# A COMMENTARY ON AGRICULTURAL RESEARCH AND DEVELOPMENT IN SOUTHERN AFRICA

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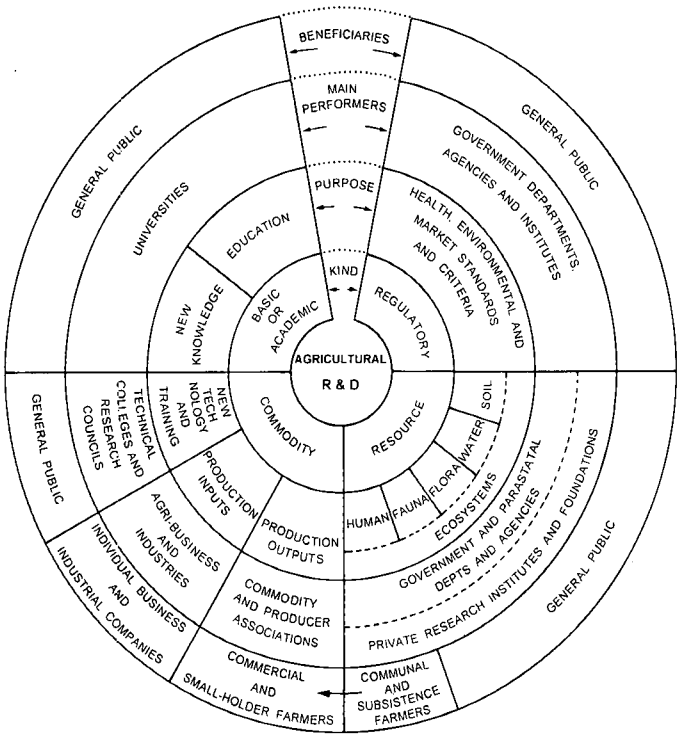
## Introduction

A useful start to a consideration of Agricultural Research and Development (AR&D) is to clarify what it consists of, and this is simply done by examining the figure below. AR&D (i) is of four main kinds, (ii) serves a variety of purposes, (iii) is performed by a number of organisations and (iv) benefits society in general, commerce and industry and the two different sectors of agriculture, commercial and non-commercial. As long as there are non-commercial (i.e. communal and subsistence) farmers, who cannot farm entrepreneurially, AR&D will be required to provide a social service as well produce inputs to improve the profitability of commercial farmers.




AR&D is an economic activity producing technologies and techniques for use as inputs in agricultural production processes (Schultz, 1953). It is, therefore, a valuable resource that has a cost and a value which can be taken into account in calculating the profit and loss or benefit:cost of producing agricultural commodities, or of the social benefits in the case of non-commercial agriculture. The important difference between AR&D primarily for private profit and AR&D for social benefit is fundamental and needs to be reflected in the mission and structure of the institutions that serve them. The same mission cannot serve both. It is also important to recognise that AR&D for private profit generates considerable social benefit as a spin-off, but the converse is not true.

## Historical and political perspective

Europe, with its long established agricultural economy, had a tradition of agricultural experimentation conducted by innovators, exemplified by Lawes and Gilbert locating field experiments at Rothamsted in 1843. However, by the end of the nineteenth century, declining agricultural prosperity caused farmers to look to the State to maintain and expand AR&D. Since that time, and until very recently, it has been assumed that the State should be responsible for the policy control and financing of all AR&D and its institutions (Donovan and Lynas, 1988).

In the New and Third World countries, however, the responsibility for AR&D has always been perceived as primarily a State function. In South Africa and Rhodesia, farmers requested the respective governments to initiate and maintain the AR&D they considered necessary, whereas in the colonial countries, particularly Nyasaland and Northern Rhodesia, it was settlers and entrepreneurs who pressurised governments to provide AR&D, particularly on export commodities.

During the past three decades, the technological demands on AR&D in developed countries have changed substantially in focus and in scope, especially in the United States (Weaver, 1993). Environmental pressures have caused the focus to shift from research on production *technology* to production *externalities*, while the scope has had to widen to include research into the social and environmental effects of agricultural production. These changes are essentially in the interests of society and are not of direct benefit to agricultural producers or the agricultural industry as a whole, and they are thus fair charges on the public purse. Political and fiscal attitudes in developed countries are also resulting in changes in the focus and scope of AR&D because societies (governments) are becoming increasingly resistant to supporting a surplus-producing agriculture whose motive is essentially private profit.

In the developing countries of southern Africa, shifts in the focus and scope of AR&D are also taking place, but mainly as a consequence of de-colonisation agendas and political empowerment of consumers, rather than (yet) as a result of environmental pressures. The focus shift is a reduction in the priority for AR&D on the technological needs of high-tech/high-input commercial

agriculture in favour of AR&D on appropriate technology for small scale, communal and subsistence agriculture. The change in scope is due to the inclusion of non-commercial agriculture in AR&D portfolios, programmes that previously received hardly any attention.

## Public sector AR&D

Public sector agricultural research in South Africa is largely in the hands of the Agricultural Research Council (ARC), operating 11 research institutes and spending (in 1992) 90% of government's expenditure on AR&D. Other government departments and universities spent 5% each.

Despite the importance of agriculture in terms of its contribution to national GDP, food security and the percentage of the populace dependant thereon (Table 1), State expenditures on AR&D have declined over the years.

