TECHNOLOGY TRANSFER OF COTTON

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Abstract

Cotton production in developing countries is affected by seed quality, the quality of water management systems, plant protection, and mechanization.

Introduction

Let me share with you our experience in Technology transfer which covers projects in more than twenty countries in Africa, South America, the Middle East and Asia. Part of the projects deal with surveys or studies. However, in many of them we were heavily involved in detailed design, management and training. Obviously, there were many cases where the project included more than one crop.

The majority of world cotton production exists in developing countries and even more if we refer to the size of planted areas. For this reason production systems are diverse in accordance with various factors. Among the major ones we can find:

1. Government regulations in the form of price support or preferential input prices (subsidies).
2. Impact of farm size on the production systems, where small holdings cannot justify the introduction of advanced technology.
3. Climate differentiates the production technology between rain-fed and irrigated cotton, short and long duration varieties, etc.
4. Institutional structure of the cotton sector within a country or a region will effect the level of research, credit supply and last but not least, marketing and processing.

Other minor factors could be the altitude of the area, existing infrastructure (such as roads, power, telecommunication, etc). Despite all these variations, I will try to discuss the major issues and illustrate them with examples from different projects.

Seed Quality

In many cases we found the poor quality of seed as a major reason for defected plant stands. Such a bad start has inevitable drawbacks throughout the season. Ironically, many of these countries maintain successful breeding programs and are able to release excellent varieties.

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Part of the problem lies at the field stage where multiplication lacks systematic control and supervision procedures. But equally crucial is the phase of processing which can facilitate mechanization of planting and disease and insect protection.

I would like to point out the case of Turkey, where breeding activities are very extensive. However, most of the seed is poorly delinted and graded, resulting in heavy seeding rates per hectare. In comparison, chemically delinting plant was added in the Aegean region, but certainly many of these will be necessary.

More difficult is the case of India, due to the micro size of the farm holdings. Lack of both finance and knowledge bring farmers to use any seed which they can get directly from the gin.

On the other hand, Zimbabwe had made great progress in the last few years where a modern and high capacity chemical delinting seed plant has been erected. The introduction of biotechnology and genetic engineering amplifies the role of the seed in the total process of production which becomes a multi-carrier of different plant protection functions later in the season and therefore, deserves much more efforts in the commercialization phase.

Water Management Complex

Irrigation is a major tool for raising yields as well as maintaining stability of production where reasonable rainfall exists. In arid regions it is obviously a pre-condition for production . In general small size farming exercises traditional irrigation systems where water is sourced from a shallow well or a nearby canal. The water distribution is by flooding, while timing of water supply is mostly arbitrary.

On the other hand, we found in some countries large irrigation schemes where water is caught by large dams and reservoirs. From there it is conveyed along a network of canals of irrigated areas, either large farms (Central Asia) or small to medium size (GAP area in Turkey).

The degree of efficiency of water usage varies among the countries, regions and individual farms. By and large, we identified low efficiency and sometimes very low efficiency. This is reflected through different stages starting from sourcing and conveying the water to the farm gate, and subsequently its actual application by the farmer.

Trying to identify the basic reason for misuse of such an expensive resource (water), we came to the conclusion that it is the pricing system of water which permits overuse and prohibits modification of old systems as well as introduction of new technologies of irrigation.

I am fully aware of the explosivity of the issue and will not advocate full cost charging. However, many types of economic incentives for using water more efficiently have been tried.

In many cases in desert areas, overuse of water results in high water table and consequently severe salinity problems. Central Asia has been severely experiencing this catastrophe during the last two decades. Leaching with high amounts of water is the accepted practice. This, in turn raises further the water table especially when it coincides with malfunctioning of the drainage system. We of course, should not ignore the educational issue. Time-honored tradition on one hand and the sophistication and cost of advanced irrigation on the other, have a negative effect on any attempt to reverse the existing trend.

In view of the growing problem of salinity, I feel that surface irrigation should be limited to flat and substantially drained soils. Otherwise, different types of pressurized irrigation systems must take place gradually. Introduction of such systems involve an integrative approach since low discharge of water supply implies a different regime of fertilization and in turn, cultivation and weed control.

Mechanized sprinkling systems (pivot or linear moving) are more suitable for areas that are large and free of obstacles. Their operation is relatively simple and flexible.. Drip irrigation goes hand in hand with other agronomic modifications, among them injection of fertilizers and herbicides through the system. Thus a continuous and slow supply of nutrients can be delivered. Sandy, shallow, slopy and practically any type of wasteland could be put under cultivation with the drip system provided proven viability of the individual case.

