm^2. Annual average cultivation area of ELS cotton in the 1950s, 1960s, 1970s, 1980s, 2000-2009 and 2010-2015 increased by 0.0197 5 × 10^4 hm^2, 0.131 1 × 10^4 hm^2, 0.372 2 × 10^4 hm^2, 0.128 8 × 10^4 hm^2, 0.37 × 10^4 hm^2 and 0.654 2 × 10^4 hm^2, respectively. Specifically, annual average cultivation area of ELS cotton in 2010-2015 reached the maximum, followed by that in the 1970s and 2000-2009.

The cultivation area of ELS cotton was fitted by a power equation: $y=0.0285x^{1.3591}$, which revealed an overall fluctuating upward trend. Since 1981, cultivation area of ELS cotton fluctuated sharply with many maximum and minimum peaks. According to the analysis results of typical peaks, in 1955, the cultivation area of ELS cotton reached the minimum (0.013 × 10^4 hm^2) in Xinjiang Uygur Autonomous Region; compared with 1955, the cultivation area of ELS cotton in 1966 increased greatly and presented the maximum peak (2.31 × 10^4 hm^2) before 1977; the cultivation area of ELS cotton in 1966 was 177.7 times that in 1955; compared with 1966, the cultivation area of ELS cotton in 1970 was reduced significantly and presented the minimum peak (1.06 × 10^4 hm^2) in the 1970s; compared with 1966, the cultivation area of ELS cotton in 1970 was reduced by 54.1%; compared with 1970, the cultivation area of ELS cotton in 1981 increased remarkably and presented the maximum peak (4.66 × 10^4 hm^2) before 1987, which was 4.4 times that in 1970; compared with 1981, the cultivation area of ELS cotton in 1983 declined significantly and presented the minimum peak (2.16 × 10^4 hm^2) in the 1980s; compared with 1981, the cultivation area of ELS cotton in 1983 was reduced by 53.6%; compared with 1983, the cultivation area of ELS cotton in 1990 increased remarkably and presented the maximum peak (6.27 × 10^4 hm^2) before 2000, which was 2.9 times that in 1983; compared with 1990, the cultivation area of ELS cotton in 1995 was reduced greatly and presented the minimum peak (0.84 × 10^4 hm^2) since 1964; compared with 1990, the cultivation area of ELS cotton in 1995 decreased by 86.6%; compared with 1995, the cultivation area of ELS cotton in 1997 increased remarkably and presented the maximum peak (3.91 × 10^4 hm^2), which was 4.7 times that in 1995; compared with 1997, the cultivation area of ELS cotton in 1998 declined significantly and presented the minimum peak (1.08 × 10^4 hm^2), which was reduced by 72.4% compared with

1997; moreover, compared with 1998, the cultivation area of ELS cotton in 2001 increased remarkably and presented the maximum peak (6.77 × 10^4 hm^2) before 2002, which was 6.3 times that in 1998; compared with 2001, the cultivation area of ELS cotton in 2002 presented the minimum peak (4.63 × 10^4 hm^2), which was reduced by 53.6% compared with 2001; compared with 2002, the cultivation area of ELS cotton in 2003 increased greatly and presented the maximum peak (7.01 × 10^4 hm^2), which was improved by 51.4% compared with 2002; compared with 2003, the cultivation area of ELS cotton in 2007 increased remarkably and presented the maximum peak (14.253 × 10^4 hm^2) during the long history of ELS cotton cultivation in China; compared with 2003, the cultivation area of ELS cotton in 2007 increased by 73.1%; compared with 2007, the cultivation area of ELS cotton in 2013 declined significantly and presented the minimum peak (3.828 × 10^4 hm^2) since 2000; compared with 2007, the cultivation area of ELS cotton in 2013 was reduced by 73.1%; subsequently, in 2015, the cultivation area of ELS cotton increased greatly and reached the peak (12.95 × 10^4 hm^2), which was improved by 238.3% compared with 2013 (Fig. 1).