**Table 1**
**Agriculture's contribution to GDP and dependant population.**

| Country | Contribution to GDP | | | Dependant population | |
|---|---|---|---|---|---|
| | 1988 | 1990 | 1995 | | |
| South Africa | 6,0% | 5,3% | 4,0% | 40% | 17 million |
| Zimbabwe | | | 13% | 70% | 9 million |
| Malawi | | | 33% | 92% | 10 million |

In South Africa in the early 1990s, State expenditure on agriculture was about R256 million, representing less than 3% of the national budget and 13% of the agricultural budget, and a decline of over 40% in real terms during the previous decade. In Zimbabwe and Malawi, the declines over a similar period were 35 and 43% respectively (Donovan, 1995).

The subservience of agriculture generally has been due to agriculture's relative decline as a political constituency, as well as government intervention in the form of price controls, subsidies, parastatal enterprises, and trade and foreign exchange quotas applied for political purposes (Knudsen *et al.*, 1990).

Only in South Africa and Zimbabwe has it been possible to estimate separately government expenditure on AR&D for commercial and non-commercial agriculture, expressed as percentages of total expenditure on agriculture. These are given in Table 2, with the numbers of farmers served in the mid-1990s.

The different priorities given to the research and extension components of AR&D in South Africa, Zimbabwe and Malawi are indicated in Table 3, expressed as percentages of total expenditure on agriculture.

Of the 17% of South African government expenditure on extension, 2% was spent on extension for the 1,75 million non-commercial farmers and 15% on extension for the 0,062 million commercial farmers.

**Table 2**
**Number of farmers and percentage of total public expenditure on agriculture spent on AR&D in South Africa and Zimbabwe.**

| Country | Commercial | | Non-commercial | |
|---|---|---|---|---|
| | No. farmers | Expenditure | No. farmers | Expenditure |
| South Africa | 62 000 | 66% | 1 750 000 | 34% |
| Zimbabwe | 8 720 | 40% | 1 000 000 | 60% |

**Table 3**
**Division of public expenditure on agriculture between research and extension in South Africa, Zimbabwe and Malawi, in percentage terms.**

| Country | Research | Extension |
|---|---|---|
| South Africa | 83% | 17% |
| Zimbabwe | 31% | 69% |
| Malawi | 16% | 84% |

## Private sector AR&D

The private sector's share of total agricultural research is highest in developed countries where it has been mainly of an industrial nature on the inputs of production, especially agricultural chemicals, machinery, seed and food processing, conducted primarily by large industrial (non-agricultural) companies and international corporations. In contrast, private sector expenditure on AR&D in southern Africa's developing countries is mainly on the technologies and techniques of production, *funded and managed by producer associations.*

In developed countries, particularly the United States, some AR&D projects are funded by producer associations but conducted by public R&D institutions, such as State Agricultural Experiment Stations. This method of getting AR&D done is now being exploited by the ARC as a means of raising revenue. Commodity and producer organisations should rather consider the alternative of commissioning contract AR&D from existing private sector (commodity) R&D institutes, which are uninhibited by bureaucracy and which have to be more cost conscious.

An important exception to the generalisation that private sector AR&D in southern Africa is only conducted by producer associations, is plant breeding, particularly maize breeding but also of a few other crops. In this important economic activity, Zimbabwe and South Africa have already developed, and Zambia and Malawi are developing, technically and structurally,

along the same commercial path as in the United States (Rusike and Donovan, 1995).

The commodity associations providing the best examples of private sector AR&D in southern Africa are sugar, tea and tobacco. These associations all assumed full responsibility for funding and managing their own R&D because of grower dissatisfaction with the type and extent of R&D originally provided by government. A number of other organisations in southern Africa are moving slowly towards providing their own R&D needs, and one organisation, the Agricultural Research Trust of Zimbabwe, supplies production R&D for a number of commodities which the government Department of Research and Specialist Services, for lack of funds and staff, is no longer able to provide.

Brief descriptions of the principal characteristics of these commodity AR&D organisations follow.

*Sugar*

Of the major sugar producing countries, only in South Africa, Zimbabwe and Colombia is the *funding and policy control* of R&D exclusively in the hands of their sugar industries. Most previously colonial countries, including Kenya and Mozambique, have their sugarcane R&D wholly funded and managed by government. In many countries, including Australia, Hawaii and Reunion, the sugar industry and government share the management and cost of R&D in various ways. The Mauritian sugar industry is in the unique and extraordinary position of having to provide the funds for the R&D it requires, but has its R&D policy controlled by government. In view of the many advantages and few disadvantages of being independent of government in terms of R&D policy and funding, it is surprising that most of the world's sugar industries remain dependent on, and subservient to, government, particularly in the United States.

The South African Sugar Association Experiment Station (SASEX) at Mount Edgecombe, the Zimbabwe Sugar Association Experiment Station (ZSAES) at Chiredzi and the Sugar Milling Research Institute (SMRI) in Durban are excellent examples of private sector commodity R&D.

SASEX was founded in 1925 because government, at that time, was unable to initiate nor sustain at an acceptable level, research on the then threatening mosaic disease of sugarcane. Furthermore, Winkelspruit, where government conducted sugarcane experiments, was considered unrepresentative by cane growers at that time. SASEX is funded by the South African Sugar Association, and its policy is determined by a committee representing both growers and millers, appointed by the Sugar Association.

