

1723 The Training Available to Developing Cotton Farmers in South Africa

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Cotton SA, the umbrella organisation of the cotton Industry has through a process of positive engagement with the South African Government developed the National Cotton Development Strategy and Programme. The strategy aims to assist new, developing or resource poor farmers to "get-on-board" the cotton train to enable them to produce 30% of the cotton crop of South Africa by 2014.

This paper covers the six different methods that are employed to transfer basic knowledge of cotton as well as the skills for successful cotton production to all levels of farmers interested in cotton as an alternative or rotation crop in Southern Africa.

Keywords: Agriculture, cotton, farmers, *Gossypium*, production, resource poor, small scale, skills transfer, technology transfer, training methods.

INTRODUCTION

From current available facts it is conceivable that cotton has been produced in India for the last three thousand years. In England the raw materials were imported and the cotton – manufacturing industries were established in 1631. (Scherffius,& Oosthuizen,1924)

By 1791 the colonists in the U.S.A. delivered 4,184 bales weighing 500 pounds each (about 200kg) to the marketers. This increased to two million bales by 1850 due to the increase in the de-linting capacity by the inventions of Hargreaves in 1767, Arkwright in 1769, Crompton in 1775 and Eli Whitney in 1793 (Scherffius,& Oosthuizen,1924).

In 1911 the Americans were producing close to fifteen million bales of cotton, which was between 66 and 75% of the world requirement. This large crop was reduced by the Mexican boll-weevil in the following years to only eleven million bales and this enabled other cotton producing countries to enter the market. By 1924 the world cotton mills required ten thousand million pounds of lint (approx.20 million bales) to meet world consumption.

Cotton in South Africa

In 1516 Odoardo Barbosa found inhabitants of South Africa growing cotton and wearing cotton garments. In 1846 an American Missionary, Dr Adams re-introduced cotton into the country and it was planted at Amanzimtoti, KwaZulu-Natal. Between 1860 and 1870 the colonists in Natal and the Cape produced cotton to supplement the shortage caused by the American Civil War. When diamonds were found and subsequently gold, the farmers became transport riders and cotton farming ceased.

In the period until 1909 several attempts were made to revive cotton production but each attempt failed although some very good individual crops with favourable fibre quality reports were produced and marketed overseas. *In 1909 the responsibility for reviving and*

encouraging the development of the industry was placed under the Tobacco and Cotton Division of the Department of Agriculture, and experiments and production testing plots were established to determine whether the cotton varieties available would thrive under prevailing South African climatic conditions. On the basis of data obtained, the Government established more ginning machines and sighted them at Durban and Rustenburg (Scherffius & Oosthuizen,1924)

In the 1910-11 season only 27 bales were produced. This increased to 5,218 bales of cotton lint in the 1922-23 production season. It was estimated that if South Africa produced 500,000 bales it would bring 12,5 million pounds of income into the pockets of the farmers annually and the benefits for labourers, the state, and the community generally would be incalculable. Scherffius and Oosthuizen(1924) determined that cotton had the potential to become one of the leading agricultural industries of the country as it was one of the few field crops from which farmers had made a profit.

However, in **Figure 1** the fluctuation of the area planted to cotton, the variation of yield(fibre in 200kg bales)and price from1959 to 2006 are indicated. Acreage varied between 15 000 ha and 208 000 ha, yield varied between 25880 and 388340 bales, and the seed cotton price between 13600 and 369000 RSA cents/kg(approx.Us\$530/ton). This fluctuation results from a combination of the fluctuating cotton prices, input costs as well as the inconsistent rainfall in the major cotton production areas of South Africa. The largest crop produced was 384,000 bales in the 1989-90 cropping season far below the 500 000 bales that W.B.Wilson had estimated could be produced in the then designated cotton production areas.(**Table 1**) He also predicted that this target would be difficult to attain as he envisaged a shortage of skills and the certain limitations in the infrastructure (Scherffius & Oosthuizen, 1924)

The negativity towards the production of cotton in Natal(KZN), was proven wrong when in the 1922-23 season 900 acres of cotton were planted in a radius of less than one mile from the 20 acre plot that had been planted as an experimental plot in 1915. Likewise in the Ngotshe area 3,000 acres had been established.

