Improving the Links between Agricultural Research and Economic Policy

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1. Introduction

This paper examines the role of the private sector in agricultural research in Tanzania from the perspective of the Tea Industry.

Tea research in Tanzania is currently going through a restructuring which may provide pointers for other forms of agricultural research, although tea is rather different from many developing-country crops. It is largely a plantation crop, with 80% of production in Tanzania in the hands of medium to large company-owned estates. It is almost exclusively a cash crop, of which over 90% is exported, and these facts need to be borne in mind when considering its research requirements. However, the industry works with a large number of smallholders who supply green leaf for processing to the factories of the major growers. These smallholders share common problems with small-scale and subsistence farmers growing other crops.

The fact that it is not a food crop does not diminish the need for tea research, it does, however, alter its focus. Tea is a commodity sold on world markets and the main factor affecting price in the long term is the cost at which efficient producers are able to produce it. Research is therefore largely directed at improving cost efficiency of production, or improving its value by increasing quality. Without these research-driven performance improvements, tea producers would fall behind their competitors in other countries, eventually reaching a situation where their cost of production exceeded the price at which other producers were prepared to sell.

The effect of this driving force is very clear from long-term tea price trends. Since 1950, prices on the London tea auctions, adjusted to the present day value of sterling, have fallen by an average of over 3% per annum from 700 pence per kilogram in 1950 to just over 100 pence by the early 1990s. This trend matches very closely the rise in agricultural yield per hectare achieved by producers and is similar to the trend seen in other internationally-traded agricultural commodities. It indicates that research and productivity improvements cannot stop for one grower or country as long as the rest of the world continues to invest in research.

While the economic case for research is clear, the adoption of a policy towards it by government and by the private sector involves many other considerations. It will be useful, therefore, to use the tea industry and its research activities as an example which may help other agricultural sectors. To set the scene, I will give a brief history of both the industry and tea research in Tanzania.

2. The History of Tea in Tanzania

By tea industry standards, Tanzania is a newcomer to the scene. Commercial production started in the Southern Highlands in the late 1920s, when settlers were advised to plant it there. A factory was opened in Mufindi in 1930 and rapid development by German settlers took place in the years between 1930 and 1939. Over 1000 hectares had been planted by the outbreak of the Second World War in 1939, when the properties were taken over by the British Government's Custodian of Enemy Properties. The management and eventual ownership of these properties in Mufindi and Tukuyu came into the hands of the Brooke Bond group.

At the same time as the early development in the Southern Highlands, tea was being developed in the Usambaras and by 1951 the total area planted in the country had reached 4,000 hectares. The total crop in that year, however, was little more than 1,000 tonnes. The average yield at that time was therefore below 300 kilograms per hectare; less than one tenth of the yield being achieved by Tanzania's most efficient producers today and a striking illustration of the benefits of research.

New planting continued through the 1950s and remained entirely in the hands of foreign companies and a few individual settlers until independence in 1961. Shortly after independence, smallholder tea planting started and by 1964 the total area under tea was 8,800 hectares of which 400 was smallholder-planted.

The Tanzania Tea Authority (TTA) was formed in 1968, one of whose objectives was the development of smallholder tea, and rapid expansion took place in this sector through the 1970s. By 1984, some 28,700 smallholders owned 9,000 hectares of tea; an average holding of under one third of a hectare. During this period, TTA built three tea factories and acquired three others.

Private sector expansion during the same period 1968 -1984, however, was virtually at a standstill because of the unfavorable economic climate within the country. This is not to say that no progress was made. Indeed some of Tanzania's producers doubled their yield per hectare in this period through improved practices, mainly from research findings on irrigation and fertilizer.

From the mid-1980s, economic reforms in the country began to encourage tea companies to invest in new plantings again and by 1995, the total area under cultivation was 20,000 hectares, of which half was owned by TTA and its smallholders and the other half by the private sector. The economic revival enjoyed by the industry in the late eighties and early 1990s was largely the result of government policy in allowing the shilling to devalue in line with inflation. Unfortunately, this devaluation trend has now stopped, costs have overtaken sales revenues and tea development at the time of this report is severely reduced. Nonetheless, tea has become an important part of the national economy. About a quarter of a million people depend on it and much infrastructure in the form of houses, hospitals, etc., is provided by the tea companies in the rural areas. It is the fifth largest earner of foreign exchange in the country, accounting for some US$25 million per annum. In a league of tea-producing countries, Tanzania ranks third in Africa and in terms of exports it ranks 10th in the world.

Tea producers in Tanzania have formed the Tea Association of Tanzania, an autonomous body on which all commercial growers are represented, including the TTA and its smallholders. The Association represents the industry in negotiations with government and its most notable recent achievement has been its collaboration with MOA in creating the new Tea Research Institute of Tanzania (TRIT).

3. Factors Affecting Production

Before moving on to tea research, it is useful to look at the factors that affect the productivity and profitability of tea growing to give an indication of the potential for research.

Tea grows best in areas of relatively high altitude and substantial, well-distributed rainfall. Soil conditions are also important and the availability of suitable areas in Tanzania is very restricted. Indeed, as early as 1951 the then Government of Tanganyika, in a report on resources and development, commented "Only very limited areas are suited to the crop and it can never be more than a useful constituent in a wide range of agricultural production".

