Cotton production in Israel

The Cotton Production and Marketing Board Ltd - Tel Aviv

Cotton growing has been known in Israel since ancient times, but was revived only in 1953.

Expansion has been very rapid, and today, cotton is grown all over the country. Actually, it is the main irrigated field crop in Israel.

The California SJV is the most accepted variety, producing high yields as well as good quality fiber. 8% of the area is planted by Pima variety.

Most of the cotton fields are irrigated, mainly by sprinklers, but swiftly moving to drip system, which contributes to additional 25% of yield, and even more, in marginal areas. In the current season almost 40% of the acreage is dripped.

Though all field operations are highly mechanized, farmers, as well as research teams, still make tremendous effort to cut labour input.

85% of the lint (about 85,000 tons) is exported, mainly to Europe. The rest is consumed by local mills.

The 160,000 tons of seed produced, are supplied both to the dairy farms for direct feeding and to the local oil mills.

Cotton is grown under the auspices of the Israel Cotton Board, a semi-governmental company, founded by the farmers and the Ministry of Agriculture.

The board is responsible for marketing of the total products (lint, seed and linter). Additionally, upon request of the farmers, the Board has framed within its establishment several divisions, which advise the farmers and supervise the various stages of cotton growing. It also is responsible for cotton classing, storing and financing the growers.

The Board operates in full cooperation with the Cotton Growers Association, the Extension Service and the Research Institutes, for the benefit of the whole cotton industry.

I - Area, yields and varieties grown

Commercial cotton growing in Israel began in 1954. Since then, and especially due to high mechanization, area has been enlarged.

Cotton growing area in 1985 was 65 000 hectares fully irrigated. Thus cotton production is nowadays the largest irrigated field crop in Israel, which consumes one third of the total water usage in agriculture.

Besides the lint, 160 000 tons of cotton seed is yearly produced. 50% are used for direct feeding of the dairy cows, while the rest is crushed for oil.

Yields : Lint production was nearly 100 000 metric tons in 1985. The national average lint yield was 1,530 kgs per hectare, for the upland varieties, and 1,300 kgs per hectare for Pima varieties.

Varieties : Acala SJ2 occupies nearly 85% of the area. A new locally bred hot region Acala variety, Eden 1 -occupies 7% and Pima S-5 (American Egyptian), a long staple variety - about 8%.

II - Economics

Nearly 90% of the lint is exported, as the local consumption is very small. Thus, cotton is a major resource of foreign currency. Also, cottonseed is a very important subtitute item, thus cotton production contributes to 15-200 million dollar a year for the Israeli economy.

Cost of production is relatively high because of intensive usage of energy for water pumping, field machinery and ginning. Insect control is also expensive **because** of high number of sprays needed.

Total cost of cotton growing is roughly $3 000 per hectare, as the following :

Labor	$300 per hectare
Water	$500
Machinery	$600
Chemical and air sprays	$500
Fertilizers	$250
Ginning	$350
Capital	$500
TOTAL	$3 000

Those are average figures, which vary in different areas and growers. Regarding the high costs, high yields are needed for minimum profitability.

III - Production practices

Most cotton is grown on relatively large units and production is fully mechanized.

Tillage practices : vary, but the following procedure is still widely practised : shredding of stalks is done after harvesting, then phosphate and sometimes potash fertilizers are often applied, if needed. Then come plowing, disking, smoothing, marking and ridging.

Throughout winter fields are kept free of weeds by cultivation or often by herbicides.

Final seedbed preparation is accomplished by various cultivators, rotovators, etc...

Lately the Puller - Shredder - Bedder is more and more experienced, saving 3-4 trips and compaction.

Planting : Cotton is usually planted from the end of March to the end of April by multirow planters to a final stand. Planting is done into moist soil or into dry soil that is afterwards irrigated up.

Fertilization : Various N, P, K solid or liquid fertilizers are usually applied according to local needs. Most growers take advantage of the testing service given by regional laboratories cooperatively held by the governmental extension service and regional councils.

In sprinkler irrigated cotton soil sampling for determining P and K availability is sometimes carried out in autumn, or in springtime. Spring soil sampling for determining available N is taken from 0-120 cm layers. In determining fertilizing needs, growers do not rely solely on soil tests but take in account some other factors too, such as anticipated yield level, cropping history, soil type, water quality, etc...