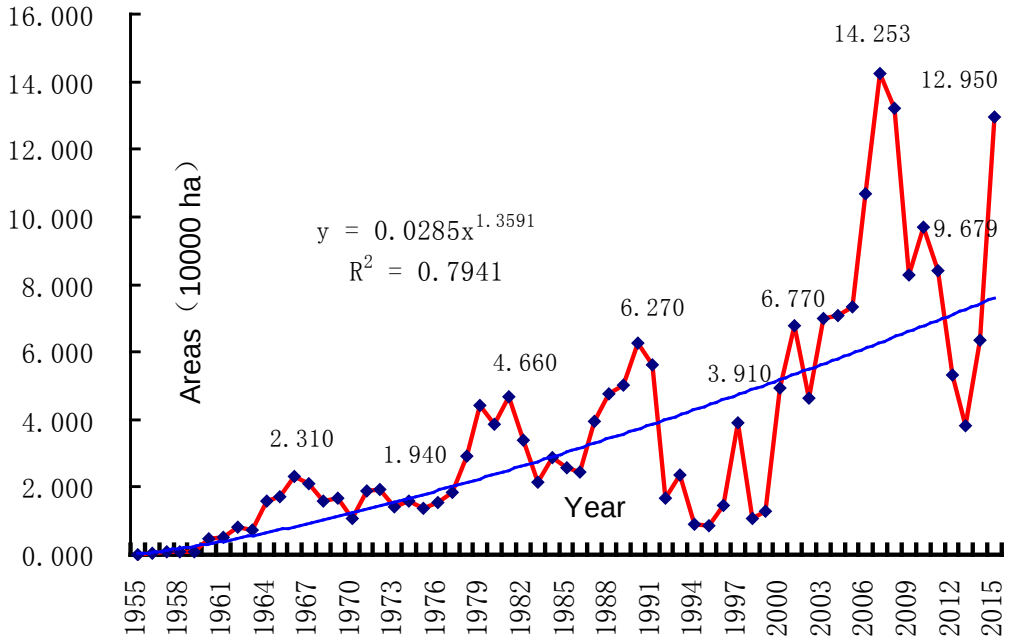

Figure 1. ELS areas in China from 1955 to 2015

2.2 Per unit area yield

According to the analysis results of annual average per unit area yield of ELS cotton in different years, in the 1950s, annual average per unit area yield of ELS cotton reached 294.0 kg/hm^2; in the 1960s, annual average per unit area yield of ELS cotton reached 334.1 kg/hm^2, which was improved by 13.6% compared with the 1950s; in the 1970s,

annual average per unit area yield of ELS cotton reached 361.4 kg/hm^2, which was improved by 8.2% compared with the 1960s; in the 1980s, annual average per unit area yield of ELS cotton reached 623.3 kg/hm^2, which was improved by 72.5% compared with the 1970s; in the 1990s, annual average per unit area yield of ELS cotton reached 1 149.9 kg/hm^2, which was improved by 84.5% compared with the 1980s; in 2000-2009, annual average per unit area yield of ELS cotton reached 1 509.5 kg/hm^2, which was improved by 31.3% compared with the 1990s; in 2010-2015, annual average per unit area yield of ELS cotton reached 1 256.2 kg/hm^2, which was reduced by 16.8% compared with 2000-2009. Apparently, annual average per unit area yield of ELS cotton in the 1980s, 1990s and 2000-2009 was improved substantially by 31.3%-84.5% compared with the previous time period. Specifically, annual average per unit area yield of ELS cotton in 2000-2009 reached the maximum, followed by that in 2010-2015, annual average per unit area yield of ELS cotton in the 1950s reached the minimum. Among different time periods, the highest annual average per unit area yield of ELS cotton was 5.1 times of the lowest annual average per unit area yield. In 1991, annual per unit area yield of ELS cotton exceeded 1 000 kg/hm^2 for the first time and reached 1 075.4 kg/hm^2. During 61 years of ELS cotton cultivation in China, annual average per unit area yield of ELS cotton was improved in varying degrees compared with the previous time period except that in 2010-2015 which showed a downward trend.

