

HARVESTING AND GINNING OF COTTON IN THE WORLD

M. Rafiq Chaudhry
Technical Information Section
International Cotton Advisory Committee, Washington, D.C.

Abstract

About 30% of world cotton production is harvested by machines. Australia, Israel and the USA are the only countries where all cotton is picked by machines. Machine picking is increasing in Argentina and Brazil. Machine picking may be adopted in Turkey in the next few years. Picking costs greatly vary among countries. About 85% of total cotton in the world is ginned on saw gins. Most countries have either large scale saw ginning or roller ginning, although small scale roller ginning does exist in some countries. Among the major cotton producing countries of the world, India and Turkey are the only countries where saw ginning and roller ginning are popular. Ginning is most expensive in Spain followed by Argentina, Zimbabwe, Australia and Colombia. Ginning is heavily subsidized in China (Mainland).

Harvesting

Cotton can either be picked by hand or by machines. Manual picking is slow but better preserves fiber characteristics of cotton. Boll opening is the first action on the fiber which pushes fibers from the place where they were embedded for weeks before being exposed to the external conditions. The boll opening action is gentle and thus has no effect on the fiber quality. However, a longer stay of the open bolls in the field may change the color and also make the fibers shrink, thus affecting the three most important fiber characters, i.e. length, strength and micronaire. One character may be affected more than the other if there is a frequent dew. Such an effect cannot be eliminated as all bolls do not open at the same time and some open bolls have to stay in the field for days and sometime even weeks. In the case of hand picking, it is possible to pick open bolls at frequent intervals, and weather effects on the fiber, after bolls have opened, can be minimized. In China (Mainland) this effect is minimized as land holdings are so small that the majority of the growers who have planted cotton on about 1/10th of a hectare, can go many times to the field to pick few open bolls. In slightly bigger plots, fiber quality is preserved through a number of pickings during the season. 3-4 pickings/season are very common in many countries where cotton is hand picked.

Hirsutum cottons can hold locks for a longer period of time without letting the seedcotton fall on the ground. But, if cotton is not picked for weeks and months, it slowly gets loose and ultimately falls on the ground. In *G. arboreum* varieties, burs do not possess enough holding force to keep seedcotton sticking in the burs. It is easy to pick such a cotton but requires more frequent pickings. In China (Mainland), India, Myanmar and Pakistan, where such cottons are grown on significant area, as many as 8-10 picks are very common. Thus arboreum varieties are not suitable for machine picking as locks fall to the ground quickly. Upland cotton locks which fall to the ground are usually loose, but arboreum locks remain more or less intact. *G. barbadense* types are almost like hirsutum cottons. Most varieties belonging to *G. herbaceum* are very difficult to pick because of the position of burs after opening. Bolls are smaller and locks after opening are positioned such that each lock has to be picked separately. Varietal differences do exist within all species.

About 30% of world production is machine picked. Australia, Israel and the USA are the only countries in the world where all cotton is picked by machines. In terms of percentage, a substantial amount of cotton is picked by machines in Bulgaria, Greece and Spain. The percentage of machine picking and hand picking in the 10 largest cotton producing countries of the world is given in table 1.

A high percentage of cotton in all republics of the former Soviet Union used to be machine picked before the republics became independent countries in 1991. Due to the lack of maintenance facilities for pickers, machine picking has been declining in almost all republics. Kazakhstan and Kirghizstan have improved the maintenance facilities, and it is assumed that now about 70-80% of total production is machine picked in these two countries. Since 1991, hand picking has been increasing in Azerbaijan, Tajikistan, Turkmenistan and Uzbekistan, and it is estimated that now 60-70% of the total area is hand picked.