The infrastructure of roads and railways has been drastically improved under the different Governments from 1924 to 1994. Farmers were resettled and given incentives to move to more remote areas, and regulations pertaining to farm labourers were regularly reviewed and adapted to International Labor standards (ILO). South Africa is currently a world leader in the field of legislation pertaining to farm labor.

However, the Cotton Industry has through a process of positive engagement with the Government developed the Cotton Development Strategy and Programme. The strategy aims to assist new, developing or resource poor farmers to "get-on-board" the cotton train to enable them to produce 30% of the cotton crop of South Africa by 2014.

Small scale farmers in the Makhathini area of South Africa are farmers that ply their craft on fields between 0,5 ha and 15 ha. In a survey conducted in 2002, 80% of the small scale cotton farmers were farming an area of between 0,5 and 1.5 ha. (Gumede, 2006)

Cotton production areas of South Africa.

Due to the fact that the cotton plant, the bolls and the fibre require a long development season to attain a good yield with acceptable fibre quality, cotton can only be planted as a crop with an economic potential in certain areas of the country. From research conducted,

eight prime cotton production areas have been identified (**Figure 2**). These stretch from KwaZulu-Natal in the east through Swaziland, the Mpumalanga, the Limpopo, the NorthWest and the Northern Cape Provinces. Since 2001 attempts have been made to find possible production districts in the Eastern Cape, some have been found with limited and some with great potential.

This paper aims at elucidating the training aspects and the methods used, that are part-and-parcel of this strategy.

SKILLS TRANSFER PROCESSES and RESULTS

A. TRAINING of "basic cotton literacy" to new farmers that have no cotton production experience.

Persons who own land or have acquired farmland via the processes of land redistribution or land restitution frequently have no or limited experience of crop production. Some have some experience of growing maize as a staple food crop in the rural and dryland farming set-up/system. They fall in a group called "bus-stop-farmers"

For on-farm familiarization with cotton a "training classroom" was designed which consists of five sub-plots. Each of these five plots is usually between 3 to 6 rows wide and the rows 9 meters long. This row length is used to accustom participants to usage of mechanical tools and irrigation systems later on or once they "go bigger".

The "training classroom" system allows the interested persons to observe/experience the negative effect that different levels of neglect have on the yield of cotton. Putting it more positively, the participants are shown what contribution is made by different aspects of the management system for a crop, in this case cotton. The three management activities demonstrated are weed control, nutrition and insect control. The five plots in the training classroom consist of the following combinations of activities

Plot 1 : Do weeding, apply fertilizer, spray appropriate insecticides = BEST PRACTICES

Plot 2 : Do weeding, No fertilizer, No pest control. = Limited resource farming

Plot 3 : No weeding, apply fertilizer, No pest control. = Limited resource farming

Plot 4 : No weeding, No fertilizer, apply pest control = Limited resource farming

Plot 5 : No weeding, No fertilizer, No pest control. = LAZY FARMING

Training commences with the taking of a representative soil sample of top (0 – 30 cm depth) and deeper soil (30-60 cm). After analysis by the **ARC-IIC** soil lab a fertilizer recommendation is made and implemented and soil preparation completed. Planting is done by hand under supervision and with the aid of measuring tools and a planting rope and hand tools. This then makes use of all their senses in the experiential learning format.

Once planting has been done and the cotton germinated the "classroom" sites are visited on a monthly basis to discuss the development of the cotton on a step-by-step basis and to

familiarize the potential farmer with the production requirements of the crop. Participants vary from a single person to a family group, a farmers association or the students from a training college.

The procedures of thinning, weed control, nutrient supply (fertilizer), square and flower development and its importance and relation to yield and fibre quality are already stressed at the time of square initiation. In the isolated case where irrigation water is available the importance of a constant water supply is stressed as well as the availability of nutrients in such luxuriously growing cotton. In cases where cotton growth is extremely vigorous the use of growth regulators is also demonstrated. The importance of regular inspection for the presence of insects through a correct scouting procedure is also indicated and the training for correct insect identification is given. The importance of maintaining insect levels below the threshold levels for each pest is also stressed.