The per unit area yield of ELS cotton was fitted by an exponential equation: $y=224.65^{0.0344x}$, which revealed an overall fluctuating upward trend with many maximum and minimum peaks. According to the analysis results of typical peaks, in 1955, per unit area yield of ELS cotton reached 277.5 kg/hm^2 in Xinjiang Uygur Autonomous Region; compared with 1955, per unit area yield of ELS cotton in 1956 was improved by 18.9% and presented the maximum peak (330.0 kg/hm^2) before 1962; compared with 1956, per unit area yield of ELS cotton in 1960 declined significantly by 29.5% and presented the minimum peak (232.5 kg/hm^2) during the long history of ELS cotton cultivation in China; compared with 1960, per unit area yield of ELS cotton in 1963 was improved significantly by 1.1 times and presented the maximum peak (487.0 kg/hm^2) before 1981; compared with 1963, per unit area yield of ELS cotton in 1972 was reduced remarkably by 50.7% and presented the minimum peak (240.0 kg/hm^2) since 1963; compared with 1972, per unit area yield of ELS cotton in 1984 was improved substantially by 1.9 times and presented the maximum peak (697.5 kg/hm^2) before 1986; compared with 1984, per unit area yield of ELS cotton in 1986 was reduced by 11.8% and presented the minimum peak (615.0 kg/hm^2); compared with 1986, per unit area yield of ELS cotton in 1995 increased remarkably by 1.2 times and presented the maximum peak (1 353.3 kg/hm^2) before 2000; compared with 1995, per unit area yield of ELS cotton in 1997 declined substantially by 41.4% and presented the minimum peak (793.1 kg/hm^2) since 1990; compared with 1997, per unit area yield of ELS cotton in 2007 was improved substantially by 1.2 times and presented the maximum peak (1 755.4 kg/hm^2) during the long history of ELS cotton cultivation in China; compared with 2007, per unit area

yield of ELS cotton in 2009 presented the maximum peak (1320.0 kg/hm^2), which was reduced by 24.8% compared with 2007; compared with 2009, per unit area yield of ELS cotton in 2011 was improved by 9.8% and presented the maximum peak (1 449.9 kg/hm^2) since 2009; compared with 2011, per unit area yield of ELS cotton in 2012 was reduced by 23.0% and presented the minimum peak (1 115.7 kg/hm^2); compared with 2012, per unit area yield of ELS cotton in 2013 increased significantly by 25.3% and presented the maximum peak (1 397.6 kg/hm^2); subsequently, per unit area yield of ELS cotton in 2015 declined substantially and presented the minimum peak (926.6 kg/hm^2) since 2000, which was reduced by 33.7% compared with 2013 (Fig. 2).