Among the major cotton producing countries of the world, Argentina and Brazil are the only countries where machine picking is expected to increase in the next few years. A prototype two row stripper machine was designed in Argentina which is commercially produced now. The model Sapucay 492 is claimed to be less expensive, and the operational cost is also

lower compared with other machines on the market. Distance between rows can be adjusted between 0.85-1.0 meter and picking efficiency ranges from 85-90%. Last year a number of these machines were imported into Brazil. Turkey may also introduce machine picking in the next few years because of a labor problem which is becoming acute. In Pakistan, by end of 1980's, shortage of labor had become a problem because of doubling production in seven years. Machine picking would probably have been introduced by now if production had not suffered due to leaf curl virus disease. Partly, the labor problem was tackled through various social incentives to the picking labor. There are many issues to be resolved before machine picking is adopted in any country. However, some experimentation work has already been performed on machine picking in Pakistan. Turkey is comparatively more prepared to adopt machine picking.

In addition to some major cotton producing countries mentioned in table 1, all cotton is picked manually in Cameroon, Chad, Côte d'Ivoire, Iran, Madagascar, Mali, Myanmar, Philippines, Senegal, Sudan, Syria, Thailand, Togo, Uganda and Vietnam. However, at least some cotton is picked by machines in the following countries (table 2).

Cost of Harvesting

The ICAC also undertook another study in 1995 on the cost of harvesting cotton in various countries. The data are available for 57 sets of cotton production conditions in 31 countries. The harvesting cost which included stick cutting and slashing was calculated in various countries in various ways. It is calculated by machine hours, weight of seedcotton picked, mandays and cost of picking a unit area. While machine hours applied to mechanical picking only, weight of seedcotton and mandays are most commonly used for calculating the cost of picking cotton. Cost of picking a ton of seedcotton and cost of picking a hectare of cotton in various countries is given in table 3.

Defoliation

For machine picking it is necessary that there are no green leaves on the plant. Under natural conditions, leaves are shed with age but formation of the abscission layer between the main stem/branch and leaf petiole is stimulated by low night temperatures. If the carbohydrate accumulation is slow and leaves are not shed naturally, application of defoliants becomes necessary. Some varieties are more susceptible to low temperatures and have a greater tendency to shed leaves compared with others. If the leaves are not shed and a time has come to pick cotton, it becomes necessary to shed leaves artificially through application of defoliants. Defoliants also need to be applied if there are green bolls along with open leaves. Defoliants are not applied in many countries; they are used only in the countries shown in table 4.

Ginning

The ICAC undertook a survey of the cotton production practices which was published in October 1996. The database has information on 35 countries which represent about 90% of world production during 1996/97. Information on ginning was also available for other countries. On the basis of 37 countries, only about 15% of world cotton production is ginned on roller gins. Almost all cotton is saw ginned in most countries with the exception of the following countries, table 5.

There are some roller gins in Argentina, Australia, Brazil, China (Mainland), Pakistan and Syria and about 1-2% of total production is ginned on roller gins. In Australia, 3 gins are mixed roller/saw combinations and they are all in New South Wales. About 2/3 of total production in Sudan is of medium staple cotton but it is ginned on roller gins. Ginning efficiency of the machines in Sudan is also dependent on the type of cotton ginned. It takes longer to gin the same quantity of Acala types compared with Barakat varieties. The first saw gin in Sudan may start working in May 1997. In Pakistan, about 150,000 tons of *G. arboreum* seedcotton is never accounted for in the gins and is usually ginned at small home roller gins for domestic use. In India and Iran, where *G. arboreum* and *G. herbaceum* are grown on significant area, a large quantity of short staple cottons is ginned at home for domestic use.

The saw gin stands could be small and large thus affecting the machine efficiency. Similarly, the roller gins could be of various output. The ICAC collected information on the number of roller and saw gins installed in each country (table 6). However, the information was not available from all countries.

Cost of Ginning

In many countries custom ginning is not available. The growers sell their seedcotton to a middle man who buys cotton either for himself or on commission basis for the ginner. Once cotton is delivered to the gin it is the property of the ginner and he

is responsible for the profit and loss on the sale of lint and seed. Under such circumstances it is difficult to estimate the cost of ginning and the data on ginning cost is not available from all countries. Anyhow, the ginning cost from countries where custom ginning is done is the actual cost to the grower. While some countries provided detailed item wise cost of ginning, a number of others provided an estimated cost of ginning all the seedcotton from a unit area. Cost of ginning is given in table 7.

