

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

THE SEED INDUSTRY IN ZIMBABWE

J.R. TATTERSFIELD & E.K. HAVAZVIDI

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**DEPARTMENT OF AGRICULTURAL ECONOMICS & EXTENSION
FACULTY OF AGRICULTURE, UNIVERSITY OF ZIMBABWE
P O BOX MP 167, MOUNT PLEASANT, HARARE
ZIMBABWE**

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Department of Agricultural Economics and Extension
Faculty of Agriculture
University of Zimbabwe
P.O. Box MP 167
Mount Pleasant
HARARE
Zimbabwe

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J.R.Tattersfield and E.K.Havazvidi are with the Seed Co-op, Zimbabwe.

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THE SEED INDUSTRY IN ZIMBABWE

J.R.Tattersfield & E.K.Havazvidi

INTRODUCTION

During the first 40 years of this century there was no organised seed industry in Zimbabwe. Varieties grown at the time were either lands varieties in the case of indigenous species or introductions from other countries. The introductions were largely made by the Department of Agriculture through what is today the Harare Research Station. Farmers obtained small samples of seed from the research station, bulked and maintained the seed on their own farms. Thus, in all farming sectors and with all the crops, most of the seed was home grown and was not subjected to any kind of inspection other than by the farmers themselves. There were no hybrids at that time, only self pollinated varieties of crops such as soyabeans, groundnuts and beans and open pollinated varieties of maize.

The first move which was made to organise seed production was in 1940 when the "Southern Rhodesia (now Zimbabwe) Seed Maize Association" was founded by a small group of farmers (Weinmann, 1975). Its objectives were to produce certified maize seed (open-pollinated at that time) under the supervision of the Department of Agriculture and provide members with advice on the best methods of seed production. The formation of the association was a big step forward in the history of maize production. When hybrid maize was

first developed in Zimbabwe and seed production was required, the association took up the task in close liaison with the government (Rattray, 1988). The first commercial double hybrid seed was marketed in 1949. Less than 100 tonnes were grown then, compared with almost 35 000 tonnes today, a 350 fold increase in only 40 years.

Following the success of the maize seed association, other associations and seed schemes were established. A unique feature of these developments has been, the exclusive rights to government-bred varieties granted to the associations. The strong position of the associations has retarded the development of private seed companies in Zimbabwe.

The government not only supplied varieties but also passed legislation for the control and organisation of the seed industry, established official seed certification and legislated for plant breeders rights. It entered into written agreements with some of the associations to formalise and strengthen relationships. These developments led to the establishment of a sound locally controlled seed production industry capable of meeting the country's requirements and eventually to export seed as well.

Since 1940 the seed industry has been supported by research and plant breeding carried out by government and statutory boards. In more recent times the industry itself has contributed to the research effort and has complimented the excellent national programmes. For most of the field crops grown in Zimbabwe, there are locally bred, well adapted varieties to particular ecological

and farming conditions. Seed producers can obtain sound advice based on research to enable them to grow their seed crops efficiently.

Various seed distribution systems are used for different commodities. These aim to ensure that seed of the right varieties are available when they are required. This is certainly true of the large scale farming sector. The small scale sector is not so completely serviced but considerable strides have been made to enable these farmers to obtain the seed they require. Price control and realistic pricing policies have meant that good quality seed produced in Zimbabwe can be purchased at prices lower than most countries in the world.

THE ORGANISATION AND LEGISLATIVE CONTROL OF SEED PRODUCTION

Seed Producers Associations

In Zimbabwe there are, three groups of organisations which produce and market seed:

- Seed producers associations
- Seed schemes operated by commodity boards or commodity producers associations
- Private autonomous seed companies.

Seed producers associations

The Zimbabwe Seed Maize Association was established in 1940 to produce good quality seed of improved maize varieties and, subsequently, hybrids. The establishment of other associations for other commodities was encouraged by government and the Farmers

Union because improved varieties could be quickly made available to the farmers and seed certification schemes could be organised.

It was agreed that improved varieties bred by government would be made available to the associations. In some cases, the associations would be the sole recipients of these. Some associations have legal agreements covering their position, some operate under specific marketing acts and others have merely an understanding with government.

The Zimbabwe Seed Maize Association.