Three policy decisions of the founders remain guiding principles of SASEX strategy, and typify the difference between private and public sector AR&D in southern Africa:

- First, that *technical advisors* (i.e. extension specialists) *should be employed by the Experiment Station to propagate research results.* That specialist extension is critical to the effectiveness of a research institute was indicated in a study of the return on investment in R&D at SASEX. Donovan and Darroch (1991) found that, between 1955 and 1985, 60% of the total return on R&D was attributable to extension.
- Second, that research must concentrate on only one crop (sugarcane) and that it must be the full time activity of a number of scientists of different disciplines working together as a team. These two SASEX strategies, extension integrated with research (i.e. having the same mission) and multi-disciplinary/commodity specific research, account in large measure for the finding by Donovan and Nieuwoudt (1992) that technology transfer lag between 1955 and 1985, at SASEX was only three years compared with five, six or seven years for public AR&D in the United States and Australia (Donovan, 1989).
- Third, that *the work should be independent, that is, not delayed by, nor dependent on, the co-operation of other organisations.* This allows research projects to be structured in matrix form and quickly from in-house resources. An exception to this strategy was the establishment of a biotechnology unit at SASEX in 1992 jointly with other national sugar industries and universities, because the cost and basic nature of such a programme would have made it too expensive exclusively in-house. However, since none of the co-operators are government institutions, public service inertia is unlikely to be the problem foreseen by the SASEX founders.

The ZSAES was founded as an independent commodity institute in the mid-1960s, following the advice of the then Director of SASEX not to go into partnership with the government in its planned lowveld research developments. Its eminent success is due in great measure to that decision. Like SASEX, ZSAES is funded and policy controlled solely by a producer association, the Zimbabwe Sugar Association.

*Tea*

The Tea Research Foundation of Central Africa (TRF), founded in 1966, with headquarters at Mulanje in Malawi, is officially recognised by the Southern African Development Community (SADC) as the regional centre for tea R&D. In that capacity it serves the tea industries of Malawi, Zimbabwe and South Africa. Mozambique and Zambia were previously members of the TRF and are expected to re-join, and Tanzania has recently shown interest in joining the Foundation. TRF is funded by a cess (levy) on tea producers according to their production and R&D policy is controlled by a Board of Trustees on which all tea producers, including smallholders, are represented (Donovan and Limwado, 1995). The TRF is responsible for R&D on both the field production and the factory processing of tea.

*Tobacco*

The Tobacco Research Board of Zimbabwe (TRB), founded in 1950, has its headquarters at Kutsaga near Harare. The TRB is now funded exclusively by levies on tobacco growers and

income from research contracts. Until last year, the Board received a grant from government which, during the 1980s, amounted to 27% of its expenditure (Donovan and Cousins, 1995). R&D policy is in the hands of a Board on which five members represent the tobacco industry and two members the government. The TRB has provided tobacco R&D services on contract to neighbouring countries, in particular to Malawi prior to independence in 1964, and again more recently until the establishment of the Tobacco Research Institute of Malawi in 1989.

## Mission, management and culture of AR&D

R&D institutes should have formal mission statements. Good examples of missions for commodity R&D institutions are those of the Sugar Milling Research Institute and the Tea Research Foundation. It is anomalous that SASEX did not have, until recently, a stated mission or remit defining its *purpose* (*what it does* and *for whom*), its *vision* and its *values*. It relied on objectives; but these are not alternatives for a mission statement, nor is the mission of a parent or controlling organisation (e.g. the Sugar Association) suitable for a subsidiary division (e.g. SASEX).

Because public sector R&D organisations, such as the ARC, have stakeholders with diverse and often conflicting interests, or with political implications, mission definition can only be in general terms, and decision making on priorities is thus far more difficult than in private sector AR&D institutes.

Operational management, i.e. the *planning, organising, leading* and *evaluating*, in private sector AR&D institutes is usually of a high standard because researchers – at least those with graduate qualifications – have had training in research methodology. Furthermore, because commodity AR&D institutes usually have unequivocal policies, a unity of purpose and because they serve stakeholders who have an economic interest in the product, operational management is much easier than in public sector R&D institutes, which have the additional problem of contending with bureaucratic overburdenment imposed by being part of a large organisation with common rules for diverse activities.

The most serious management deficiency in both private and public R&D organisations is the lack of human resource (HR) management skills at top and senior management level. Top and senior R&D managers are usually promoted scientists who have seldom had any training in HR management and often regard that vital function as unimportant and the practise thereof with disdain. The result is that HR policy and management in R&D institutes has frequently to be provided by social scientists, who are usually not agriculturally orientated and are seldom even on the institute's staff, sharing its mission and culture.

A culture conducive to effective and efficient R&D is created by the institute's leadership and is facilitated essentially by a well understood and accepted mission, by a consultative style of management and by sympathetic management of human resources. Southern Africa's commodity AR&D institutes vary in the quality of their cultures, some better than others, but all have the advantage of better opportunities to generate good cultures than the region's public sector AR&D institutes.

## Costs of AR&D

It is not meaningful to compare costs of AR&D institutes directly, because different types of R&D require different levels of sophistication or amounts and types of equipment, types of laboratories, areas of land and ratios of professional to technical to unskilled staff. However, some interesting comparisons can be made in terms of cost per technologist* (CPT) between institutes in the same category. It is suggested that the three institute categories are Hi-Tech, Lo-Tech and Production, with the characteristics indicated in Table 4.