On a "classroom" plot growth control with growth regulators like mepiquate chloride (Pix), is never done as the extraordinary growth that can result from adverse weather conditions must also be in-grained in their reference register.

A few first flowers as well as the late flowers are marked so as to indicate which bolls mature first and that late flowers/bolls do not contribute to the total yield and have inferior fibre qualities.

After these participants have actually seen a cotton crop from start to finish they are aware of the peculiarities of the cotton crop and are able to comprehend the content of the PAETA/SETA course which leads to obtaining a certificate in cotton production and farming management.

Trainees now have the basic vocabulary of " *cottonish* " the language of the cotton plant.

This training results in a clear understanding of production management as well as the detrimental affects of negligent management and the affect on yield and quality.

Results on the classroom plots vary according to the treatment applied to a certain sub-plot and the prevalent weather/rainfall pattern of a particular season. In Tables 2 and 3 it is evident that cotton reacts very similar at different locations and under differing farming systems.

The participating aspiring farmers have in most cases commented as early as two months after planting that the plots where no weeding was done were doomed and they wanted to "salvage the cotton" by late hoeing. As part of the training plot system this was not allowed but the vulnerability of any crop to weed competition was clearly illustrated and seriously considered.

The use of herbicides was always put forward as a solution, but the pitfalls of the susceptibility of conventional/traditional cotton to herbicide damage is stressed. The arrival of GM cotton in the MAR format with stack-gene traits will change the ease of management of cotton for resource limited farmers. The enthusiasm for GM cotton is very great and planting GM cultivars is seen as the only possibility to overcome/sidestep the high cost of labour during the growing season of cotton.

B. Empowerment plots and continued training

Empowerment plots are planted simultaneously with classroom plots or the year following group classroom plots. The idea of empowerment plots came about as a result of the frustration of new literate cotton farmers who could not obtain input financing as they hardly had anything that financial institutions required as collateral. Furthermore, government sponsored funding was scarce and required a vast questionnaire to be completed and when money became available the planting window for cotton had passed.

We then successfully approached the cotton industry to increase their contribution to the programme and participants were required to use their own inputs, labour, to plant an additional plot of "commercial" cotton after he/she/they had attended the planting of the classroom plot. If, by the next follow-up visit, the cotton had been planted or had already germinated the participant was supplied with the basic nutrients as indicated by the results of the soil analysis. At the following visit the first top-dressing fertilizer was supplied if thinning and weed control had been accomplished according to the classroom standard. By 9 weeks the last installment of fertilizer is supplied and applied to the field.

When scouting data pointed to the need for application of pesticides a knapsack-sprayer and the relevant pesticide was supplied. Harvesting of this empowerment plot is done by the person/family/group or self financed labour and the yield sold to the ginnery in the participant's name. He/she/they thus achieved a creditworthy level that allowed them to buy inputs for the following season. The balance of the money could be used for household needs as well as some other input support for the following season. This system has enabled some farmers to accomplish some self-sufficient cotton planting. It is seen to be the most effective way to encourage and empower new farmers to include cotton as a rotation and alternative crop in their farming enterprises.

C. TRAINING of cotton production and farming skills to cotton literate farmers.

Farmers from all the cotton production areas are eligible for participation in the comprehensive cotton training program. Training is conducted for groups in different production areas. Participants from different production districts are nominated by their farmers associations and/or the extension officer from that area. Training is conducted at training centres fairly close to the participating farmer's permanent residence on a fulltime attendance format. The original syllabus comprised five modules which has been restructured into 4 modules, each of which is presented over a five-day period. Modules are spaced across the production season, with at least three week intervals between each module. This allows farmers to see to the affective management of their crops and personal affairs.

MODULE 1 : The cotton plant as model for management and financial management training.

MODULE 2 : Land preparation : Soil sampling, preparation, fertilization and planting

MODULE 3 : Pest and disease control in cotton production.

MODULE 4 : Harvesting, quality determination and marketing of cotton.