This association is the largest in the country. It was founded in 1940 and has 164 members at present who produce mainly hybrid maize seed. The association operates under the tripartite agreement between the association, government and the Farmers Unions as discussed later.

This association amalgamated its business activities with the Zimbabwe Crops Seeds Association in 1982 and established the Seed Co-op Company of Zimbabwe Ltd., whose shareholders are the members of the two associations. The Co-op provides management, financial administration, controls production and seed stocks, certifies maize and manages a seed laboratory and a research station. It carries out seed processing and marketing with exports being handled by a separate company, Certseeds International (Pvt) Ltd.

The Zimbabwe Crops Seeds Association

This association was established in 1957 to produce seed of a number of important field crops, including wheat, barley, sorghums,

soyabeans and groundnuts under a bipartite agreement with government. It also produces seed of a few other crops such as sunflowers, field beans and sunhemp. There are 80 members of the Seed Co-op.

The Zimbabwe Tobacco Seed Association

Established in 1957, the association produces seed of tobacco varieties released by the Tobacco Research Board under the Tobacco Marketing and Levies Act No.32 of 1977. The association produces about 70 percent of the virginia flue cured seed and all burley seed used in Zimbabwe.

The Tobacco Research Board produces the remainder of the flue cured seed of mainly limited release varieties and hybrids plus oriental tobacco seed. There are about 25 association members; the seed is marketed by a wholly owned company, Farm Sales.

The Potato Seed Producers Association

The present association dates back to 1957. The association receives virus tested breeders seed from the government breeder and carries out its initial bulking in a cool high altitude area specified in the Plant Pests & Diseases Act (Seed Potato Regulations) 1982. The incidence of virus diseases is low and the soil is free of bacterial wilt. Further bulking is then permitted in low altitude areas for a maximum of two generations. About 30 members operate the association as a cooperative.

The Zimbabwe Pasture Seed Growers Association

This association is the largest which produces pasture seeds and was established in 1964. The 80 members of the association produce Katambora Rhodes Grass Seed plus a few other pasture species such as Sirattro, Silver Leaf Desmodium and Fine Stemmed Stilo. The Farmers Co-op Ltd are agents for the Association and provide a management and marketing service.

COMMODITY BOARD AND PRODUCER ASSOCIATION SCHEMES

The Cotton Marketing Board's Cotton Seed Scheme.

This scheme was initiated by the Board around 1970 for the production of seed of varieties released by government under the Cotton Marketing and Control Act of 1969. Good cotton growers are selected to produce seed and are offered incentive prices above the normal seed cotton prices. The Board sells the cotton seed through all their depots and also through licensed selling agents in communal areas.

The Coffee Producers Association's Coffee Seed Scheme.

This is a small scheme established in 1980 with six producers of seed of varieties required by the industry. In view of problems with Fusarium and coffee berry disease, tissue culture is being examined as an alternative method of propagation.

The seed scheme produces most of the seed required in the country plus a substantial amount for export. Present production levels per annum are approximately : hybrid maize seed 35 000 t, crops seeds (including open pollinated maize) 20 000 t, tobacco

seed 320 kg, potato seed 2 000 t, pasture seed 150 t, cotton seed 8 500 t and coffee seed 10 t.

PRIVATE SEED COMPANIES

A number of private companies market seed of field crops such as maize, soyabeans, sorghums, wheat and sunflowers. Some of the varieties have been selected in Zimbabwe, other obtained from elsewhere and are grown under license. Private companies probably have about 5 percent to 10 percent of the Zimbabwe market share for these seeds. Some companies are particularly active in vegetable and flower seed. Mostly they contract production for export with a small proportion being marketed in Zimbabwe. In general, seed produced by private companies is not certified but it may be inspected for phytosanitary reasons when it is grown for export. In addition to the above companies which are wholly or partially Zimbabwean owned, international seed companies are establishing branches in Zimbabwe. Pioneer International, a U.S.A. company, recently established a research unit near Harare.

HOME GROWN SEED

A large quantity of seed used in Zimbabwe is not purchased but retained from the previous season's field crops. The amounts retained vary considerably with the crop in question and with the farming sector. Retention of seed from maize hybrid crops has almost ceased because research has illustrated the poor performance of second generation seed compared with true hybrid. Rattray, (1970), reported a yield reduction of 46 percent with second

generation seed of single hybrid SR52 and 19 percent with second generation double hybrid SR12 seed.