Cost comparisons in terms of CPT of AR&D institutes of the same category, shown in Table 5, suggest that those in the private sector operate more economically than public sector institutes.

In 1994 the ARC Headquarters cost was R2 million to pay *inter alia* for one President, two Vice-Presidents and three Directors (of Human Resources, Marketing and Information and Finance).

Because universities should play a major role in AR&D, particularly for its basic research needs, it is disturbing to see how little they spend on AR&D compared with both public and private AR&D institutes. Although the estimates are subject to considerable variation, they are as shown in Table 6.

*CPTs calculated from data in: *Restructuring Agricultural Research in South Africa* (see References)

**Table 4**
**Categorisation of AR&D institutes.**

| Category | Ratio prof:tech:unskilled staff | Laboratory sophistication | Land requirement | Service and admin function | Extension function |
|---|---|---|---|---|---|
| Hi-Tech | High | High | Medium | Medium or low | Low |
| Lo-Tech | Medium | Medium | Low | Medium | Medium |
| Production | Low | Low | High | High to low | High to low |

**Note:** *Head Office* costs are included in the CPTs for SASEX and SMRI, but not in the CPTs for the ARC institutes. In 1994 the ARC Headquarters cost was R2 million to pay *inter alia* for one President, two Vice Presidents and three Directors (of Human Resources, Marketing and Information and Finance).

**Table 5**
**Cost per technologist for three categories of AR&D institute funded by the public and private sector.**

| Sector | Hi-Tech institutes | | Low-Tech institutes | | Production institutes | |
|---|---|---|---|---|---|---|
| Public sector institutes (all ARC) | Onderstepoort | 423 | Plant Protection | 187 | Tobacco & Cotton | 391 |
| | Neetvoorbijl | 407 | Soil, Water & Climate | 175 | Vegetable & Ornamental | 236 |
| | Irene | 300 | | | | |
| Means | | 377 | | 181 | | 311 |
| Private sector institutes | | | SMRI | 156 | SASEX | 250 |
| | | | | | Outspan | 200 |

**Table 6**
**University expenditure on AR&D in terms of CPTs.**

| | |
|---|---|
| Mean estimate for all universities | 33 |
| Estimate for *historically white* universities | 66 |
| Estimate for *historically black* universities | 0 to 16 |

## Funding of agricultural R&D

Expenditure in 1992, the last year for which comparative data are available, by governments, commerce and industry and by commodity associations in South Africa, Zimbabwe and Malawi are shown in Table 7.

**Table 7**
**Expenditure (1992) on AR&D by South Africa, Zimbabwe and Malawi in Rand and percentages of expenditure on agriculture for South Africa and as percentages for Zimbabwe and Malawi.**

| | South Africa | | Zimbabwe | Malawi |
|---|---|---|---|---|
| | Rm | % | % | % |
| Government | 256 | 58 | 64 | 75-85 |
| Agric Research Council | 230 | | | |
| Universities | 13 | | | |
| Government departments | 13 | | | |
| Commerce and industry | 143 | 32 | 14 | 0-5 |
| Agric co-operatives | 50 | | | |
| SANSOR (seed firms) | 35 | | | |
| AVCASA (Vet products) | 34 | | | |
| Animal feed companies | 17 | | | |
| SMRI | 5 | | | |
| FSSA (Fertiliser Ass) | 2 | | | |
| Commodity associations | 42 | 10 | 22 | 15-20 |
| SASEX | 25 | | | |
| Outspan | 8 | | | |
| Other commodity ass | 5 | | | |
| UNIFRUCO | 4 | | | |
| Total | 441 | | | |
| % of national budget | 2,9 | | 5 | 13 |
| % of agricultural budget | 13 | | 17 | 73 |

Expenditure on AR&D is more meaningful when expressed as percentages of the gross value of the agricultural products (GVP) subjected to R&D, as shown in Table 8.

**Table 8**
**Expenditure on AR&D as percentages of GVP by government, producer associations and industry in South Africa, Zimbabwe and Malawi (1992-93).**

| | South Africa | Zimbabwe | Malawi |
|---|---|---|---|
| **Government** | | | |
| Commercial agriculture | 0,83 | 2,18 | |
| Non-commercial agriculture | 0,42 | 3,28 | |
| Animal products[2] | *0,56* [1] | | |
| Horticultural crops[2] | *1,32* | | |
| **Commodities** | | | |
| Sugar (SASEX) | 1,40[3] | *0,54* | |
| Tobacco | | 1,37 | *0,83* |
| Tea | *0,50* | *1,10* | *1,20* |
| Agric Research Trust[4] | | *0,78 (0,53)* | |
| **Industries** | | | |
| Sugar (SMRI) | *0,45* | | |

(1) Figures in italics are for AR&D excluding extension.
(2) It is not possible to break these groups down into individual commodatiers.
(3) Mean for 1993-94 to 1996-97 is 1,17%.
(4) R&D portfolio of three commodities: cattle, grain and oilseeds. Contract research and sale of produce reduces 0,78 to 0,53.

Between 1980 and 1994 Zimbabwe's ratio of government expenditure on commercial to non-commercial agriculture changed from 2:1 to 2:3. It is likely, therefore, that the South African ratio will change in the same direction and for the same reasons as it did in Zimbabwe but probably at a faster rate, from the 2:1 in 1994 to the Zimbabwe ratio of 2:3. This indicates a x3 reduction in government spending on commercial agriculture in South Africa over the next few years.