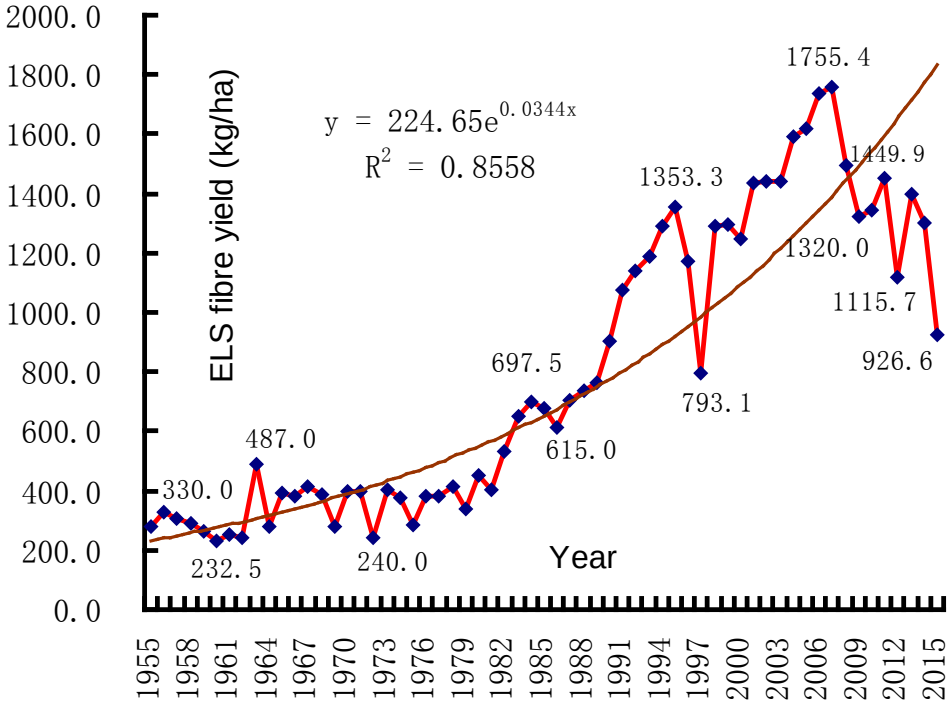

Figure 2. ELS yield from 1955 to 2015 in China

2.3 Total yield

According to the analysis results of total yield of ELS cotton in different years, in the 1950s, annual average total yield of ELS cotton reached 0.02 × 10^4 t; in the 1960s, annual average total yield of ELS cotton reached 0.472 8 × 10^4 t, which was 23.6 times that in the 1950s; in the 1970s, annual average total yield of ELS cotton reached 0.708 8 × 10^4 t, which was improved by 49.9% compared with the 1960s; in the 1980s, annual average total yield of ELS cotton reached 2.203 × 10^4 t, which was 3.1 times

that in the 1970s; in the 1990s, annual average total yield of ELS cotton reached 2.666 × 10^4 t, which was improved by 21.0% compared with the 1980s; in 2000-2009, annual average total yield of ELS cotton reached 13.011 × 10^4 t, which was 4.9 times that in the 1990s; in 2010-2015, annual average total yield of ELS cotton reached 9.455 × 10^4 t, which was reduced by 27.3% compared with 2000-2009. Apparently, annual average total yield of ELS cotton in the 1960s, 1980s and 2000-2009 was improved substantially by 3.1-23.6 times compared with the previous time period. Specifically, annual average total yield of ELS cotton in 2000-2009 reached the maximum, followed by that in 2010-2015; annual average total yield of ELS cotton in the 1950s reached the minimum. Among different time periods, the highest annual average total yield of ELS cotton was 650.6 times of the lowest annual average total yield. During 61 years of ELS cotton cultivation in China, annual average total yield of ELS cotton was improved remarkably (≥21.0%) compared with the previous time period except that in 2010-2015 which showed a downward trend.

The total yield of ELS cotton was fitted by an exponential equation: $y=0.0751^{0.0934x}$, which revealed an overall fluctuating upward trend with many maximum and minimum peaks, especially since the 1990s. According to the analysis results of typical peaks, in 1955, total yield of ELS cotton in Xinjiang Uygur Autonomous Region was 0.004 × 10^4 t, which reached the minimum level during the long history of ELS cotton cultivation in China; compared with 1955, total yield of ELS cotton in 1966 was improved substantially by 221.3 times and presented the maximum peak (0.889 × 10^4 t) before 1977; compared with 1966, total yield of ELS cotton in 1975 was reduced significantly by 56.5% and presented the minimum peak (0.387 × 10^4 t) since 1964; compared with 1975, total yield of ELS cotton in 1982 was improved remarkably by 3.7 times and presented the maximum peak (1.810 × 10^4 t) before 1983; compared with 1982, total yield of ELS cotton in 1983 was reduced significantly by 22.7% and presented the minimum peak (1.4 × 10^4 t) in the 1980s; compared with 1983, total yield of ELS cotton in 1984 was improved remarkably by 42.9% and presented the maximum peak (2.0 × 10^4 t); compared with 1984, total yield of ELS cotton in 1986 was reduced by 25.5% and presented the minimum peak (1.49 × 10^4 t); compared with 1986, total yield of ELS cotton in 1991 was improved substantially by 3.0 times and presented the maximum peak (5.97 × 10^4 t) before 1999; compared with 1991, total yield of ELS cotton in 1995 declined greatly by 81.1% and presented the minimum peak (1.13 × 10^4 t) since 1978; compared with 1995, total yield of ELS cotton in 2001 increased significantly by 7.6 times and presented the maximum peak (9.71 × 10^4 t) before 2001; compared with 2001, total yield of ELS cotton in 2002 was reduced by 31.3% and presented the minimum peak (6.67 × 10^4 t); compared with 2002, total yield of ELS cotton in 2007 was improved remarkably by 2.8 times and presented the maximum peak (25.02 × 10^4 t) during the long history of ELS cotton cultivation in China; compared with 2007, total yield of ELS cotton in 2009 decreased significantly by 55.9% and presented the minimum peak (11.04 × 10^4 t); compared with 2009, total yield of ELS cotton in 2010 was improved substantially by 18.0% and presented the maximum peak (13.03 × 10^4 t) since 2009; compared with 2010, total yield of ELS

cotton in 2013 was reduced remarkably by 58.9% and presented the minimum peak (5.35×10^4 t) since 2000; subsequently, total yield of ELS cotton in 2015 presented the maximum peak (12.0×10^4 t) since 2012, which was improved significantly by 124.3% compared with 2013 (Fig. 3).