The retention of tobacco and cotton seed is also negligible because farmers do not have the equipment to clean and process the seed and there is very strict variety control throughout the country. In the case of self pollinating species, seed retention is more common. In 1990 commodity association estimates that 45 percent and 30 percent of the soyabeans and wheat hectarage, respectively were planted to farm retained seed. Over 90 percent of the hectarage of a number of crops grown in communal areas such as groundnuts, beans, cowpeas, sorghums and munga is planted to farm retained seed; the practice is widespread with cross pollinated crops such as sunflowers.

With self pollinated crops, it is arguable that farmer retention of seed is an acceptable practice and that it reduces production costs. In practice farm retained seed is usually inferior to certified seed for a number of reasons:

- ° Varietal purity is reduced by ad-mixture and cross pollination.
- ° New varieties will not be available to the farmer.
- ° Physical quality will be reduced and the seed will not usually be graded and tested.
- ° Seed will often be attacked by storage pests.
- ° Due to the last two points above, plus other factors, germination can be reduced, resulting in bad stands.

° Seed borne diseases will be more prevalent in farm retained seed.

It was for the above reasons that Zimbabwe developed certified seed production. With the non-hybrid crops, farmers will continue to use farm retained seed, in spite of the disadvantages.

THE TRIPARTITE AND BIPARTITE AGREEMENTS.

All the seed associations, since their inception, have established formal agreements with government with regard to the use of varieties bred by government and research boards. The Tripartite Agreement for maize was drawn up in 1970 between the Ministry of Agriculture, the Seed Maize Association and Farmers Union. The Bipartite Agreement for certain crop seeds (sorghum, wheat, barley, soyabeans and groundnuts) was drawn up in 1981 between the Ministry of Agriculture and the Crops Seeds Association. Representatives of the users i.e. the Farmers Unions, have to be consulted on production levels and prices. These two unique agreements are similar in most aspects. Important features are:

- ° The associations have exclusive access to government-bred inbred lines and varieties of the designated crops for the production of seed.
- ° The fruits and results of any plant breeding carried out by the associations must be available to government.
- ° The annual seed production programme must be agreed to with government and the Farmers Unions.

- ° A strategic reserve of seed of at least 20 percent of hybrids must be held by the associations and surplus production of 30 percent of non hybrids must be planned for.
- ° Seed must be adequately distributed to all parts of the country.
- ° Seed must be grown under inspection and be certified as far as possible.
- ° Government will retain ownership of their varieties under the Plant Breeders Rights Act of 1973 and the Associations will be the sole licensees.
- ° The associations may export seed provided it is surplus to local requirements plus the strategic reserve.
- ° Seed prices will be controlled by government after consultations with the associations and the Farmers Unions.
- ° Donations by the associations towards government research will be used exclusively for the crops specified in the agreements.

These agreements have so far not been amended. They are considered to have functioned well for maize and other commercially grown crops but have been less satisfactory for other seeds grown mainly for communal areas such as sorghums, sunflowers and groundnuts. Opinions vary on leaving the agreements unchanged to totally liberalising the seed industry and abolishing them. Although they are monopolistic they have ensured a sound production base and supplies of seed of adapted varieties at reasonable prices plus a strategic seed reserve. However, it is likely that a more

effective distribution of seed to communal areas will be required in future.

SEED LEGISLATION AND IMPLEMENTATION

The Seed Act 1965

This act was promulgated to promote the production of high quality seed and to regulate the sale of seed. Regulations under the Act are outlined below. These were gazetted in the Seeds Regulations 1971 and Seeds (Certification Scheme) Notice 1971. The Seed Regulations specified certain conditions such as record keeping, importing and exporting seed by seed sellers. They then laid down procedures and standards to be used by seed laboratories and thus, defined minimum standards for seed sold in Zimbabwe. The Seeds (Certification Scheme) Notice laid down the rules for seed certification stipulating the procedures, the standards and by whom certification can be carried out. The scheme defined three categories of seed as Breeders, Foundation and Certified. Seed not falling into these categories may be Standard seed.

The Plant Breeders Rights Act 1973

This Act enables persons or organisations to protect the ownership of varieties bred either within or outside Zimbabwe. When rights have been granted their normal duration is 20 years. This Act as in other countries, protects the owner of a variety from its unauthorised use and enables him to collect royalties from licensees.