A criticism of commodity AR&D by proponents of government funding and control of AR&D is that commodity organisations are less reliable sources of funds than governments. This has been refuted before but most significantly recently by the fact that, over the five year period, 1991-92 to 1996-97, which included unfavourable seasons, SASEX funding increased in real terms, namely by 62% compared with an increase of 59%

in the consumer price index. During the period 1983 to 1989 government expenditure on R&D declined by 40% in real terms and, although more recent figures are not available, the decline is continuing.

The reduction in expenditure at SASEX from 1,40% to 1,17% of GVP, noted in Table 8, is more significant in a reduction in investment in R&D than a reduction in funding. Considering the high returns in investment in R&D at SASEX, discussed in the next section, this must be regarded as a poor strategic decision even if it seemed necessary tactically.

## Returns on AR&D

The high and increasing costs of R&D inputs have become of great concern to investors in AR&D, both government and producer associations. It is therefore urgently necessary to have reliable estimates of the return on their investments in AR&D.

Many studies have been made on the returns on R&D by government and government funded institutions but most of them have, of necessity, used indirect or surrogate indicators of change in total agricultural output or productivity and are therefore expressed in terms of the *total* (i.e. social + private) *return* on R&D.

Thirtle and van Zyl (1994) used total factor productivity growth in South African agriculture to estimate the return on R&D in *commercial agriculture* between 1947 and 1991 and found the total return on *research* was between 60 and 65%, and on *extension* between 28 and 35%. The authors rightly point out that these findings make a strong case for increased investment in commercial agriculture by government.

Unfortunately, political reality is that government investment in non-commercial AR&D is already 55 times lower *per farmer* than in commercial agriculture, and inevitably this will result in government decreasing its investment in commercial agriculture in order to 'level the playing fields' rather than exploit a higher interest investment.

In a more recent study using a profit function approach, van Zyl and Thirtle (1996) found the internal rate of return on public sector research to be 44% and on extension 3%. The difference between the 1994 and 1996 studies is mainly due to the exclusion of most of the R&D for commercial agriculture in the later study, as well as the use of different econometric methods. However, the main interest of both these studies is the much lower return on extension than on research, which is in direct contrast to the findings of Donovan and Darroch (1991), which indicated a return on extension 1,5 times that of the return on research at SASEX between 1950 and 1985.

There are two reasons for this difference: firstly, as already noted, the inadequacy of government extension services in both commercial and non-commercial agriculture, and secondly (and probably more significant), the institutional separation of extension and research into separate government departments. This is additional evidence that extension is much more effective when integrated with research so that both have the same mission.

It is unfortunate that few studies have been made of the return on investment in individual commodities, projects or even individual technologies, such as a variety within a commodity. Those that have been made in the United States are of the return to *government* investment in commodities, estimating, therefore, the total return which cannot be separated into social benefit and private profit. Agriculture's private sector, particularly producer associations, need to know the return (or loss) on their investment in AR&D for two reasons: firstly, because the productivity of R&D and its value in competition with other forms of investment have become major concerns of R&D decision-makers, and secondly, because R&D top management needs benefit:cost information to improve decision making on R&D project priorities and to support budget proposals convincingly.

The results of a limited number of studies, all of an empirical nature, on the return to commodity R&D in southern Africa, with some results from other countries, are given in Table 9.

**Table 9**
**Return on private sector AR&D expressed in benefit:cost (B:C) terms.**

| Country and institute | Year | R&D component | B:C ratio | Reference |
|---|---|---|---|---|
| South Africa : SASEX | 1983 | All programmes | 1,33 | Anon (1983) |
| South Africa : SASEX | 1985-86 | All services<br>Research only<br>Research + Extension<br>Plant Breeding | 1,76<br>1,37<br>4,57<br>0,61 | Donovan (1989) |
| South Africa : SASEX | 1949-50 | Variety NCo310 | 25,00 | Donovan (1996) |
| Australia | 1945-58 | Sugarcane | 1,50 | Evenson (1969) |
| India | 1945-58 | | 1,60 | |
| South Africa | 1948-58 | | 1,40 | |
| Zimbabwe : TRB | 1955-95 | Tobacco | 1,22 | Donovan and Cousins (1995) |
| Malawi : TRF | 1974-93 | Tea | 1,12 | Donovan and Limwado (1995) |

### Advantages of private sector (commodity) AR&D

1. **Policy decisions** are taken by the stakeholders who pay and benefit from them and not, as in most public sector AR&D institutes, by persons who have no financial interest in the commodity or the outcome of the R&D and who sometimes represent opposing economic interests.
2. **Management decisions** can be based on unequivocal objectives specific to the commodity. This makes for improved staff commitment and dedication, eliminates policy conflicts which, in public sector R&D, dilute effort and effectiveness, major causes of staff dissatisfaction.
3. **Recruitment and retention of staff** at market related rates provide the incentive needed to stimulate staff productivity, conditions seldom found in public AR&D.
4. **An integrated and commodity-specific extension service** is essential for efficient and rapid technology transfer without which research has little value. This seems to be possible only in private sector AR&D.
5. **Economic independence from government funding** will become more important as government increasingly favours non-commercial over commercial in dispensing its limited and declining resources for agriculture.
6. **Lack of 'political' cannibalism** which occurs, particularly in public sector departments and institutions, when they have to compete for limited resources from a common pool. Under these conditions politicking and fund-raising become more important functions for senior staff than R&D itself.
7. **Bigger social benefits** are generated by private than by public enterprises because they are produced without cost to government and are produced more efficiently.

