Atelier : "mécanisation"

Cotton mechanization in Greece

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Abstract

Cotton mechanization in Greece at the different cotton growing stages is described, with emphasis, on mechanization of cotton harvesting. Data are given on the evolution of mechanical harvesting since its experimental application in 1963 until today, whereas about 70% of total cotton production is mechanically harvested. Adverse factors related to the mechanization of harvesting and measures taken to face these factors are also presented.

Cotton as an agricultural production has long tradition in Greece. It has been cultivated for many centuries, showing considerable increase from the 17th century and then. It accounts now as one of the important agricultural products and in 1985 covered 209 000 ha, 93% of which were irrigated. This area constitutes the 5.3% of the total agricultural land in Greece and the 21% of the irrigated one.

Although the country lies on the northern part of the cotton growing belt, which imposes problems of adverse weather conditions, with usual rainfalls in autumn during harvesting period, both cotton yield and quality are considered high.

Mechanization in cotton cultivation, from the stage of soil preparation for planting until the stage just before harvesting, was almost totally accomplished some 20 years ago. Of course, there have been improvements since then, following the new technology in this field.

Mechanical harvesting has started experimentally with pickers and strippers since 1963, but there were many problems to be overcome, such as very small agricultural holdings, land partitioning (fragmentation), high cost of machinery, etc. The cotton pickers started being used in a significant area only in 1972-73. Today, about 70% of total cotton production is mechanically picked, and there are 1 684 two-row harvesters in operation. The target now is the mechanical harvesting to reach about 85% of the total cotton area.

I - Mechanization at the different cotton growth stages

1. Soil preparation, fertilization and planting

There is sufficient number of tractors available, stalk cutters, mouldboard ploughs, chisels, disk and tooth harrows for land preparation before planting and coverage of fertilizers, pesticides, and herbicides. The mean labor needed for all these soil preparation operations is 13 h/ha, which represents about 4.2% of the total. There are furrow planters for accurate sowing of chemically or mechanically delinted seeds, equipped with fertilizer and pesticide applicators. In the last years, the twin-row planting method gains preference by the farmers, because yields can increase by this method, up to 25%. Many twin-

row planters have been constructed locally and last year (1985), 15% of the total cotton area was sowed by these planters. The twin-rows are 15-20 cm apart from each other and there is 1 m distance between two twin-rows, so that mechanical harvesting can be done by the usual cotton pickers sufficiently. Planting on seed beds has certain advantages for cold and very wet soil, such as earlier sowing, better yield and crop earliness, experimentally proved by the HCB. The difficulties in bed preservation and use of row cultivators for weed control have not permitted the wide use of this method.

2. Thinning, weed control, insect control and irrigation

Plant **thinning** is not mechanized. Cotton producers always try to obtain a good stand having no need fo thinning. This can be achieved by regulating the quantity of planting seed according to variety soil and weather conditions.

Usually, they can avoid the need of thinning, which is expensive as it is made by hand. But many times, there are some areas having dense stands due to favorable weather or other conditions. Most of these stands receive hand thinning.

Weed control by herbicides is usual in a high percentage of total area. In 1985, 99% of the total area received herbicidal weed control, 62.4% of which was pre-sowing application, 17.6% meta-sowing and 20% double application.

Mechanical weed control by four-row tractor-mounted or towed cultivators is usually a supplementary method of controlling weeds. It is applied one to three times and there is sufficient equipment for this work. For the application of insecticides, foliar fertilizers, growth regulators and other chemicals, there are spreaders mounted on tractors in a sufficient number for all cotton area.

For late sprays, when the plantation has full height, there is need for high clearance-high capacity-self propelled sprayers. These sprayers are not enough today. Many cotton cooperatives in the last years have been buying these sprayers to cover the needs of their members, as they require large areas for productive use.

Cotton irrigation is done by surface water in about 46% of total area, and by wells, deep or shallow, in about 54%. Shallow wells are replaced gradually by deep ones, having a depth of at least 100 m. The usual method of cotton irrigation is by sprinklers and only 15% of total irrigated area is irrigated by furrows. There are enough sprinkler irrigation units available. Drip irrigation is not used yet in cotton, because the installment cost of this system is high. It is only experimentally tested, starting last year by the Hellenic Cotton Board. Recently, the self-propelled big sprinklers gain preference, and almost all cotton growers who buy a new irrigation system prefer this type, mainly because it requires less labor.

