

Review

Kiwifruit (*Actinidia chinensis* and *A. deliciosa*) plantings and production in China, 2002

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Abstract The Chinese kiwifruit (*Actinidia chinensis* and *A. deliciosa*) industry continues to expand. Plantings in September 2002 occupied 57 400 ha with total production estimated to be 340 000 t per year. China now has more kiwifruit planted than any other country and annual production is probably second only to that of Italy. About one-quarter of total plantings are of *A. chinensis* cultivars, the remainder in cultivars of *A. deliciosa*. Eleven cultivars of *A. chinensis* and 11 cultivars of *A. deliciosa* together account for 91.5% of total kiwifruit plantings. One-third of all Chinese kiwifruit orchards are in Shaanxi, planted almost entirely in *A. deliciosa* 'Qinmei', by far the most common kiwifruit cultivar in China. 'Bruno' and 'Hayward', cultivars selected in New Zealand, now account for approximately one-sixth of the total area in kiwifruit in China.

Keywords China; kiwifruit; cultivars

INTRODUCTION

China is a very large and very diverse country with layers of administration at the national, provincial, and county level. As a consequence, it can be difficult to get a clear and comprehensive understanding of an industry, particularly an agricultural industry. Until recently, this was the case with kiwifruit (*Actinidia chinensis* and *A. deliciosa*): the Chinese kiwifruit industry was the big unknown player on the international scene, a player whose potential was tremendous but also somewhat uncertain.

In 1998 the Wuhan Institute of Botany carried out a survey on the kiwifruit industry in China getting the best available information on planting and production trends. We used some of the data obtained in our account of the Chinese kiwifruit industry (Huang & Ferguson 2001), and articles prepared for grower journals (Ferguson 2001, 2002). Similar surveys were carried out in 2001 and 2002, but the results have not previously been available outside of China. In this note we present some of these more recent data as they confirm and extend our earlier conclusions. The data are as of 18 September 2002. As with the previous survey, the data were obtained by asking experts in each province or growing area to fill out a questionnaire, and some information was then checked by telephone interviews. We must stress that in most instances, the data are estimates, but estimates made by those in the best position to make reliable and considered estimates. There remain some inconsistencies and anomalies in detail, especially in yields and in the relative importance of different cultivars, but we believe that the overall patterns and trends are clear.

INCREASING PLANTINGS AND PRODUCTION

Over the 4 years since 1998, the date of the first comprehensive survey, total kiwifruit plantings have increased by nearly 30% (Table 1). Some of this

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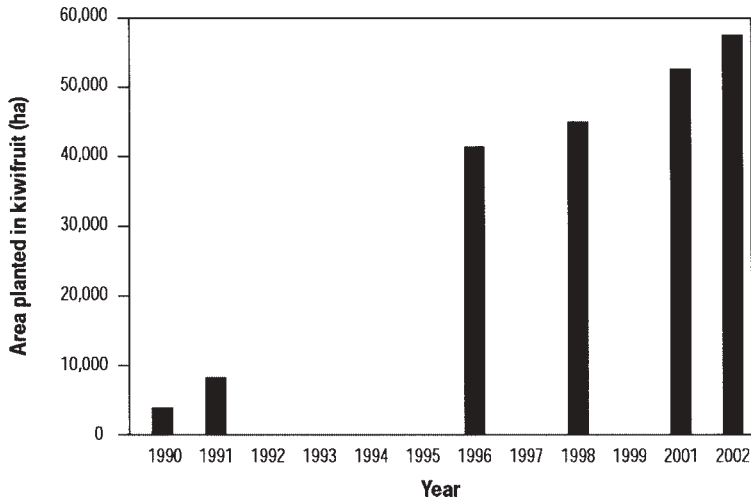


Fig. 1 Estimated total area in China of kiwifruit plantings (*Actinidia chinensis* and *A. deliciosa*), 1990–2002.