### Reputed disadvantages of private sector (commodity) AR&D

1. **Financial insecurity.** This is fallacious. As shown earlier, government funding of AR&D declined by 40% in real terms when the South Africa sugar industry maintained its funding of AR&D in real terms.
2. **Duplication of staff and facilities** is claimed will occur if all commodities set up their own R&D institutions. Because commodity AR&D is funded by those whose economic interests are at stake there is less likelihood of wastage and misuse of funds than in organisations controlled by persons who have no such financial interest. For the same reason there is less likelihood of 'empire building' which, in public sector AR&D institutions, is one of the few ways of establishing the scientific status of institutions and their directors.
3. **Loss of control over national food security.** If there is any justification (in a food surplus situation) for government control of food supplies, it can be done more effectively by manipulating the economics of production than by controlling AR&D whose task is to produce the *technology* (not the product itself) for optimising economic yields. There is no better way of ensuring adequate food supplies than to leave it to private enterprise. Attempts by governments throughout Africa to regulate agricultural production have failed, and have led to higher food prices and often to popular uprisings.
4. **Many commodities are too small to fund their own AR&D.** This is supported by Donovan and Nieuwoudt (1988) who found that half of South Africa's 22 listed commodities had gross values too small to support their own R&D institutes. However, there are two ways in which small producer associations can fund and *control* the AR&D they decide they need rather than leave it to a public sector institute where the producers would have little influence on what, and how much, R&D is done or of the costs of the projects. The first is to contract out the R&D projects they want done and can afford, to other private sector (commodity) AR&D institutions. This is done with success by the Coffee Growers Association of Malawi, who place research and extension contracts with the Tea Research Foundation, which has the necessary infrastructure and facilities of which it is pleased to make more economic use. The second way for small commodities to fund and control their own R&D requirements is to enter into partnership with other commodities in establishing a joint AR&D institute. This is the successful route taken by three commodity associations (grain, cereals and cattle) in Zimbabwe who set up the Agricultural Research Trust.

### Conclusions

Privatising all agricultural commodity research and development in Southern Africa, on the model of the South African Sugar Association's Experiment Station for individual commodities, or Zimbabwe's Agricultural Research Trust for a group of commodities, would, on the one hand take AR&D for private profit out of the hands of a bureaucracy that is less cost effective and not directed by stakeholders, and on the other hand would permit government to use the public funds at present devoted to commodity research and development for private profit, for the higher priority social services of education, health, housing and human resource development.

Notwithstanding these major advantages, the greatest gain would be the increase in commodity productivity and profitability, together with the spin-off of even larger social benefits that would accrue to society, without cost to government.