3. Cotton harvesting

As it has been mentioned before, mechanization in cotton harvesting today covers about 70% of total production and there are 1 684 available two-row harvesters. In 1985, 70.7% of total production was mechanically harvested. In Figure 1, one can see the evolution of mechanical harvesting during the last 20 years. The first experiments of harvesting by machines were carried out in 1963 and 1964, when HCB's experts could foresee that :

a. The availability of labour for hand-picking gradually would be restricted in the future to a level which would be insufficient to cover the need.

b. The cost of harvesting would increase substantially in level not permitting the continuation of the production.

In 1965, 17 cotton pickers were bought and introduced to the cultivation. Until 1972, 204 pickers were bought, which could harvest 3.4% of the total of cotton production. During this period, it was not very difficult to find labor for picking although the cost of it was increasing rapidly each year. At the same time, the producers experienced the need for successful defoliation and the gin factories had to modify their machinery and operation, adding more seed cotton dryers and cleaners. Besides, many of them had to change their machinery in new gining machines and equipment suitable to machine-picked cotton. At this stage, the further increase of mechanical harvesting was not possible any more because :

a) 97% of cotton producers had only 0.1-8 ha (Table 1) mostly in more than one land pieces (Table 2) ;
b) One two-row harvesting machine, depending on crop earliness, rains during harvesting period, size and distance among cotton fields, etc., had to

harvest at least 80 ha each harvesting period for economical use. But factor (a) which is mentioned before, was negative, not permitting such an operation ;
c) The cost of machinery was very high.

Since 1973, due to the organization of group farming by the HVB. mechanical picking has advanced rapidly from 3.4 to 60% in 1981. From 1973 to 1982, 923 new pickers were bought, 50% of which by the Hellenic Cotton Board. The HCB's machines were hired for one year by the farmer groups and the following year were bought by the same group. In 1981, by the EEC's Common Organisation of the Cotton Market, the cotton groups and unions of groups were recognized legally and the agricultural cooperatives took action, forming cooperative cotton groups and buying the harvesting machines without the intervention of the HCB. After this, 563 news machines have been bought until today by the cooperatives, on behalf of their members, who are small cotton farmers. In Table 3, are presented the data of harvesting machines and the degree of mechanization according to the region of the country. In Thrace, Ipiros and Macedonia, mechanization is lower than that of the other regions, because cotton farms are smaller there and weather conditions during harvesting are usually more adverse (more rains than in other regions). There is also available labor to cover today's needs in these areas. It is interesting to note that during the progressive increase in mechanization of cotton harvesting (1964-1984), although total acreage did not change significantly, the following changes have occurred:

- the number of cotton farms reduced by 25% and their average size increased from 2.1 ha to 2.8 ha (Figure 2 and Table 4) ;
- the interest of cotton growers to hire land also increased (Table 5) ;
- In regions where mechanization of harvesting could not fit completely, cotton acreage gradually decreased (Table 6).

The mechanical harvesting period varies mainly according to weather conditions (Figure 3). If rains start late in autumn, the first picking, which represents 70% to 75% of the total yields, lasts from about 15 to 25 days, starting usually by the end of September in the south and some days later in the north. The second picking may last 15 days, or in case of adverse weather conditions, up to 2 months following immediately after the first picking. The harvesters work all this period at maximum possible operation, in order to harvest good quality product before rains deteriorate the seed cotton of open bolls in the field. If air relative humidity is high during the night or even during the day, there is danger of cotton and seed quality deterioration. Proper defoliation plays also important role to the quality of seed cotton. When rains and/or winds occur during the harvesting period, besides quality losses, there are also picking losses in quantity, which have been found to account for 3% to 30% of total yield, with an average of about 8% in total area.