Other regulations

The Department of Research and Specialist Services has a Crop Variety Release Committee comprising members of the department plus other invited representatives from organisations such as the Marketing Boards, AGRITEX and the Seed Co-op. All government bred varieties are submitted to this committee for official release. Due to its close relationship with DRSS department, Seed Co-op varieties can also be released through this committee. However, varieties introduced or developed by other parties are not considered by this committee. In Zimbabwe at present, there is no scheme for variety registration and national testing of crop varieties such as the system which operates in the EEC.

Implementation of seed legislation

The Zimbabwe Seed Services Unit, a Branch of the Department of Research and Specialist Services, is the enforcement agency of the seed legislation mentioned above. It comprises a seed testing laboratory and a seed inspectorate plus technical and administrative facilities. The Branch is headed by a senior scientist, the laboratory has 16 senior and junior staff and there are eight staff in the inspectorate at present. The Registrar of Plant Breeders Rights is also housed in Seed Services.

The inspectorate examine seed crops in the certification scheme and the laboratory tests the seed after harvest. Seed will be certified if it meets the standards in the legislation. Certain organisations such as the Cotton Marketing Board and the Seed Co-op have been designated as certifying agencies. Their own inspectors

may inspect and certify seed of specified crops under the overall control and supervision of Seed Services.

The Zimbabwe seed traders association

Most organisations which trade in seed in Zimbabwe are members of this association. It has no statutory authority but it seeks to improve seed production and marketing and provides a forum for exchanging ideas.

PLANT BREEDING AND SEED TECHNOLOGY RESEARCH

Plant Breeding

In Zimbabwe plant breeding has played a major role for the seed industry. Most of the varietal improvement work has been done by the government. However, certain statutory bodies and other organisations have also made significant contributions as outlined below.

Plant breeding conducted by Government

Government agricultural research commenced in 1897 with the establishment of the Southern Rhodesia Department of Agriculture. Research with crop varieties started in 1890 at the Botanical Experiment Station, now called Harare Research Station. Agricultural Research was re-organised in 1948 with the establishment of the Department of Research & Specialist Services (DRSS) (Weinmann, 1972). Plant breeding was consolidated in 1975 into the Crop Breeding Institute (CBI) based at Harare Research Station. The CBI can utilise about 18 research stations and educational centres for multi-location testing in different agro-

ecological regions. It can also use facilities in the hot southern lowveld to grow winter breeding nurseries of summer crops and in the cool eastern districts for summer nurseries of winter crops, thus speeding up breeding work. Government also make extensive use for variety testing of Rattray Arnold Research Station which is owned by the Seed Co-op and the Agricultural Research Trust Farm (ART) which was established by the commodity associations of the Commercial Farmers Union. On-farm testing of varieties in communal areas was initiated shortly after Independence but it has been curtailed due to financial constraints.

Most government plant breeding has been carried out on the major food crops and cotton. Maize breeding commenced in 1933 and concentrated on hybrids. The first double hybrid was released in 1949 and the first single hybrid for commercial production, SR52, in 1960 making Zimbabwe the first country in the world to use a single hybrid commercially. Since then a number of single and three-way hybrids of different maturities have been released of both white and yellow dent grain which are well adapted to local conditions, agronomically strong and resistant to the main diseases in Zimbabwe.

A small sorghum breeding programme commenced in 1960. The first releases were brown grained types used for brewing opaque beer. More recently however, greater emphasis has been placed on white grained sorghum for human food. The programme has received germplasm and assistance from ICRISAT. The releases so far have been open pollinated varieties but hybrids are also being bred. In

addition to sorghum, work has commenced with pearl millet for marginal areas.

Attempts to breed wheat for production in hot summer months have so far failed, but a very successful programme to breed spring wheat varieties for production in winter under irrigation has been carried out since the mid 1950s with the first varieties released about 1960. (Agricultural Experiment Station, 1959/60). The varieties are high yielding, short strawed, lodging resistant and disease resistant and have good milling and baking quality. In recent years much of the germplasm has come from the International Maize and Wheat Improvement Centre (CIMMYT), Mexico. A small barley breeding programme for winter production has also been carried out to develop varieties for the local malting and brewing industry. Some of the varieties used have been imported, others have been bred locally.