After completion of Module 4 a graduation ceremony follows at which occasion all the participants receive their certificate and marks. The qualification fulfills some credits

required to allow further study in certain tertiary institutions. Farmers who have passed through this training programme are also better equipped to manage and record the required data to enhance the performance of their farming enterprises.

D. Training of extension officers and cotton production advisors.

The farmers' extension service in South Africa is primarily the responsibility of the Provincial Departments of Agriculture. Training of these extension officers has been conducted by **ARC-IIC** and Cotton SA staff at the local offices of the extension staff or at the **ARC-IIC** main campus in Rustenburg or at the Outstations to ease pressure on their limited budgets for transport & accommodation costs.

The idea is not to provide as comprehensive a course as that which is presented to the literate farmers, because the extension officers have a tertiary qualification in agriculture but to highlight the important differences in cotton production management that determine the final success of a cotton venture. Nevertheless, all the aspects of the four modules are included so that they are able to assist the farmers when required. This training is usually conducted over a period of five days. Self-study to enable constructive discussions is crucial to enable the programme to be conducted in a week. An attendance certificate is handed out at the end of this familiarization period

E. Development and assistance to farmers after their training and for farmers with large scale cotton plantings.

Producers committed to cotton farming are assisted to gain input financing agreements with Co-operatives/ginneries. These entities have support staff that help to assure that the members are able to repay their loan.

The cotton production management guide was revised in 2005-06 and is available at R 65, (approx. US \$ 10).

Farmers have easy and open access to the research staff, facilities as well as specialized support services such as soil, water and plant analyses, associated fertilization advice, plant disease tests and pathological screening as well as nematode and insect identification and related pesticide recommendations. These services are available at a reasonable tariff.

Courses are presented in standard format but can be adapted to suit client's requirements.

F. Mentorship programme.

For the 2006-2007 season Cotton SA has signed a Master Mentorship Service Level Agreement with the National Department of Agriculture. The latter will provide the funding for the implementation of this programme. Three master mentors and a programme manager have been appointed to implement the business plan in the cotton growing provinces. This mentorship programme will supplement the training programmes detailed above and sharpen the knowledge and skills of the small cotton growers.

It is the aim that in the long-term this programme will present small-scale farmers with an opportunity to farm commercially, moving away from subsistence farming. It is the target that a skilled extension workforce with access to information and technology must support them.

DISCUSSION

TRAINING of cotton literacy to new farmers.

Persons who have such a limited agricultural experience and background to the intrinsic physiological processes within a plant require an intensive level of attention and guidance. The amazement of the intricate system of the cotton plant is always apparent and leads to great satisfaction to the trainer when the participants understand it. After this initial encounter with cotton they have a better understanding of plant physiology and associated subjects. It was evident very early on, in 2002 that the training on its own was a very negative experience when the aspiring producers were unable to source inputs / input financing for the following production year. This gave rise to the introduction of the empowerment plots.

The TRAINING of production and farming management skills to cotton literate farmers.

This level of training is dearly required as it covers not only cotton production but also farm management activities. Participants are usually already leaders in their communities and as such have an avenue open to them to introduce their training skills to fellow members of their society/community.

Development and assistance to farmers with large scale cotton plantings.

Farmers in this category usually have very active study groups and are able and approach the ARC-IIC when they have a need. They frequently request us to address these groups or arrange visits to the research activities. The Master Mentorship Programme will help to overcome the current shortage of skilled extension workforce.

CONCLUSIONS

It is sad that 80 years after Wilson identified certain aspects that would curtail the development of the cotton farming enterprises they still have not been completely resolved. However, the methods described make a decisive difference to the understanding of cotton production by aspiring farmers and current cotton farmers.

A system is in operation that farmers can consult to assist them in decision making and attaining maximum success in their enterprises.

It is a system devised, supported and focused on all the cotton farmers to ensure that the cotton pipeline in South and Southern Africa remains viable.