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# SASTA GOLD MEDALISTS

CGM PERK PGC BRETT JL DU TOIT AE RABE JB ALEXANDER IA BELL GD THOMPSON

# TALBOT-CROSBIE AND KYNOCH/TRIOMF PRIZEWINNERS 1962 TO 1997

| Year | Prize Award | Author(s) |
|---|---|---|
| 1962 | **Talbot-Crosbie** | T COVAS |
| | **Kynoch** ..... | JR ANDERSON |
| 1963 | **Talbot-Crosbie** | EJ BUCHANAN, K DOUWES-DEKKER and A VAN HENGEL |
| | **Kynoch** ..... | GS BARTLETT |
| 1964 | **Talbot-Crosbie** | AE RABE |
| | **Kynoch** ..... | RT BISHOP |
| 1965 | **Talbot-Crosbie** | EJ BUCHANAN |
| | **Kynoch** ..... | JM GOSNELL and GD THOMPSON |
| 1966 | **Talbot-Crosbie** | Prize shared by RC TURNER and RP JENNINGS |
| | **Kynoch** ..... | AJM CARNEGIE |
| 1967 | **Talbot-Crosbie** | A VAN HENGEL |
| | **Kynoch** ..... | J GLOVER |
| 1968 | **Talbot-Crosbie** | J BRUIJN and RP JENNINGS |
| | **Kynoch** ..... | G ROTH |
| 1969 | **Talbot-Crosbie** | RCS ROBINSON and RP JENNINGS |
| | **Kynoch** ..... | PK MOBERLY |
| 1970 | **Talbot-Crosbie** | IA SMITH |
| | **Kynoch** ..... | ME SUMNER |
| 1971 | **Talbot-Crosbie** | GG ASHE |
| | **Kynoch** ..... | JM GOSNELL and AC LONG |
| 1972 | **Talbot-Crosbie** | JP MURRAY |
| | **Triomf** ..... | FE RICHARDSON |
| 1973 | **Talbot-Crosbie** | B ST C MOOR |
| | **Triomf** ..... | H ROSTRON |
| 1974 | **Talbot-Crosbie** | NO WINNER |
| | **Triomf** ..... | JPM DE ROBILLARD and GA IGGO |
| 1975 | **Talbot-Crosbie** | EEA ROUILLARD |
| | **Triomf** ..... | PGC BRETT, RL HARDING and RG PAXTON |
| 1976 | **Talbot-Crosbie** | LMSA JULLIENNE |
| | **Triomf** ..... | JR PILCHER and G VAN DER MERWE |
| 1977 | **Talbot-Crosbie** | RP SCOTT |
| | **Triomf** ..... | J BURROWS |
| 1978 | **Talbot-Crosbie** | PG MOREL DU BOIL and KJ SCHÄFFLER |
| | **Triomf** ..... | DB HELLMANN |
| 1979 | **Talbot-Crosbie** | MR KEDIAN |
| | **Triomf** ..... | PR ATKINSON |
| 1980 | **Talbot-Crosbie** | A KOEN |
| | **Triomf** ..... | NG INMAN-BAMBER |
| 1981 | **Talbot-Crosbie** | RG HOEKSTRA |
| | **Triomf** ..... | KE CACKETT and JJ RAMPF |
| 1982 | **Talbot-Crosbie** | LMSA JULLIENNE |
| | **Triomf** ..... | E MEYER and B WORLOCK |
| 1983 | **Talbot-Crosbie** | BS PURCHASE |
| | **Triomf** ..... | TMC BOEVEY and TJ MURRAY |
| 1984 | **Talbot Crosbie** | GPN KRUGER |
| | **Kynoch** ..... | PET TURNER |
| 1985 | **Talbot Crosbie** | PG MOREL DU BOIL |
| | **Kynoch** ..... | NB LEIBBRANDT |
| 1986 | **Talbot Crosbie** | GRE LIONNET |
| | **Kynoch** ..... | KM HARBORNE-RUTHERFORD, RA BAILEY and JV DA GRACA |
| 1987 | **Talbot Crosbie** | PW REIN, MGS COX and G MONTOCCHIO |
| | **Kynoch** ..... | TMC BOEVEY and JP FOURIE |
| 1988 | **Talbot Crosbie** | MJ REID |
| | **Kynoch** ..... | BRF GEORGE |
| 1989 | **Talbot Crosbie** | GRE LIONNET |
| | **Kynoch** ..... | JH MEYER, RA WOOD and RL HARDING |
| 1990 | **Talbot Crosbie** | CMJ DAY-LEWIS and KJ SCHÄFFLER |
| | **Kynoch** ..... | NG INMAN-BAMBER and BA STEAD |
| 1991 | **Talbot Crosbie** | SJ MADAREE, PW REIN and CM WENMAN |
| | **Kynoch** ..... | RA BAILEY and SA TOUGH |
| 1992 | **Talbot Crosbie** | Prize shared by MGS COX and P SAHADEO, and M MEADOWS and S WADLEY |
| | **Kynoch** ..... | SJ SNYMAN, KG BLACK, BI HUCKETT and MP WATT |
| 1993 | **Talbot Crosbie** | M MOODLEY |
| | **Kynoch** ..... | NG INMAN-BAMBER, TL CULVERWELL and MG McGLINCHEY |
| 1994 | **Talbot Crosbie** | VC STONE |
| | **Kynoch** ..... | BL SCHROEDER, JB ROBINSON, PET TURNER and M WALLACE |
| 1995 | **Talbot Crosbie** | DC WALTHEW and LM TURNER |
| | **Kynoch** ..... | DB HELLMANN, GG PLATFORD and M WALLACE |
| 1996 | **Talbot Crosbie** | DC WALTHEW and RW WHITELAW |
| | **Kynoch** ..... | R VAN ANTWERPEN, MG McGLINCHEY, NG INMAN-BAMBER and ATP BENNIE |
| 1997 | **Talbot Crosbie** | KJ SCHÄFFLER and MTD DE GAYE |
| | **Kynoch** ..... | MG KEEPING |

# ANNUAL CECIL RENAUD SASTA AWARDS

| Year | Prize Award | Author(s) |
|---|---|---|
| 1977 | **Factory Prize .....** | B ST C MOOR |
| | **Agricultural Prize** | RT BISHOP |
| 1978 | **Factory Prize .....** | RD ARCHIBALD and C MACK |
| | **Agricultural Prize** | OP LANDREY |
| 1979 | **Factory Prize .....** | GG ASHE |
| | **Agricultural Prize** | NO WINNER |
| 1980 | **Factory Prize .....** | DCM KEIR |
| | **Agricultural Prize** | AN MILLS and EH RINGELMAN |
| 1981 | **Factory Prize .....** | S NORTH-COOMBES, K TAYLOR and K KOSTER |
| | **Agricultural Prize** | JG HARDY |
| 1982 | **Factory Prize .....** | P GLAUM and A LANDMAN |
| | **Agricultural Prize** | PC WISE |
| 1983 | **Factory Prize .....** | RAH CHILVERS |
| | **Agricultural Prize** | JE LONSDALE |
| 1984 | **Factory Prize .....** | DJ CARLIELL |
| | **Agricultural Prize** | PG BRAITHWAITE |
| 1985 | **Factory Prize .....** | MA GETAZ |
| | **Agricultural Prize** | J CHEDZY and JBR FINDLAY |
| 1986 | **Factory Prize .....** | RAH CHILVERS and DJ LOVE |
| | **Agricultural Prize** | DJ NIXON, M WORKMAN and PJ GLENDINNING |
| 1987 | **Factory Prize .....** | GF MANN |
| | **Agricultural Prize** | CPM SWEET, PW WHITE and GH DODSWORTH |
| 1988 | **Factory Prize .....** | RP SCOTT |
| | **Agricultural Prize** | DAG RALFE |
| 1989 | **Factory Prize .....** | PM SCHORN, J BECKETT and WS GRAHAM |
| | **Agricultural Prize** | TL PEARSE |
| 1990 | **Factory Prize .....** | DM VAN DEN BERG |
| | **Agricultural Prize** | RN STATHAM |
| 1991 | **Factory Prize .....** | B ST C MOOR |
| | **Agricultural Prize** | PJB GARDINER and K CAZALET |
| 1992 | **Factory Prize .....** | RR SANDERS |
| | **Agricultural Prize** | GC SPALDING |
| 1993 | **Factory Prize .....** | DJ TAYFIELD and EW ANDERSON |
| | **Agricultural Prize** | OP LANDREY, GG EICHLER and J CHEDZEY |
| 1994 | **Factory Prize .....** | C CREBO, L BACHAN and V PILLAY |
| | **Agricultural Prize** | PC HENRY and W RHEBERGEN |
| 1995 | **Factory Prize .....** | M MACNAUGHTON |
| | **Agricultural Prize** | D McARTHUR and VW SPAULL |
| 1996 | **Factory Prize .....** | B MISPLON, H VERBANCK and P McINTYRE |
| | **Agricultural Prize** | PA DONOVAN |
| 1997 | **Factory Prize .....** | Prize shared by M MOODLEY, DJ BEKKER, PJ PIENAAR and R PILLAY; M MOODLEY and PM SCHORN; I SINGH, NJ COETZEE and E BURMEISTER; I SINGH, R RILEY and D SEILLIER |
| | **Agricultural Prize** | A PRINS, JJ BORNMAN and JH MEYER |