Government carry out plant breeding with three oilseed crops; soyabeans, groundnuts and sunflowers. Soyabean breeding commenced in 1963 to develop varieties adapted to local conditions of day length and temperature with high yields, resistance to lodging and pod shattering, high pod clearance and resistance to diseases. A number of varieties have since been released which suit the local environment. Groundnut breeding started about the same time and has developed varieties belonging to two distinct groups, early maturing for dryland production and late maturing for production with supplementary irrigation. The former are the most widely grown, the latter are a specialised crop being grown on a limited

scale to produce high quality kernels for confectionery use. Sunflower breeding is more recent, aiming to produce high oil content varieties to be grown as cash crops in marginal rainfall areas. Both open pollinated and hybrid varieties are being bred and some have been released.

Cotton breeding was initiated in 1925 and the programme is based at the Cotton Research Institute, Kadoma. Lint quality is very important and there is a well equipped fibre laboratory to back the breeding work. Different varieties for the mid altitude (1200 m.a.s.l.) and low altitude (450 m.a.s.l.) are bred plus special long staple types in addition to the main group of medium staple varieties.

Government conduct a small potato breeding programme, mainly in the cool eastern highlands where they also maintain virus free stocks of varieties and release virus tested breeders seed for seed multiplication. Other small programmes have recently been initiated with field beans and cow peas.

The role of seed co-op in plant breeding

An important policy of the Seed Co-op has been to encourage and support government plant breeding work as the Co-op benefits, through its agreements with government, from the release of new varieties. In 1973 the Co-op established the Rattray Arnold Research Station and government have used this as a major variety testing centre since that time. The Station is 30 km north east of Harare at a lower altitude and higher rainfall than CBI and with more disease pressure, being in an intensive farming area.

Rattray Arnold Research Station is privately funded by the Seed Co-op and has embarked on plant breeding and seed agronomy programmes of its own which compliment the governments work. Breeding programmes with maize, soyabeans and wheat have been established. Maize breeding, in addition to the general requirements for maize in Zimbabwe, has placed considerable emphasis on shorter maturing stress-tolerant types for the communal areas as a large amount of seed is purchased by those farmers. Also maize with resistance to virus streak disease is being developed as this is now a serious problem in areas where winter irrigated crops are grown.

Disease resistance is also being emphasised in the soyabean and wheat breeding programmes. Red leaf blotch (Pyrenochaeta glycinis) is a serious disease of soyabeans in parts of Africa and is endemic at Rattray Arnold, where selection for tolerance to the disease is carried out.

Leaf rust (Puccinia recondita) is often severe at the station making field selection possible during both summer and winter. As in the government programme, CIMMYT wheat germplasm is widely used.

Tobacco breeding by the Tobacco Research Board

Tobacco is the most valuable agricultural export commodity grown in Zimbabwe. The research requirements are provided by the Tobacco Research Board (TRB), a parastatal organisation which receives most of its funds from the industry. The TRB carries out plant breeding on the three types of tobacco grown in Zimbabwe, namely flue cured, burley and oriental. Particular emphasis has

always been placed on leaf quality to satisfy market requirements and on resistance to diseases. Recently the TRB has developed tobacco hybrids, now on limited release, and embarked on the use of biotechnological methods in its breeding work.

Regional programmes conducted by ICRISAT and CIMMYT in Zimbabwe

The International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) has established regional breeding and research programmes on sorghum, pearl millet and finger millet in co-operation with the Southern African Development and Co-ordination Conference (SADCC). The programmes are based at Matopos Research Station near Bulawayo.

CIMMYT is conducting breeding and research mainly on maize streak virus with maize at a site near Harare. Both organisations develop germplasm which they distribute to national programmes in the region.

Other plant breeding programmes

The Zimbabwe Sugar Association Experiment Station, near Chiredzi, which is funded by the industry carries out sugar variety selection work. Some plant breeding work is carried out at the Crop Science Department of the University of Zimbabwe on crops such as maize and cassava.

The development of improved seed technology

Seed production has its own peculiar agronomic problems which need to be addressed to improve methods of seed production. The Seed Co-op established a seed agronomy research programme in 1980

in order to provide sound advice to its members and also conducted development work with seed handling equipment. Most of the research has been with maize, with some work also on sunflower and sorghum.