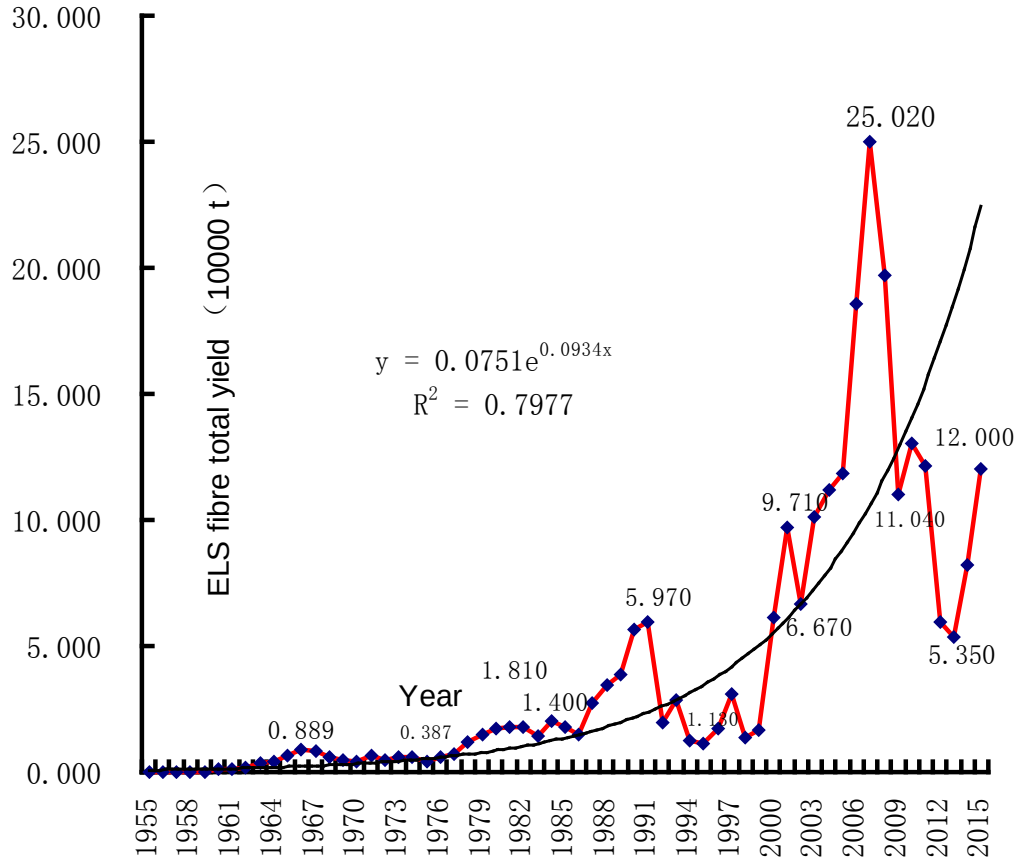

Figure 3. ELS total yield in China from 1955 to 2015

2.4 Quality changes

At present, ELS cotton cultivars produced worldwide basically belong to Sea Island cotton(LI J.F. et al., 2008), which can be mainly divided into Pima series (planted in the United States), Giza series (planted in Egypt) and Xinhai series (planted in China). Xinhai series in Xinjiang cotton planting region are derived from central Asian-Egyptian type Sea Island cotton, which are remarkably early-maturing and have excellent fiber quality. The fiber quality of ELS cotton used for textile industry mainly depends on its genetic quality. So far, 56 ELS cotton cultivars have been officially authorized (identified) in China, but only 11 cultivars have been popularized and applied in large areas and have become main local cultivars (Table Ⅰ).