The quarterly journal published free of charge by Cotton SA is distributed to all farmers registered as active producers with the ginneries. The Journal covers current global trends, predictions about future trends, includes interesting and background information and discussion articles as well as the results of funded research and a section on the activities for and by small scale farming communities. Individual registration on the mailing list is also encouraged for new farmers and persons interested in the cotton industry. REFERENCES

Bembridge, T.J., 1991, Practical Guidelines for Agricultural Extension Workers – A field manual.

Cotton SA Katoen Journal, March 1997 - Dec 2006

Dippenaar, M.C., 1988, PhD Thesis, UOVS. Praktyke om 'n kort groeiseisoen vir katoen optimal te benut. (Practices to make optimal use of a short growing season for cotton)

Gumede P., 2006. Survey of the production area available to members of the Ubombo Farmers Association (small scale cotton farmers) (Chairman UFA) Personal communication

Scherffius, W.H., Oosthuizen, JduP, 1924, Cotton in South Africa; South African Agricultural series No 3. Published by CNA, Ltd., South Africa.

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The dedicated help of technicians, extension officers and contracted specialist trainers has been a continuous strength of these programmes.

The financial support for acquiring inputs by Cotton SA, The Cotton Trust and the SRL programme of the ARC that has supplied us with the bottom-line funding from the Parliamentary Grant. has enable us to undertake this task.

However, the driving force that has invigorated the staff involved has been the sincere interest shown by prospective farmers in cotton in sometimes very trying circumstances and climatically extreme years.

TABLES

TABLE 1 : Data from the survey on the potential acreage available for cotton production in the Union of South Africa and Swaziland, as well as the number of inhabitants in the respective areas, by Mr. W.B. Wilson, Tobacco and Cotton Division, Department of Agriculture.(Scherffius & Oosthuizen, 1924)

AREA	Acres	Whites	Blacks
Kaapmuiden-Komatipoort &Barberton	400,000	3246	33,367
Zoutpansberg district	500,000	2000	133,000
Waterberg area	500,000	7152	68,376
Rustenburg district	1,000,000	15,564	46,589
Marico district	50,000	7520	18,000
Swaziland	400,000	Unknown	Unknown
Zululand	350,000	"a few"	220,000
Ngotshe district	200,000	500	23,962

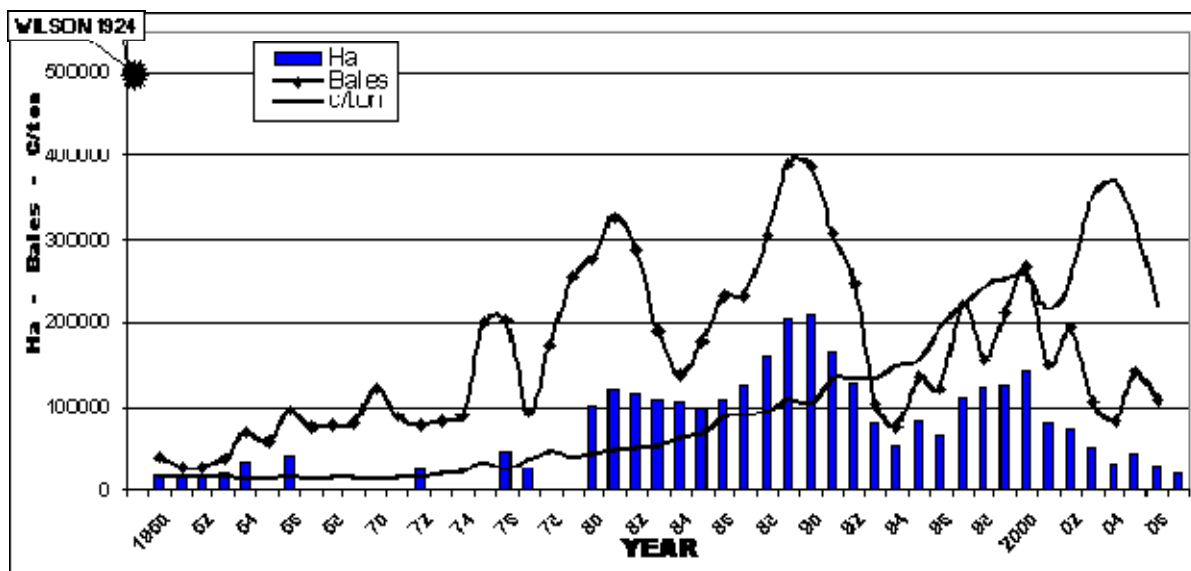







TABLE 2 : Cotton production data from classroom plots grown at Kroondal under two systems of moisture management (rainfed or Irrigation) and two planting dates. The five treatment combinations in the demonstration plots are depicted. The yield obtained at the different planting dates is indicated.