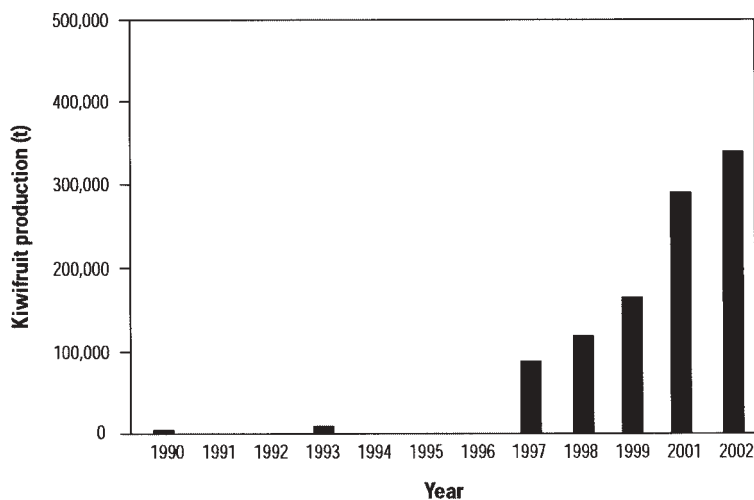
Table 1 Kiwifruit (*Actinidia chinensis* and *A. deliciosa*) plantings and kiwifruit production in different provinces of China in 1998, 2001, and 2002.

Province	Area (ha)			Production (t)		
	1998	2001	2002	1998	2001	2002
Shaanxi	16 700	17 500	17 700	c. 80 000	157 500	163 125
Sichuan	5 300	4 800	5 900	–	8 550	11 500
Yunnan	–	310	380	–	1 200	1 800
Henan	7 300	1 200	1 700	–	1 300	1 500
Hubei	2 500	4 333	4 667	–	13 500	15 000
Hunan	2 700	3 000	3 333	–	15 000	20 000
Guizhou	2 400	5 333	6 666	–	22 500	37 500
Guangxi	1 350	1 000	1 000	–	3 500	3 500
Anhui	–	400	400	–	6 000	6 000
Jiangxi	3 300	4 833	5 000	–	13 000	15 000
Jiangsu	–	530	650	–	8 400	9 500
Zhejiang	1 350	6 000	6 000	–	16 000	20 000
Fujian	–	3 333	4 000	–	25 000	36 000
Others	2 100	–	–	c. 38 500	–	–
Total	45 000	52 572	57 396	118 500	291 450	340 425

increase may be because of the better collection of statistics, but it seems that in China, there has been a relatively steady increase in kiwifruit plantings over this period whereas in the rest of the world (except perhaps for Iran), there has been only a relatively modest increase in the area planted (Belrose 2003). During the past 12 years, kiwifruit plantings in China have therefore risen more than 10-fold from c. 4000 ha to the current area of almost 60 000 ha (Fig. 1). This area is approximately the same as the total of all the kiwifruit plantings

throughout the rest of the world (Belrose 2003). Within China, Shaanxi still has far more kiwifruit orchards than any other province with c. 30% of all plantings: this is an area almost equal to the total kiwifruit plantings in Italy. However, Shaanxi has relatively few new orchards and this may reflect the comparatively low prices now being received in the marketplace for fruit of 'Qinmei', its predominant cultivar. There is an obvious anomaly in the data for Henan (Table 1) and it is probable that the 1998 estimate was over-optimistic.

Fig. 2 Estimated total production in China of kiwifruit (*A. chinensis* and *A. deliciosa*), 1990–2002.



Total production is also increasing (Fig. 2). In 1990, total production was estimated to be only c. 5000 t but since then the increase has been dramatic. In the period for which we have more detailed data, 1998–2002, total production increased almost 3-fold from 118 500 to 340 425 t (Table 1), which is equal to Italy's current production. As indicated by a comparison of Fig. 1 and Fig. 2, there is always a lag between planting and fruit production: this increase in production therefore reflects the earlier increase in plantings, the higher proportion of plantings now fruiting (at present c. 70%), and the increasing age of fruiting plants as they approach full cropping maturity. Thus Shaanxi, which has many of the longest established kiwifruit orchards, produced nearly half the total kiwifruit crop in China even though it has less than a third of the total plantings.