The introduction and evolution of mechanical harvesting, apart from positive effects, had a negative effect on cotton quality, mainly on class, which reduced by about half grade in average. However, mechanical harvesting was necessary in Greece, otherwise cotton could not have continued to be produced any more. Efforts are made to reduce the negative influences of mechanical picking in quality, which up to a point is possible, through production and ginning means.

II - Mechanization in the future

In the next five years (1986-90), new cooperative cotton producing groups are expected to be formed, and 800 new cotton pickers to be bought. With these pickers, the mechanization of cotton harvesting in the country shall reach the maximum, which is around 85-90 for today's conditions in Greece.

In the same period, about 200 new high clearance-high capacity self-propelled sprayers are expected to be entered for the cotton cultivation and these will cover all needs for satisfactory performance of late sprays of the plantations (late insect control and defoliation).

Summarizing the above, cotton mechanization in Greece is complete in all stages of cultivation, except for harvesting, which is now about 70% mechanized, though it will be almost completed in the next five years. At present, there is not scarcity of labor for hand harvesting of the 30% of cotton production, while the cost of it is high.

Classes of cotton acreage (ha)	Number of cotton growers (%)			
	1974	1982	1983	Differences 1974 - 1983
0,1 - 2,9	77,80	69,40	64,80	-13,00
3,0 - 7,9	19,20	25,60	27,60	8,40
8,0 - 9,9	1,30	2,40	3,10	1,80
10,0 - 15,0	1,30	2,10	3,20	1,90
15,0 -	0,40	0,50	1,30	0,90
TOTAL	100	100	100	

Table1: Number of cotton growers according to the size of their cotton acreage

Regions	Mean number of land fragments		Mean acreage per land fragment (ha)	
	per farm	per cotton acreage	Total acreage per farm	acreage of cotton
Central Greece	6,7	1,8	1,14	1,47
Ipiros	5,1	1,5	0,73	0,72
Thessalia	3,9	2	1,83	1,77
Macedonia	5,6	2	0,91	0,94
Thrace	8,9	1	0,91	0,86

Table 2: Cotton land partitioning

Regions	Cotton area (ha)	Seedcotton production (ton)	Cotton pickers		Degree of mechanization of harvesting %
			Number	% Total	
Thrace	6 200	11 500	1	0,06%	–
Macedonia	45 000	106 000	281	18,08%	51,40%
Thessaly	100 658	238 000	952	61,26%	73,00%
Central Greece	37 400	86 400	309	19,88%	87,60%
Ipiros	2 100	6 400	2	0,13%	10,70%
Peloponisos Islands	642	1 700	9	0,58%	97,70%
TOTAL	192 000	450 000	1 554	100,00%	68,00%

Table 3: Distribution of cotton harversters, seedcotton production and degree of mechanization of harvesting

Year	Number of growers	Average cotton land per grower (ha)
1977	71,853	2,545
1978	57,916	2,904
1979	51,561	2,644
1980	52,268	2,698
1981	47,565	2,655
1982	52,46	2,622
1983	63,482	2,646
1984	74,545	2,576

Table 4: Number and average size of cotton farms

Regions	1974			1978		
	Owned %	Hired %	Total 100	Owned %	Hired %	Total 100
Central Greece	91,70%	8,30%	100%	77,80%	22,20%	100%
Ipiros	81,60%	18,40%	100%	62,90%	37,10%	100%
Thessaly	77,20%	22,80%	100%	70,20%	29,80%	100%
Macedonia	82,40%	17,60%	100%	69,40%	30,60%	100%
Thrace	86,30%	13,40%	100%	85,60%	14,40%	100%
TOTAL	82,10%	17,90%	100%	71,10%	28,90%	100%

Table 5: Owned and hired land cultivated with cotton

Regions	Acreage			Number of harvesters			
	1974	1978	1982	1974	1978	1982	1985
Peloponisos	1 051	550	333	4	7	7	10
Central Greece	25 218	23 696	23 001	31	132	210	311
Ipiros	5 770	1 100	1 126	–	–	2	2
Thessaly	68 886	96 130	75 295	126	514	647	1 027
Macedonia	48 839	43 435	35 194	41	188	211	311
Thrace	3 885	3 200	2 562	–	1	1	1
Islands	395	120	26	–	–	–	–
TOTAL	154 044	168 231	137 537	202	842	1 078	1 662