Cost of ginning given here also includes transportation cost to the ginning factory, fee for classing and grading of cotton, if any, and cost of other expenses related to ginning. Value of seed has not been deducted from the ginning cost. Ginning is most expensive in Spain, probably due to the subsidy to be paid to the growers. Compared with the total cost of producing cotton, ginning is an expensive operation in Argentina, Bolivia, Pakistan, Paraguay, Philippines and Zimbabwe. In Israel, ginning of hirsutum costs US\$158/ton of lint. Ginning of Pima cotton is expensive and costs US\$240/ton of lint. Ginning is least expensive in China (Mainland) because of ginning in the public sector under the control of Bureau of Cotton and Jute of the All China Federation of Supply and Marketing Cooperatives.

Table 1: Percentage of Hand and Machine Picking in 10 Major Countries

Country	Hand Picking	Machine Picking
Argentina	25	75
Australia		100
Brazil	90-95	5-10
China (Mainland)	100	
Greece	8	92
India	100	
Pakistan	100	
Turkey	100	
USA		100
Uzbekistan	60-70	30-40

Table 2: Hand and Machine Picking in Some Countries

Countries	Hand Picking (%)	Machine Picking (%)
Bolivia	96	4
Bulgaria	15	85
Colombia	65	35
Ecuador	97	3
Paraguay	95	5
South Africa	80-85	15-20
Spain	5	95
Uruguay	30	70
Zimbabwe	95	5

Table 3: Cost of Picking Cotton

Country	US\$/ton Seedcotton	US\$/ha
Argentina (Irrigated)	90	198
Australia (NSW)	53	225
Bolivia	81	159
Brazil (Northeast)	109	163
Chad	43	43
China (Mainland)	36	87
Colombia	123	245
Ecuador	97	176

India	113	79-248
Iran	62	129
Israel	27	145
Kirghizstan	85	115
Mexico	98	385
Pakistan	55	79-137
Paraguay	143	222
Philippines	40	43-76
South Africa	60-90	36-251
Spain	138	471
Sudan		116-138
Syria	76	236
Thailand		100
Turkey	40	120
Uganda	94	47
Vietnam	30-40	37-55
Zimbabwe	50	50

Table 4: Area Treated With Defoliants

Country	% Area
Argentina	10-15
Australia	100
Bolivia	27
China (Mainland)	5
Colombia	4
Greece	37
Israel	100
Paraguay	2
South Africa	15-20
Spain	92
USA	71
Uzbekistan	72-75

Table 5: System of Ginning Cotton in Some Countries

Countries	Saw Ginning	Roller Ginning
Cameroon	100	
Egypt		100
India	40	60
Israel	85	15
Madagascar	90	10
Myanmar	20	80
Philippines	90	10
Spain	91	9
Sudan		100
Thailand	100	
Togo	90-95	5-10
Turkey	25-30	70-75
Uganda		100
USA	98	2
Vietnam	90-95	5-10

Table 6: Number of Gins in Some Countries

Country	No. of Saw Gins		No. of Roller Gins
Australia		39	
Bolivia		9	
Brazil		440	20
Colombia		5	
Greece		80	
India		480	46529
Iran		58	
Israel		5	2
Madagascar		5	1
Myanmar		1	416
Pakistan	1132	8	
Paraguay		45	
Senegal		4	
Spain		22	4
Sudan			39
Syria		39	1
Thailand	6	2430	
Togo		5	1
Turkey		24	803
USA		1275	31
Uganda		1	22
Vietnam	12	5	
Zimbabwe		6	

Table 7: Cost of Ginning

Countries	US\$/ton of Lint
Argentina	352
Australia (NSW)	270
Bolivia	257
Brazil	170
China (Mainland)	25
Colombia	265
Côte d'Ivoire	107
Ecuador	252
Iran	82
Israel	158-240
Kirghizstan	146
Mexico	193
Pakistan	300
Paraguay	217
Philippines	262
Spain	549
Syria	176
USA	178
Vietnam	165
Zimbabwe	371