Large quantities of kiwifruit have long been collected from the wild in China (Huang & Ferguson 2002). Estimates vary but the total yield could exceed 150 000 t per year. However, yields are decreasing because of over-exploitation of the wild resources and the quality of the fruit is often very poor. Much more fruit of better and more consistent quality are now being produced from commercial orchards and any kiwifruit harvested from the wild are becoming correspondingly less important.

The average yield per ha of fruiting kiwifruit varies considerably between different provinces (Table 2) and, as might be expected, tends to be lowest in those provinces with a low proportion of fruiting vines, i.e., those provinces in which the plantings are generally youngest. There are some

exceptions: the estimated yields/ha of fruiting vines are very high in Hunan and the yields for Jiangsu (27.1 t/ha fruiting vines) seem improbable. In 2002, the average yield/ha of fruiting kiwifruit for all of China was 8.5 t. This yield is still low compared to those for many other kiwifruit-producing countries in which plantings are more mature and have largely achieved full production: current average yields for Chile, France, Italy, and New Zealand range from 16 to 22 t/ha (Belrose 2003). The most realistic comparison is probably with Shaanxi (11.25 t/ha fruiting vines) as it has mainly mature orchards.

KIWIFRUIT CULTIVARS IN CHINA

Tables 2, 3, and 4 show the breakdown of Chinese kiwifruit orchards according to species and to cultivar. Only 8.5% of all plantings are not accounted for by the 22 cultivars listed. The relative importance of the two species, *A. deliciosa* and *A. chinensis*, has not changed greatly over the past 4 years. About one-quarter of all kiwifruit plantings in China are currently in *A. chinensis* (Table 2), and of this area c. 80% is accounted for by five cultivars, 'Kuimi', 'Jinfeng', 'Zaoxian', 'Hongyang', and 'Lushanxiang', together with their pollenisers (Table 3). No single cultivar predominates and the cultivar apparently most widely planted, 'Kuimi', accounts for just on 5% of the total area in kiwifruit. These statistics are in general agreement with those from Huang & Ferguson (2001), except that 'Guihai No. 4' now seems less important whereas there have been extensive plantings recently of the

cultivar 'Hongyang'. This was commercialised by the Sichuan Provincial Natural Resources Research Institute, Chengdu, from seed collected in the wild. The fruit flesh is yellow-green to yellow and the inner pericarp has strong red pigmentation. The fruit average only c. 80 g in weight but the flavour is good and sweet. This is the first red-fleshed kiwifruit cultivar to have been planted on a commercial scale. It is also the only *A. chinensis* cultivar to be grown on a large scale in Sichuan and Shaanxi, areas in which *A. chinensis* has only limited distribution naturally.

The data for *A. deliciosa* cultivars (Table 4) are largely consistent with those in Huang & Ferguson (2001): these cultivars (together with their appropriate male pollenisers) now account for three-quarters of all total kiwifruit plantings in China. 'Qinmei' is still by far the most important cultivar (now 30% of all kiwifruit in China), but as there has been few new plantings of this cultivar, the big increases in total area planted mean that other cultivars of *A. deliciosa* have become relatively more important. Two cultivars of New Zealand origin, 'Bruno' and 'Hayward', now make up about one-sixth of all female kiwifruit plantings in China: 'Hayward', because of its superior flavour and long storage life, is the cultivar of choice throughout the rest of the world (97.5% of kiwifruit plantings outside of China); 'Bruno' is very productive and

tends to be more amenable to different management techniques. 'Chuanmi No. 1' now seems less important than indicated in Huang & Ferguson (2001). Instead, 'Xuxiang' is being planted more widely. It is a seedling from 'Hayward' and is noted for its precocious cropping and early maturity, towards the end of September.

WHAT NOW?