Studies of pollination in maize seed production

In producing hybrid seed, contamination by foreign pollen has to be controlled to very low levels. One method is by distance isolation. Kok (1985) showed that, for certified seed, the distance required of 350 m can be reduced to 150 m provided 20 barrier rows of the male parent are planted around the seed field. The other method of isolation is by time, so that no foreign pollen is being shed when the seed field is silking. This research required studies of flowering dates of maize genotypes under different environmental conditions. From this data formulae were derived to calculate safe planting dates for various combinations and circumstances (Havazvidi, 1989). Another aspect covered in these studies was the effect of seed crop contamination on subsequent crop yield and it was shown that contamination up to 10 percent did not reduce yields but that contamination from incomplete detasseling within seed fields was more detrimental than outcrossing.

Studies of how widespread contamination is from a single rogue in a seed field indicated that most contamination occurs within a radius of 5 m. Within a seed field synchronisation of tassels and silks of the male and female parents must be good to achieve good pollination and seed set. Studies of silking and silk viability

have been carried out and flowering times of seed parents carefully measured to determine their correct planting dates. It has also been found that extra phosphate can hasten flowering if necessary.

Studies to increase yield of maize seed crops

Seed production usually involves inbred parents which are weak plants, pollen is in limited supply, crop geometry differs from commercial crops and seed is more valuable than ordinary grain. The effects of planting patterns and plant populations have been studied at Rattray Arnold Research Station. A planting pattern of three female rows to one male at plant populations of from 48 000 to 60 000 plants per hectare has usually given the highest seed yields. Early removal of the male rows soon after pollination also increased seed yields. Early harvesting and drying seed crops has reduced field losses appreciably, while field drying by sloughing cob sheaths in sunny weather has hastened the process. It was shown that seed should not be reaped above 25 percent moisture nor dried above 35°C.

Maize seed may be deficient in molybdenum, especially on certain acid soils (Tanner and Grant, 1977). A minimum level of 0,083 ppm is stipulated in the certification scheme. Applying 100 grams/hectare of sodium molybdate as a spray between nine and 14 weeks after planting has corrected the deficiency. Inbreds have been found to require less nitrogenous fertilizer than hybrids maize and smaller applications can be recommended for them.

Inbreds are more prone to disease and pest attack than hybrids. Of various pesticides tested, Carbofuran (Furadan or

Curaterr), a wide spectrum pesticide has increased yields considerably when applied at 15 to 20 kg/ha. Another pesticide, Gaucho, has been very effective as a seed dressing in controlling maize streak virus.

Other seed production research

The Seed Co-op has conducted parent synchronisation research with sunflowers and sorghums in a manner similar to maize to determine planting dates for male and female parents used in hybrid seed production. Work has also been carried out to improve the mechanical handling of seed. An integrated unit for cleaning, grading and treating maize seed has been designed and improvements to planting and shelling machines have been made.

SEED DISTRIBUTION AND PRICING

Seed distribution

Seed distribution systems vary from a single outlet to serve the whole country such as for tobacco seed to a nation-wide system which is used by the Seed Co-op. The Seed Co-op tries to make seeds available to even the remotest Communal Area farmer. The selling season for summer crops is very short, from September to December, and large volumes of stock have to be in place and moved rapidly during that time. To achieve this the Co-op uses a three stage system once seed leaves their premises for the distributor, wholesaler then retailer. Most seed moves through all stages prior to sale but farmers can buy directly from any stage of the system including direct purchase from the Co-op if they wish. Consignment

stock is built up by the distributors who receive discounts from the Seed Co-op some of which they pass on to the other stages in the system.

The use of small packs is an important development in marketing seed of maize. In addition to the standard 50 kg pack, seed is also sold in pack sizes of 25 kg, 10 kg, 2 kg and 500 g. The smaller pack sizes have been very popular with smallholders and have enhanced the penetration of hybrid seed into those areas now estimated to exceed 90 percent of all seed sold.

But there have been some problems. The Seed Co-op has depended largely on other parties to promote seed sales. Recently the Co-op has placed area sales representatives in different parts of the country to intensify the sales effort and provide a better service. Also, whereas the distribution of maize seed has been satisfactory in remote areas, the supply of other seeds has been very erratic. Higher levels of seed production and stock levels and advertising are being planned to improve service. Also, selected wholesalers have been granted the same discount levels as the main distributors to encourage them to increase seed sales.

