IPM APPROACH IN NON GM COTTON- A WAY OF LIFE

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ABSTRACT
An IPM & IRM approach are two strategic ways to reduce the use of harmful pesticides. Israeli cotton growers adapted several techniques to reduce the number of insecticides applications. Improved field inspection, more rational use of different chemical groups, use of pheromone traps and pheromone mating disruption ropes. All resulting in a dramatic reduction in pesticides use.

INTRODUCTION
Modern agriculture which consists of large fields of single crop monocultural practice generally causes an aggressive violation of the ecologic balance. A single host gives an "unfair" advantage to specific insects that can accelerate their population levels within a few generations, leaving their predators far behind. As a result, the food chain is damaged and an insect turns to be a pest to a crop. Non GM cotton growers face major distress as on one hand they have to eliminate harmful insecticides and on the other hand chemical companies have no incentive to develop new environmental friendly pesticides. The only way to handle it on a large scale is to use an IPM - IRM approach.

DEAD END?
During the mid 1980s' cotton growers in Israel found themselves in an unbearable situation concerning pest control. 3 major harmful insects: Cotton whitefly (*Bemisia tabaci*), Pink bollworm (*Pectinophora gossypiella*) and Cotton bollworm *Heliothis (Helicoverpa) armigera*, followed by additional minor pests caused severe damage. this situation forced farmers to implement about 16 applications of insecticides during the season. This was unacceptable and we understood that we are in a critical junction. Decisions had to be made whether to stop cotton farming altogether or adapt a totally different approach to pest control.

IPM - IRM

Integrated Pest Management (IPM) and Insect Resistance Management (IRM) are ecosystem-based strategies that focus on long-term prevention of pests development or their damage through a combination of techniques such as: biological control, habitat manipulation, modification of cultural practices, use of resistant cotton varieties.
Pesticides are used only after monitoring indicates that the level of damage in the field is above a threshold according to established guidelines. Pesticides selected and applied with the goal of removing only the target organism, and in a manner

that minimizes risks to human health, beneficial insects , non target organisms and the environment.

ASSESSING FLUCTUATIONS OF PEST POPULATIONS

A. Visual scouting
1. Dividing every field into reference plots.
2. Assessing the populations of pests and beneficials - predators within each plot   ,

B. Pheromone *traps*
> Installing pheromone traps in cotton fields. For each pests there is a threshold number of individuals, found in the trap, which indicate a population increase up to a damaging level.

When pest populations reach threshold levels, they will be sprayed with the suitable insecticide according to the IPM-IRM strategy.

INSECT'S RESISTANCE MANAGEMENT

1. Each generation of a pest is exposed to one group of insecticides (Figure1). The objective is to prevent the possibility of developing resistance by the insect to a particular pesticide.
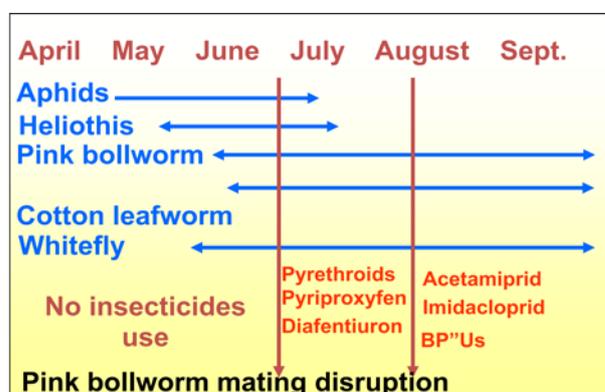

Figure 1. The Israeli IRM version

2. Central monitoring system for pest population level and plant development aspects & resistance levels was established. The scheme is to collect data from all regions about pest behavior and try to understand each insect dynamic with the aim to predict when it will achieve a damaging stage.
3. Study of the influence of new insecticides on beneficial –predators insects.
4. Explanatory and educational campaign.

ACHIEVEMENT

Within 6 years, 1986-1992, the number of seasonal pesticides applications dropped dramatically from 16 to 7 (Figure 2).
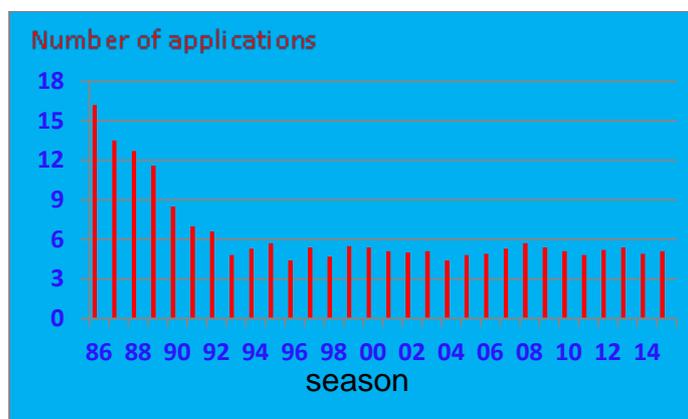

Figure 2. Number of pesticide applications during season.