Table 6: Cotton acreage (ha) and mechanization of harvesting

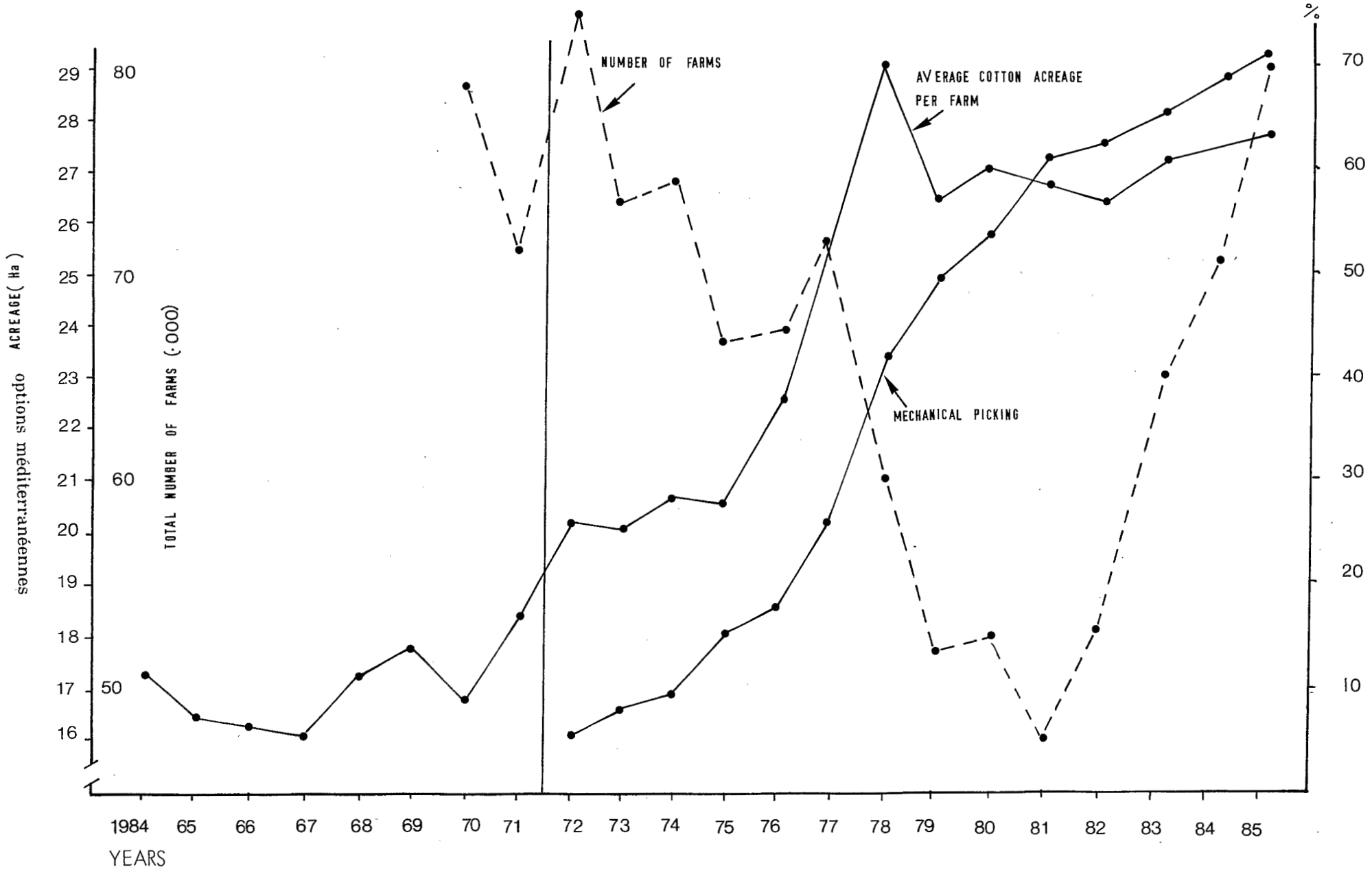

Figure 1 : Number and