Kroondal dryland demo block layout & results

2004-2005

E I A P I					
	Nov 118 Kg/ha Dec 47 "	Nov 214 Kg/ha Dec 18 "	Nov 265 Kg/ha Dec 37 "	Nov 1495 Kg/ha Dec 157 "	Nov 2162 Kg/ha Dec 223 "









Kroondal Irrigated demo block layout & results

E I A P I					
	Nov 19 Kg/ha Dec 25 "	Nov 51 Kg/ha Dec 27 "	Nov 89 Kg/ha Dec 29 "	Nov 2079 Kg/ha Dec 236 "	Nov 3765 Kg/ha Dec 542 "








TABLE 3: Cotton production data from classroom plots grown at Loskop, Groblersdal, under two systems of moisture management (rainfed or Irrigation) and three planting dates.

Loskop dryland demo block layout & results

2004-2005

								
P L A N T	Nov 44 Kg/ha	Nov 44 Kg/ha	Nov 190 Kg/ha	Nov 594 Kg/ha	Nov 613 Kg/ha			
	Dec 24 "	Dec 24 "	Dec 215 "	Dec 257 "	Dec 443 "			
	Jan 0 "	Jan 0 "	Jan 0 "	Jan 0 "	Jan 0 "			

Loskop Irrigated demo block layout & results

							
P L A N T	Nov 118 Kg/ha	Nov 97 Kg/ha	Nov 182 Kg/ha	Nov 3061 Kg/ha	Nov 5695 Kg/ha		
	Dec 69 "	Dec 29 "	Dec 52 "	Dec 1059 "	Dec 1402 "		
	Jan 0 "	Jan 0 "	Jan 0 "	Jan 0 "	Jan 0 "		

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FIGURE 1: A graphic representation of the fluctuation in farm area planted, fibre yield, and the seed cotton prices between 1959 and 2006. The T.B.Wilson 1924 predicted potential is indicated..

FIGURE 2: Map of South Africa showing the eight primary cotton production areas.

FIGURE 3 : The plot pin designed to enable participants (literate as well as illiterate) to understand the applied treatment and have a reference pointer during the season for executing the treatment combinations.

FIGURE 4 : A midseason view of the five treatments of a "classroom plot."

Figures

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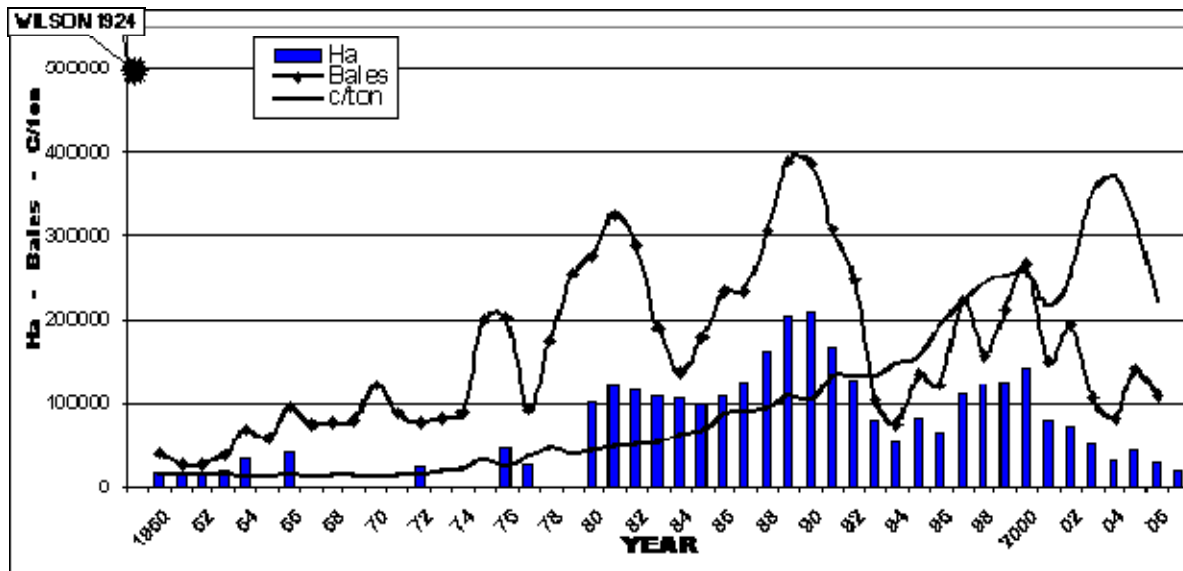