PINK BOLLWORM (*Pectinophora gossypiella*)

Pink bollworm is a major pest in non GM cotton as the larval stage penetrates the boll within a very short time after emergence from the egg. Once it is inside the boll it is almost impossible to control it by pesticide application.

Therefore, the strategy is to prevent adult moth mating. The technique is dispersing slow-release pheromone ropes in the field to cause mating disruption of males seeking females for mating. We started with 250 ropes per hectare (Figure 3), in 10 fields from different regions. In addition farmers placed pheromone traps in fixed points in the field (Figure 4) to acquire knowledge about the point in time that the insect population accelerates to a point in which pesticide application is needed. The results were convincing, we understood that we can reduce the volume of this pest population.
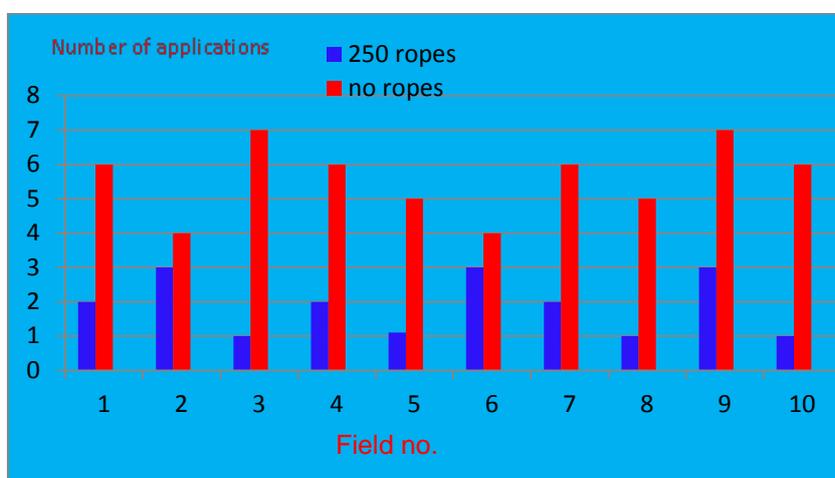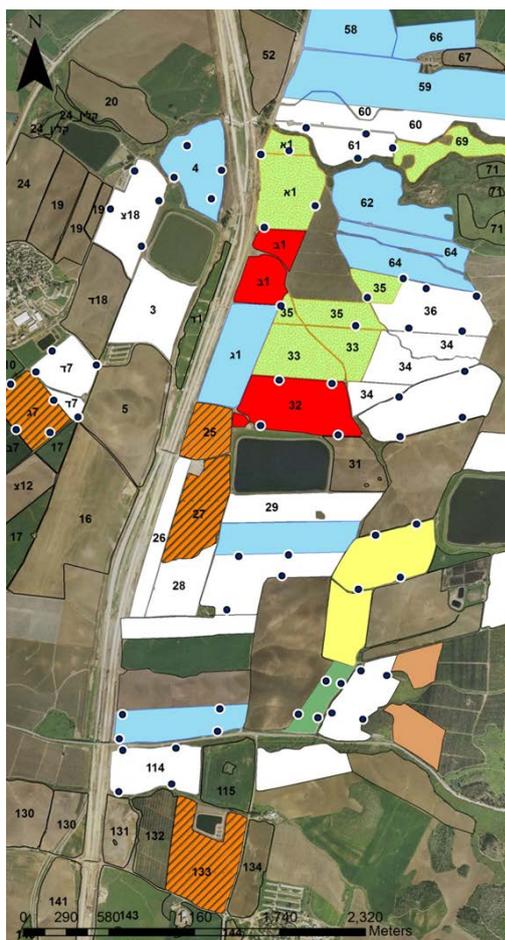

Figure 3: Mating disruption experiment 2002

Figure 4: Pheromone traps map

As for the last 3 years, the cotton growers apply 500 ropes/Ha at the beginning of the season –at 6 leaves stage, and another 500 ropes/Ha 50 days later. This pest is now under control and is not a critical threat as it used to be. In most fields there is no need to use pesticides to control the Pink Bollworm.

CONCLUSION
- Non GM cotton farmers can reduce the number of insecticides application by using IPM & IRM strategy.
- Achievement can be reached by using several techniques together: proper pest scouting in fields, pesticides usage policy, pheromones etc.
- The approach is based on big scale; single farmers can succeed by cooperating.