average size of coton farm with mechanical picking

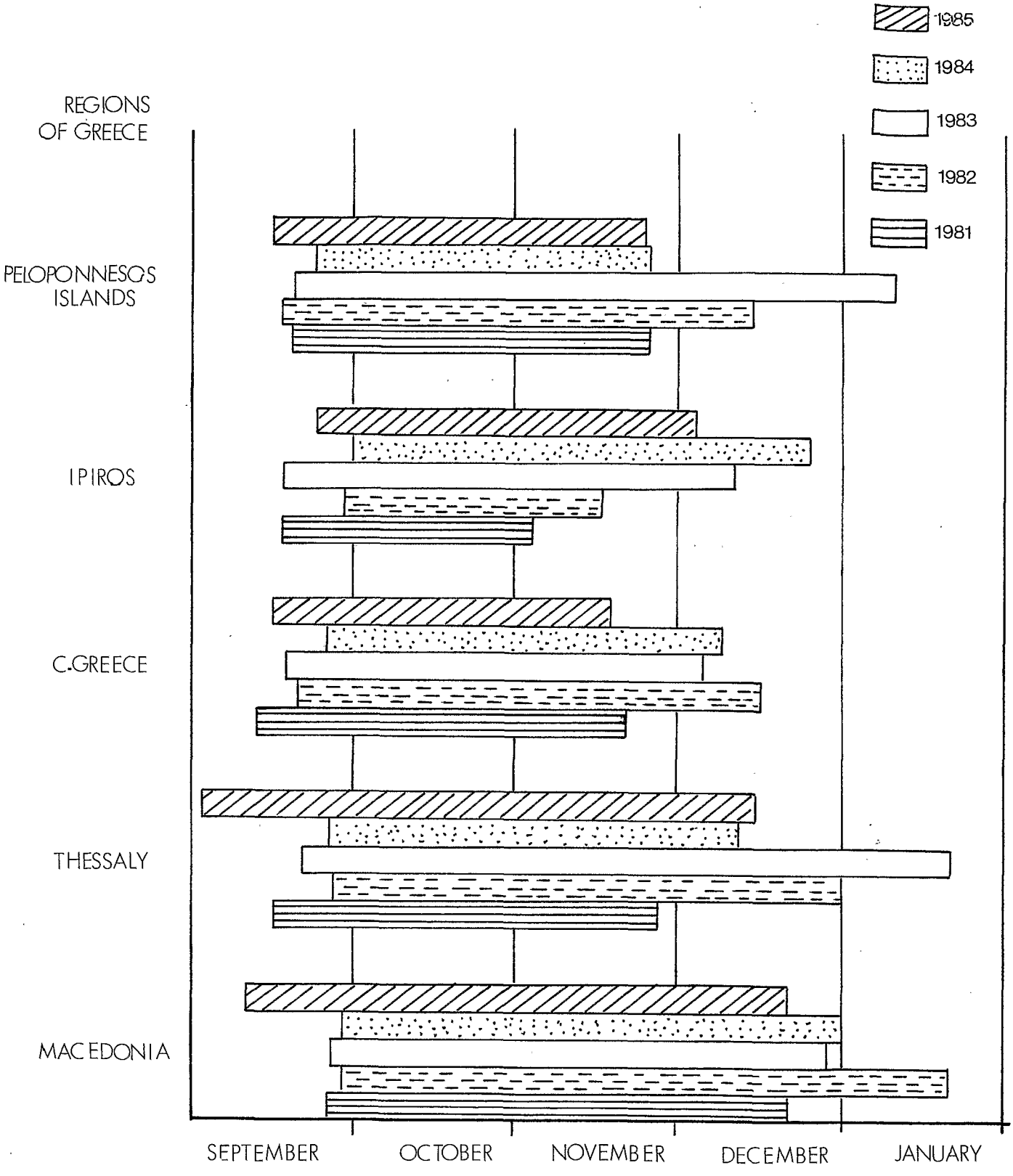

Figure 2 : Mechanical harvesting period