In Central Asia we used drip irrigation in cotton, tomatoes and silage corn while potatoes were irrigated by sprinkling machines. Combined with other agronomic modifications such as decreased amounts of used water, a very significant increase in yields occurred in all the crops. However, we feel that drip irrigation can be economically justified more in the southern parts of Uzbekistan and Turkemenia where the frost-free season is long enough to enable the formation of high yields. Pivot center systems have proven every effective in the northeast of Brazil, especially in light soils where furrow irrigation was practically impossible.

In Southeastern Turkey, where a huge irrigation project is under development, there is a large potential for pressurized irrigation, especially in hilly lands where flood irrigation is extremely inefficient. Here again the pricing system of water (a fixed price per ha regardless of actual consumption) plays a negative role.

Obviously, pressurized systems involve energy costs (more in sprinklers and less in drip). Current energy costs (in one form or another) are quite reasonable. However, in some countries we found artificially high prices of diesel gasoline which inhibited the use of water for cotton in one project (North Senegal).

Plant Protection

Over the last few decades, overuse of chemical control of insects, weeds and diseases resulted in significant development of resistance. Overuse occurs because of over-dependence as well as excessive dosage and frequency. This is true especially in places where chemicals are subsidized.

The human factor plays a major role in the process of digesting new technology. It is more significant in the case of chemicals firstly because insect monitoring and identification needs high knowledge and experience and secondly because less educated farmers are persuaded than in the use of chemicals 'the more the better'. Our experience in India was quite frustrating because it was extremely difficult to cross the blockade that farmers imposed against new attitudes. This is unlike other issues where the problem is lack of finance or institutional regulations. In the case of plant protection, the major efforts should be devoted to educational programs in the following areas:

1. Visual acquaintance with the existing pests.
2. Timely application of chemicals according to thresholds.
3. Wide selection of chemicals in order to avoid repetitive application of the same chemical.
4. Efficient applicators (availability, spare parts, maintenance).
5. Intensive support of extension specialists.

Mechanization

This issue applies to large and semi-large farms, and I would like to restrict myself to the subject of harvesting which, unlike other issues is considered a technological breakthrough. Lack of labor supply and the desire not to be totally dependent on hand labor push farmers to use picking machines.

Many issues are involved. Varieties, row spacing, stand, weed control, proper irrigation, plant regulation, defoliation, storage and transportation of raw cotton and finally, ginning. While many of these subjects could be transformed into educational programs, there are two issues which form a bottleneck:

1. The cost of the picking machine.
2. The modification of a gin for proper cleaning of machine-picked cotton.

For the moment, except for the American machines, no other models have gained popularity. Recently, John Deere developed a tractor-driven 2-row machine which was intended to cut the price. The Central Asian machines, manufactured for many years in Tashkent, are loosing ground locally and have never been successful for wide export.

There are two practical ways for economic implementation in middle-sized farms: cooperative operation of a number of machines or purchase of second-hand machines. We have successfully experienced both of these systems. To Central Asia and Brazil we delivered second-hand John Deere 2-row machines supported by our mechanics and spare parts. In Zimbabwe we support second-hand machines purchased in South Africa with spare parts, training and technical assistance. Our next target is Turkey where we identified a serious delay in the introduction of mechanical harvesting as hand labor costs about US$5-6 per day (break-even point should be US$3-3.5, depending on yield). Case International introduced the four and five-row models, but an individual farmer is reluctant to invest in the cost of such a machine. Proper cleaning of the trash mixed with the machine-harvested cotton deserves special care. Due to the high cost of the equipment, a minimum volume of raw material will be necessary to justify the high investment in ginning cleaners.

Cotton Quality

It is very unfortunate that most of the cotton is sold in a raw form. It has been realized that the major quality parameters can be affected by "do or do not do" of the farmers. The trade and pricing systems of raw cotton is far from motivating the farmer to evaluate the effect of different agronomic parameters on quality results. This is very difficult issue when we refer to small farmers. However, the fact is that this system is currently exercised in large and even very large farming due to the institutional reasons. We studied the subject in Zimbabwe and made recommendations for contract ginning and sale of the lint on behalf of the producers on a regional basis. Of course, modification of the raw cotton trade structure can take place in order to reflect more strongly the aspects of quality, but this will always have a limited effect.

Summary

The five subjects which I selected for illustrations of the problems which can be faced in the infinite way of technology transfer may be debatable. It is not that important. The cornerstone of a real technology transfer is the mutual interest of the parties. Sadly, many programs have failed due to lack of genuine communication and careful listening. I believe that the partner who delivers the technology needs a lot of patience. Let us put less emphasis on the merits of the sold technology and more on the local inherited practices. Many times we tend to underestimate their value. In short, the name of the game is "dosage".**For further information, please call:** Mr. Joseph Dloomy – Director. Merhav Agro Industries, Israel, Tel: 972-9-950 1735, e-mail: tova@merhav.co.il