FIGURE 2: .The eight cotton production areas of the Republic of South Africa.

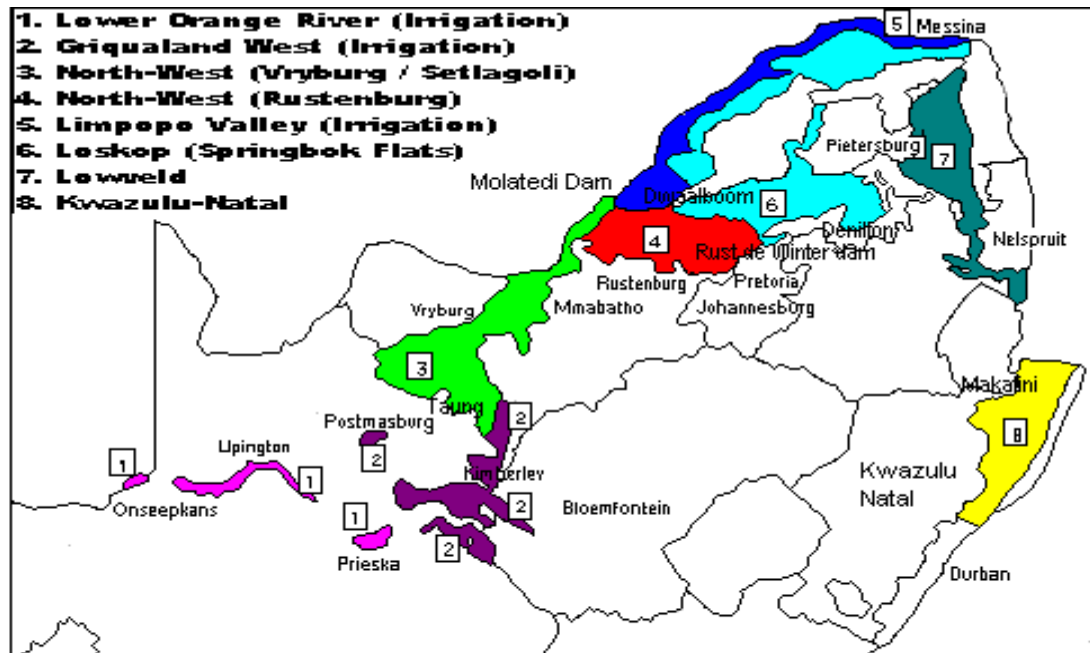


FIG. 1. Cotton Areas in the RSA (areas 1 to 8)

FIGURE 3 : The Plot pin that was designed for use with the demonstration plots, depicting the three main activities required for cotton management, hoeing(weed control), application of fertilizer, spraying(pest control with appropriate protective clothing and pesticide)

Fertilizer

Spray.

(Pest control)

Hoeing.

Weed control

When a treatment is not to be applied on the field a cross(X) is painted across the picture.



FIGURE 4 : A midseason view of the five treatments of a "classroom plot."



Weeds controlled

No fertilizer No spraying



No weed control

Fertilized No spraying



No weed control

No fertilizer Sprayed



No weed control

No fertilizer No spraying



Weeds controlled

Fertilized Sprayed