P - If results of (spring sampling) soil test (Olsen) is higher than 12-14 ppm, level is considered high enough ; when 10-14 ppm, 300-500 kgs/ha of superphosphate is applied in the next autumn, when less than 8 (in the spring), side application is recommended.

K - When result is too low KCL should be applied.

N - 250 kgs/ha of (available soil N + applied N) is considered high enough for getting good yields. When anticipating very high yields growers often like to have a total supply of 300 kgs/ha available .

For drip-irrigated cotton somewhat higher amounts are applied. Some N is applied at the beginning of the season and a lot more is applied in the irrigation water.

Weedcontrol : Growers usually take both mechanical and chemical control measures for controlling weeds.

Various preplanting, preemergence and postemergence weed killers are efficiently and widely used.

Infestation with some "hard to kill" weeds increased in the last few years and research people have been asked to supply good enough answers to the problems.

Efficient control methods should also be developed for some of the new production methods.

Insect control is a factor of major economic importance in Israeli cotton production. Certain insects, if not properly controlled, might inflict heavy damage to cotton yield and quality. On the other hand, control expenses are often quite high.

Some of the damaging insects are : *Heliothis*, *Prodenia* (really *Spodoptera littoralis*), Pink bollworm. Various sucking insects and spider-mites are of lesser importance, though sometimes necessitate control measures. These called "White fly" (*Bemisia tabaci*) became important only in the last few years but some of the control measures taken against it proved to be effective if properly applied.

Pest control is mainly chemical, but growers often try to delay first treatment as long as possible, so as to let "beneficials" fulfill their role in supressing damaging insects.

Treatment decision making -about kind of insecticide, rates of the insecticide used, etc., is always based on findings of a systematic field checking, that is carried out twice a week in each plot. Economic treatment thresholds have been established for each insect.

The danger that insects might develop resistance to presently used insecticides, is not overlooked and research is ever trying to develop new effective control methods.

Diseases : Certain local disease problems sometimes become troublesome like the *Fusarium* wilt in Pima, leaf spots in Pima (*Alternaria macrospora*) and sometimes seedling diseases.

Irrigation : Water supply is considered to be the main limiting factor in production and therefore much has been done to make water use as efficient as possible.

Methods of application : Sprinkling has been the method almost generally employed, but, in the last few years, drip irrigation has been commercially introduced by cotton growers and now nearly 40% of the area is irrigated by dripping. Its annual cost is higher when compared to conventional sprinkling.

Dripping equipment is usually used in the same field throughout a season and application intervals are usually short. Sprinkling is usually applied at longer intervals and its portable lines are repeatedly pulled by tractors, every day to another plot. Quite a few growers have been convinced to shift over from sprinkling to dripping because they managed to achieve higher yields and make some extra profits by doing that, under certain circumstances.

A new practice that has been only recently commercially introduced by cotton growers, is applying water by self-propelled irrigation machines. Various types of such machines have been built and commercially introduced to about 5% of the irrigated cotton.

Automation and "computerization" at various levels is now widely used in operating and controlling irrigation systems.

Amount of water annually applied to cotton vary considerably, mainly in accordance with climatic conditions, soil type and depth, application efficiencies, etc...

For fully irrigated fields, growers apply from 350 to 1,200 mm per season. In most years however, the greater part of the cotton area is irrigated with no more than 400-500 mm.

Growers usually base irrigation planning of any specific field on their experience with it. Later on, thoughout the season they may make certain changes, if considered necessary.

As an aid for irrigation decision making, growers use various methods and equipment. Of the "meteorological" methods, Evaporation Pans are widely used. For soil moisture measurements Neutron Probes are now commercially used by some growers ; there is no general agreement as to the practical value of this method. Plant water potential measurements by Pressure chambers are regularly made by growers in certain regions.

Growers prefer one method or another, depending also on the conditions prevailing in their fields.

We think however that, for the purpose of "fine tuning" irrigation, also systematically, measured data of actual plant growth and yield development should be taken into consideration together with the information achieved by other methods.

Harvesting, storage and ginning : Harvesting is done by machine pickers, after cotton has been defoliated. Most of the fully irrigated cotton is picked throughout October, in certain regions also in November.

Most of the cotton (Upland) is ginned by high capacity saw gins, and the *pima* cotton by roller gins.