The kiwifruit industry in China continues to expand. Our prediction (Huang & Ferguson 2001), based on data from 1998, that Chinese kiwifruit production could exceed 400 000–500 000 t by 2006 seems realistic, perhaps even conservative. Most of the cultivars grown in China are not widely known throughout the rest of the world and this may hinder the development of exports, irrespective of fruit quality. However, there are already nearly 8000 ha of 'Hayward' orchards established which, assuming average Chinese production yields, at maturity would provide of the order of 80 000–90 000 t of 'Hayward' fruit per year. This would place China ahead of France as the fourth biggest producer of 'Hayward' kiwifruit. Export of fruit of this one cultivar, relatively unimportant in China but standard in other countries, could have a significant effect on world trade in kiwifruit.

Table 2 Percentage of fruiting vines, yields, and species composition of kiwifruit (*Actinidia chinensis* and *A. deliciosa*) orchards in different provinces of China in 2002.

Province	Fruiting vines (%)	Yield (t/ha fruiting vines)	<i>A. chinensis</i> cultivars (ha)	<i>A. deliciosa</i> cultivars (ha)	Species not defined (ha)
Shaanxi	82	11.3	50	16 480	1 170
Sichuan	64	3.0	2 130	3 770	0
Yunnan	69	7.0	220	130	30
Henan	41	2.1	0	1 400	300
Hubei	60	5.4	1 960	3 000	*
Hunan	40	15	0	2 000	1 333
Guizhou	75	7.5	0	6 663	3
Guangxi	50	7.0	210	0	790
Anhui	90	16.7	120	190	90
Jiangxi	60	5.0	4 800	200	0
Jiangsu	54	27.1	120	500	30
Zhejiang	67	5.0	2 800	2 300	900
Fujian	85	10.6	1 650	2 070	280
Total			14 060	38 703	4 926

*Summed areas in Hubei for specified *A. chinensis* and *A. deliciosa* cultivars exceed by 297 ha (c. 6%) the total estimated area in kiwifruit for that province.

Table 3 Chinese plantings (ha) of *Actinidia chinensis* cultivars (and associated pollenisers) by province in 2002.

Province	Guilhaia No. 4	Hongyang	Jinfeng	Kejian	Kuimi	Lushanxiang	Tongshan No. 5	Wuzhi No. 2	Wuzhi No. 3	Zaoxian	Zhengzhou 90-1
Shaanxi		50									
Sichuan		2 130									
Yunnan				160		60					
Henan											
Hubei						800	330	330	200		300
Hunan											
Guizhou	200										
Guangxi			10								
Anhui			40							80	
Jiangxi			1 000		2 500	50				1 250	
Jiangsu					120						
Zhejiang			1 500		300					1 000	
Fujian			170	940		540					
Total	200	2 180	2 720	940	3 080	1 450	330	330	200	2 330	300

Table 4 Chinese plantings (ha) of *Actinidia deliciosa* cultivars (and associated pollenisers) by province in 2002.

Province	Bruno	Chuanmi	Guichang	Hayward	Huamei	Jinkui	Miliang No. 1	Qinmei	Wancui	Xuxiang	Yate
Shaanxi				450							600
Sichuan		1 800		1 970			15 430				
Yunnan				130							
Henan				400	100	200		700			
Hubei				1 870		1 130					
Hunan							2 000				
Guizhou			333	2 330			2 670	1 330			
Guangxi											
Anhui				120					70		
Jiangxi						150					
Jiangsu				10		20		20		450	
Zhejiang	2 000			300		840				400	
Fujian							830				
Total	2 000	1 800	333	7 580	100	2 340	5 550	17 480	70	850	600

In 2001, China exported 152 t of kiwifruit. There are many problems to be overcome if Chinese exports of kiwifruit are to expand greatly (Huang & Ferguson 2001). The difficulties should not be over-emphasised. Few would have expected that by the same year, 2001, China (albeit including Hong Kong) would be the world's 10th biggest importer of kiwifruit (Belrose 2003).

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