Seed pricing

Seed prices are set by three methods:

- Prices are determined by association executive committees or private company management.
- Prices are set in consultation with commodity associations of the Farmers Unions using a formula agreed by government.

Prices are fixed by the Ministry of Trade & Commerce after some consultation with interested parties.

The first method is a free market system with supply and demand an important factor and applies to seeds such as grasses, potatoes and tobacco. The second method applies to crop seeds covered by the Bipartite Agreement marketed by the Seed Co-op. The third method applies to hybrid maize seed produced by any organisation. A formula is used as a guide by the Ministry of Trade & Commerce which was designed jointly by the Ministry of Agriculture, the University of Zimbabwe, the Farmers' Unions and the Seed Co-op in 1987. The formula relies on the variable cost of production of single hybrid maize seed. Prices are adjusted for other types of hybrids such as three-way hybrids, double hybrids etc.

Until recently seed prices were fixed by the Ministry of Agriculture but the recent changes in ministerial responsibility have altered certain aspects as follows.

- ° The price of every pack size is now controlled, not just the 50 kg pack as before. The price per kilogram of seed is roughly the same for all pack sizes.
- ° The markup for wholesalers and retailers has been limited to 13 percent. It used to be 10 percent for wholesalers and 15 percent of the wholesale price for retailers i.e. 26,5 percent in all.

° A fixed average transport allowance of \$4.02 per 50 kg of seed can be added to the price irrespective of distance.

These changes have resulted in increasing the price of large packs and reducing the price of small packs.

THE NATIONAL AND REGIONAL EFFECTS OF THE ZIMBABWE SEED INDUSTRY.

The impact of improved seeds on Zimbabwe's agriculture

Agriculture in Zimbabwe has made great strides, particularly in the last 40 years. The general improvement in crop yields was reviewed by Tattersfield (1982) and related to the impact of research and plant breeding. In the case of maize, the main food staple, yields have increased by 325 percent during the period in both large scale and smallholder farming sectors. A significant portion of this increase can be attributed to the use of improved hybrids: Tattersfield (1982) reports that they contributed 40 percent to the yield increases on commercial farms between 1950 and 1980. This yield increase is probably the same for Communal Area farmers as well, especially in the last decade.

The benefits of improved varieties only reach the farmer when seed is available through the seed industry. Thus the seed industry has played a vital role in Zimbabwe through the transfer of better genetic material from research to the farmer.

An important feature of Zimbabwe's seed industry is that it uses mainly locally bred varieties. Local plant breeders have developed these to suite local conditions and they out-perform varieties which are imported. This means that the industry is independent of outside parties and it does not have to pay large

sums of foreign exchange in royalties. It is likely that some use of external commercial germplasm and technology, especially biotechnology, will be necessary in the future but the very strong base of local germplasm will be the main component of future progress.

Zimbabwe exports seed, especially maize hybrids and open pollinated varieties. These exports boost trade and earn the country foreign exchange and are very beneficial to the agricultural industry. Seed is also imported, mainly of horticultural crops, but a significant portion is used to grow seed crops for export on contract.

The Zimbabwe seed industry in relation to the Southern African Region.

Zimbabwe's well developed seed industry has important regional implications. Seed production in the region is unstable. There are large fluctuations in output from year to year and in some years certain countries have severe shortages of seed of their main staple crops, particularly maize. Under such circumstances, these countries can obtain ample supplies of suitable varieties from Zimbabwe. Zimbabwe is responsible for food security under SADCC and in practice it fulfills an important seed security role. No country chooses to import seed in preference to growing their own but present circumstances necessitate importations from time to time. Zimbabwe is a willing supplier as this represents valuable trade and the industry is geared to meet future demands for seed from neighbouring countries when they have seed shortages.

Zimbabwe's seed industry has a high standard of performance and it has developed and adapted technology to suit Central African countries. A number of neighbouring countries are trying to improve and extend their industries but they do require information and training. A number of organisations in the industry e.g. the Seed Co-op, are very willing to pass on their knowledge and experience and will provide training facilities for people from other countries. Likewise government departments involved with the seed industry, especially the Seed Services Unit and the Crop Breeding Institute in Harare, will willingly assist other countries with their problems and provide material for research purposes.

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