The gins have been designed so as to operate throughout a period that is much longer than that of picking and so very large amounts of picked seedcotton must be stored in the fields or in storing centers before ginning. Auxiliary equipment - intermediary wagons, module builders and special trucks handle seed cotton, make modules, and later on haul them to the gins.

IV - Classing and Marketing

Samples taken from each bale in the gin is sent to a central classing institute where classing and fiber testing take place. The Institute is owned and operated by the Cotton Board, which also does all the marketing and pays growers according to the real market price of their cotton. Lately, HVI instrument was operated successfully.

V - Research Support Facilities

Researchers have access to the following facilities:

Libraries : The agricultural library of the faculty of agriculture, of the Volcani Agricultural Research Center and to a few others.

Information Centers : The irrigation information center, the Information Center of the Ministry of Energy that has on-line connections with some of the large computerized information centers in the world.

Soil & water laboratories - exist at the Volcani Agricultural Research Center, at the Faculty of Agriculture, as well as in each one of the regions.

Fiber Laboratories - exist at the Fiber Institute (Jerusalem), at the Classing Institute of the Cotton Board and at the Shenkar College.

Spinning Laboratories - exist at the Shenkar College of Textile Sciences and at the Fiber Institute.

Computers : All the universities, the research centers and the Ministry of Agriculture own big computers. Each one of the regional agricultural centers has got their own computers. Researchers have access to practically unlimited computer facilities. In fact there is a computer terminal in almost all of the big farms.

Publications : Each one has got to write a progress report, at least one a year and a final report on termination of his research work. Some publish in local or in foreign periodicals.

In the last five years, a compilation, in which summaries of all recent cotton research works is included, has been published annually. Also, abstracts of all cotton research reports are usually published in a local general agriculture monthly journal. Any result that is considered fit for commercial application is examined by special committees that decide on the professional recommendations that should be extended to the cotton growers, by the extension service.

Sources of tables 1 and 2 : Cotton production and Marketing Board Ltd.

Ton of seeds	Year	Average yield per hect. in Kg.	Ton of lint	Acreage in hectares	Number of growers
–	1953	–	30	30	–
22 000	1963	1030	13 410	13 000	263
63 390	1973	1200	37 410	31 135	294
124 490	1979	1320	75 140	56 880	469
128 950	1980	1350	78 140	57 720	437
152 100	1981	1530	91 600	59 840	435
144 360	1982	1550	86 550	55 930	459
153 200	1983	1630	92 628	56 800	450
145 000	1984	1380	87 538	63 300	470
165 000	1985	1520	99 000	65 500	500

Table 1: Crops

Country	1 983	1 984
Germany	2 423	4 030
Italy	9 375	11 413
Belgium	2 766	2 065
Portugal	26 848	24 554
South Africa	2 109	696
England	4 973	1 650
Greece	16 468	19 502
Spain	2 187	991
Holland	–	102
Jugoslavia	2 722	496
Ethiopia	1 388	–
Philippines	108	–
Norway	–	317
Argentine	341	60
Chile	681	–
Romania	7 865	–
Others	240	61
Undelivered		12 563
TOTAL	80 494	78 500

Table 2: Cotton export 1983-1984 crops (tons)

1984/85 Research project

Subjects

Irrigation : Drip & Sprinkler

Upper Galilee Region
Affula "
Western Galilee "
Hadera "
Rehovot "
Lachish "
Negev "
Beit Shean "
Volcani Research Institute

Models

Radiation Research
Plant & Insect Models, Various Regions

Insect control

Bemizia tabaci
Prodenia (*spodoptera littoralis*)
Spiny Bollworm (*Earias insulana*)
Pink Bollworm (*Pectinophera goss.*)
Heliothis Biological Control
Spider Mites
Feromones
Development of Methods for efficient Scouting

Pests & Diseases

Alternaria research
Gall Nematodes control in cotton
Seed diseases

Weed control

Tests and research, various regions

Variety improvement

Breeding program
New variety tests
Introduction field tests
Cross breeding trials
Fusarium Resistant Pima

Soil & fertilizers

Various regions
Prognozing Nitrogen Levels in soil
Potassium & Phosphorus Application by drip irrigation

Technology & Mechanization

Soil cultivation systems
New machines development
Testing new ground sprayers
Fighting fibre stickiness
Ginning tests
Controlled traffic

Miscellaneous

Plant growth regulation
Defoliation
Double cropping