Shengli No.1, which was cultivated before the 1960s, has remarkably short and thick fibers. Junhai No.1 and Xinhai No.3, which was cultivated in large areas from the late 1960s to 1990s, have excellent agronomic traits as current main cultivars. Specifically, Junhai No.1 had been cultivated for more than 20 years and the cumulative planting area reached 24.31 × 10^4 hm^2; Xinhai No.3 had been cultivated for more than 13 years and the cumulative planting area reached 16 × 10^4 hm^2. Xinhai No.5 and Xinhai No.9, which were mainly planted in Turpan Area of Xinjiang Uygur Autonomous Region, have relatively poor quality. Especially, Xinhai No.9 has remarkably short and thick fibers. As a high-quality ELS cotton cultivar with the cumulative planting area of above 10 × 10^4 hm^2 during the late 1990s-early 21st Century, Xinhai No.14 exhibits good coordination between various fiber quality indicators, which is well evaluated by textile enterprises. However, due to low disease resistance, yielding ability and stability, Xinhai No.14 was eventually replaced by Xinhai No.21 although the latter has shorter and thicker fibers.

Up to now, Xinhai No.21 has the largest cumulative planting area in Xinjiang Uygur Autonomous Region, which reaches above one million hm^2(Tai,H.Z. et al., 2013). Currently, Xinhai No.28, which has been popularized in cotton production, exhibits evidently thicker and shorter fibers. However, due to higher resistance to fusarium wilt than other cultivars, Xinhai No.28 has been planted for a long time but in small areas. In recent two years, cultivation areas of Xinhai No.24, Xinhai No.35 and Xinhai No.36 are increasing rapidly. Specifically, Xinhai No.24 and Xinhai No.35 have excellent comprehensive traits; Xinhai No.36 is a high-quality cotton cultivar bred in recent years. Large-scale cultivation of the above cotton cultivars significantly affects the yield and quality structure of ELS cotton in China(Kong,J. et al., 2011) (Table Ⅱ).
Currently, common genetic quality indicators of ELS cotton cultivars in China are: 2.5% span length above 36 mm, specific strength above 41.0 cN/tex, uniformity above 85.0%, micronaire value around 4.2, elongation rate above 6.8%, reflectivity around 76%(Liu X. et al., 2015) (Table Ⅱ).

Table ELS cotton cultivars cultivated in large areas during the cultivation history

Cultivar Name	Cultivation period
Shengli No.1	Before the 1960s
Junhai No.1	Late 1960s-1980s
Xinhai No.3	Early-mid 1980s-Middle 1990s
Xinhai No.5	Mid-late 1980s-Early 21th Century
Xinhai No.9	1990s-Early 21st Century
Xinhai No.14	1990s-Early 21st Century
Xinhai No.21	2003 -To date
Xinhai No.24	2005 -To date
Xinhai No.28	2007 -To date
Xinhai No.35	2010 -To date

Xinhai No.36	2010 -To date

Table Ⅱ Main fiber quality indicators of ELS cotton cultivars cultivated in large areas during the cultivation history

Cultivar	2.5% span length [mm]	Specific strength [cN/tex]	Micronaire value	Uniformity [%]	Breeding time
Shengli No.1	32.5	38.5	4.7	--	1964
Junhai No.1	36.9	41.2	3.9	87.7	1967
Xinhai No.3	36.7	41.4	3.7	87.3	1982
Xinhai No.5	35.4	38.7	4.1	87.7	1984
Xinhai No.9	34.8	35.4	4.8	85.0	1990
Xinhai No.14	37.2	43.6	4.1	88.1	1999
Xinhai No.21	36.1	41.2	4.3	86.3	2003
Xinhai No.24	36.9	43.8	4.2	87.6	2005
Xinhai No.28	35.4	40.1	4.6	85.5	2007
Xinhai No.35	36.9	43.9	4.1	87.8	2010
Xinhai No.36	37.5	44.5	3.7	88.9	2010

3. Results and Discussions

3.1 Production characteristics

According to official statistics, ELS cotton has been planted for 61 years in China. Its cultivation area, per unit area yield and total yield show an overall fluctuating upward trend and a short-term sharply fluctuating upward trend with many maximum and minimum peaks. Especially, since 2000, cultivation area and total yield of ELS cotton has developed rapidly(Tian, C.Y. et al., 2008). In recent 10 years, the maximum cultivation area, maximum per unit area yield and maximum total yield of ELS cotton reached 14.253 × 10^4 hm^2, 1 755.42 kg/hm^2 and 25.02 × 10^4 t (in 2007), respectively; the minimum cultivation area, minimum per unit area yield and minimum total yield of ELS cotton reached 3.828 × 10^4 hm^2 (in 2013), 926.6 kg/hm^2 (in 2015) and 5.35 × 10^4 t (in 2013), respectively.