# INSTRUCTIONS TO AUTHORS

1. **Deadlines**

- An abstract of approximately 100 words must reach the SASTA Secretary by **31 December**.
- Authors will be informed of acceptance of their papers by **31 January**.
- Completed papers to be submitted by **1 March**.
- Papers will be refereed and returned by **31 March**.
- Revised papers to be returned (with electronic version on disk) to SASTA Secretary by **15 April**.
- Proofs will be given to authors during the Congress.
- Corrected proofs to be returned to the SASTA Secretary by **15 June**.

These should be sent to:

The SASTA Secretary
SASA Experiment Station
Private Bag X02
Mount Edgecombe
4300, Republic of South Africa

2. **Scripts**

When papers are first submitted, only the script must be forwarded and not the computer disk. Scripts should be in English in third person format, on one side only of A4 paper. Double spacing must be used, with a 25 mm margin all round. Pages are to be numbered consecutively. The author is responsible for making all changes and additions suggested by the referees. The script must then be returned to the SASTA Secretary together with the computer disk. The disk should be marked with the author's name, the program used to generate the text and the program used to construct the figures.

3. **Layout and headings**

The sequence of items in the script should be:

**Title:** This must be short and concise, followed by the authors' names and addresses. If an author's current address has changed from that where the work was carried out, both addresses should be included.

**Abstract:** This should be between 60 and 180 words, and should be an informative digest of the important features of the paper.

**Main text:** The main text must be divided into sections such as: **Introduction**; **Materials**, **Method** or **Procedures**; **Results**; **Discussion** or **Conclusions**. These headings should be centered. In addition, side headings may be used. Lower case letters should always be used, except for the initial letters of first words and proper nouns.

**Acknowledgements:** (If any.)

**References:** Literature cited must be arranged **alphabetically**. References in the text are given as Jones (1996) or (Jones, 1996) depending on context. Where two authors are involved (Jones and Smith, 1996) should be used. Where more than two authors are involved, the citation should be written as (Jones *et al.*, 1996). When citing several papers by the same authors published in the same year, a, b, c, etc should be placed after the year of publication. Each citation in the reference list should include the names of all authors, the year of publication, complete title, publisher, publication, volume number, issue number in brackets and inclusive page numbers, e.g.

Barnes, AC (1964). *The Sugarcane.* Leonard Hill, London. 456 pp.

de Beer, AG (1976). An inexpensive mechanical harvesting system that works. *S Afr Sug J* 60(3): 111-112.

Abbreviations for periodicals should be as quoted in the *World List of Scientific Periodicals*. References not cited in the text should not appear in the list of references and *vice versa*.

Unpublished data and verbal communications should not appear in the list of references, but should appear in brackets in the text, e.g. ([1]personal communication) or ([1]unpublished data), and be accompanied by a footnote giving more details.

**Tables:** Tables must not be incorporated in the text, and should be submitted separately. Tables must be numbered consecutively, and the preferred position of each indicated in the text, e.g. (Insert Table 1).

**Figures:** Graphs, diagrams and photographs must be submitted separately and not incorporated in the text. The preferred location of each should be indicated in the text, e.g. (Insert Figure 1). It should be borne in mind that figures will in most instances be reduced to one column width in the Proceedings, and lines should be sufficiently dark to accommodate the reduction. Originals only should be submitted; photocopies will result in poor quality reproduction.

Photographs must be glossy, black and white, postcard size.

4. **Numbering**

In the text all numbers below 10 should be written in full, and numbers greater than nine in digits. Paragraphs in the text should not be numbered.

5. **Units**

The SI system of units must be used.

6. **Acceptance**

**The Editorial Committee reserves the right to reject any paper. Papers read at the Congress will not necessarily be published in the Proceedings.**