In recent six years (2010-2015), annual average cultivation area, per unit area yield and total yield of ELS cotton reached 7.752 × $10^4$$hm^2$, 1 256.2 kg/$hm^2$ and 9.455 × 10^4 t, respectively. According to long-term research of ELS cotton producing areas in China, annual cultivation area, per unit area yield and total yield of ELS cotton in China are approximately 10 × 10^4 hm^2, 1 200 kg/hm^2 and 12 × 10^4 t, respectively. Moreover, total yield of ELS cotton accounts for about a quarter of total yield of

long-staple cotton (including L.STPL in Egypt) and one-third of total yield of ELS cotton (excluding L.STPL in Egypt) in the world(Tian, L.W. et al., 2014).

3.2 Factors influencing ELS cotton production in China

The rapid development of ELS cotton production in China is related to the progress of cultivation technologies. So far, a total of 56 Sea Island ELS cotton cultivars have been successfully bred, including Shengli No.1, Xinhaimian, Junhai No.1, Xinhai No.2, Xinhai No.3……Xinhai No.54. These early-maturing cultivars are suitable to be planted in Xinjiang cotton producing area. Specifically, Junhai No.1, Xinhai No.3, Xinhai No.14, Xinhai No.21 and Xinhai No.24 have played an important role in improvement of yield and quality of ELS cotton in China, thereby contributing to large-scale ELS cotton cultivation and production in Xinjiang Uygur Autonomous Region.

In addition to these successfully bred ELS cotton cultivars, supporting measures have been developed. At present, large-scale popularization and application of "short, dense, early, mulching, dripping" supporting measures and "unified management" measures provide practical technical support for ELS cotton production in China.
The sharp fluctuation of ELS cotton production in China is mainly caused by the change in demand that breaks the balance between supply and demand, thereby affecting cotton price. When the supply is much lower than the demand, cotton price will rise remarkably to trigger large-scale cultivation which will simultaneously affect the relationship between supply and demand and result in oversupply, thus leading to price reduction. Currently, due to low overall demand of ELS cotton, existing cropping patterns in China can easily lead to drastic changes of cotton cultivation area, thereby leading to sharp fluctuation of ELS cotton production in China.

In addition, policies, natural disasters and production costs also have a greater impact on cotton production. During the implementation of cotton purchasing and storage policy in 2011-2013, Chinese government offered subsidies to upland cotton production for three consecutive years, but ELS cotton production did not obtain any subsidies in that period, combined with high costs of ELS cotton cultivation, leading to the marked decline in ELS cotton cultivation and production in China during 2012-2014. Specifically, in 2013, total yield of ELS cotton declined substantially and reached the minimum level since 2000, which was mainly due to the policies and hail damage in the cotton producing areas in 2013. Moreover, in 2015, per unit area yield of ELS cotton was only 926.6 kg/hm^2 and reached the minimum level since 2000, which was mainly caused by the abnormal high temperature disaster in the summer of 2015(Tian, L.W. et al., 2014).

Although the excessive inputs of ELS cotton harvest lead to high cultivation and production costs, since 2014, Chinese government have implemented "price-subsidy

separation" policies and have offered subsidies to upland cotton and ELS cotton production. Specifically, the subsidy standard of ELS cotton is 1.2 times that of upland cotton, and the market purchasing price of ELS cotton is 2.3-3.1 kg/hm^2 higher than that of upland cotton, resulting in remarkably higher economic benefits of high-yield ELS cotton fields (per unit area yield above 4 500 kg/hm^2) than upland cotton fields. This subsidy policy is expected to maintain large cultivation area and high yield of ELS cotton in China in the next few years, which is conducive to establishing the largest ELS cotton producing country in the world.

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