Even these areas do not enjoy such favorable conditions as exist, for example, in the Kericho district of Kenya whose annual rainfall is much more evenly distributed than that of Tanzania's tea districts. This difficulty can be overcome by irrigation if a suitable water source exists but, of course, it puts the Tanzanian producer at a cost disadvantage against Kenya.

Planting material provides much scope for variation and therefore for improvement. Since the early 1970s, clonal plants have been in use for both new tea development and infilling of areas of old tea where deaths have occurred. Prior to this, most planting was from seed, so that genetic variation existed within the bush populations. By clonal selection, however, it is possible to identify clones with desirable properties such as yield, tea-making quality, resistance to disease, suitability for particular soil/weather conditions, etc. Breeding from selected clones offers further scope for improvement, although over a much longer timescale.

Plant nutrition, through the application of chemical fertilizers has produced dramatic benefits in plant health and productivity in recent years. The value of extra tea produced exceeded by many times the cost of applying the fertilizer. Chemical fertilizers were first used on tea in Tanzania around 1950 and application rates have been progressively increased from 50 kilograms of nitrogen per hectare at that time to 300 at present.

Weed control by chemical herbicides, introduced in the 1960s, brought further benefits, reducing physical damage to bushes and roots caused by manual weeding and allowing leaf litter to remain undisturbed as a mulch.

Harvesting of leaf, both by hand and mechanically, can have a significant effect on crop volume. Careful study of growth patterns and harvesting techniques and timing have again produced major productivity benefits.

I have covered here some of the main variables affecting tea productivity and quality, concentrating on those where major improvements have occurred in recent years. There are, of course, many other factors that the tea planter has to contend with that can effect the productivity and profitability of his estate.

From what has been said about the history of the industry here and the influence that agricultural inputs can have on the performance of the industry, it is clear that much scope for research work exists. At this stage, therefore, I will review the history of tea research in Tanzania as a background to recent developments and plans for the future.

4. Tea Research in Tanzania

Formal tea research takes place at four sites in Tanzania with additional field trials on commercial estates:

(i) Marikitanda, Usambaras; the first formal tea research in Tanzania started here in 1959 under the Tea Research Institute of East Africa. Little work took place on the first site but a move in 1967 to a nearby site having soils with low nutrient status provided a "zero base" situation for fertilizer and mulch trials. The station came under MOA control in 1979 but little new work was done for the next ten years due to lack of funds. Now a commercial grower provides some assistance with finance and advice.

(ii) Kifyulilo, Southern Highlands, formerly a German-owned small tea estate acquired by the government in 1986. Trials are limited by lack of funds and by the fact that seedling tea is used, so genetic variation in trial plots limits the value of results. However the site is useful in providing rain-fed conditions as experienced by smallholders and growers on the Mufindi escarpment and has extensive buildings useful for research.

(iii) Maruku, Bukoba Region, is a multipurpose MOA station in which tea plays only a small part, again affected by lack of funds, and most trials have closed.

(iv) Ngwazi, Southern Highlands, provides a useful "zero base" site for water studies because of its long dry season. First operated as a TRIEA station in 1967, carrying out trials on irrigation related to fertilizer, temperature and wind shelter. The site closed in 1970, but reopened in 1986, run by a consortium of commercial growers, ODA and the government to study optimum nitrogen and irrigation levels and later, clonal responses to irrigation. The station is now run privately by three major growers and produces high quality work, including fundamental scientific studies of plant behavior, albeit at high cost.

5. Relationship between Growers and Research Bodies

Whatever criticism may be made of the present research structure in the country, it should be remembered that the yields of major commercial growers have increased by approximately ten times from 1950 to the present day. Most of that increase arises from applying research findings on irrigation, harvesting, fertilizer and weeding. The findings may be in the form of direct recommendations through visits, field days and research unit reports or by way of handbooks issued by research units.

The experience with smallholders has been much less satisfactory and for two main reasons. Firstly there has been a lack of adequate machinery to spread the knowledge from research to smallholders and secondly, smallholders experience many social and economic pressures which cannot be solved by tea research. As a result, smallholder yields remain at levels which the commercial growers obtained in the 1950s, on average less than 500 kilograms per hectare against over 3,000 now being achieved by efficient commercial growers.

For many years growers have paid a cess to the TTA, a proportion of which was earmarked for research. Financial constraints, however, prevented TTA from playing an active role in either research or adequate extension services. Consequently, neither private growers or smallholders have benefited from this cess and the larger private growers have had to pay again to fund high quality private research at high cost. Also, the work has been carried out in isolation, since neither

TTA or the government has been able to provide the funds, so that the three government tea research stations could carry on complementary work in parallel with the private Ngwazi station.

To summarize the problems: lack of funding from government and TTA for the three government stations; lack of co-ordination between the stations; duplication of cost for the private sector with both cess and Ngwazi costs; lack of uptake of research findings by smallholders.

Despite the problems, it is well understood in the industry that continued research is essential to survival by maintaining a competitive position within the tea world.

6. Reform of Research in Tanzania

The problems were recognized by both government and the industry and finally, in 1993, an FAO-funded project to advise on tea research started work. Government and TAT are now collaborating on putting the FAO recommendations into practice. The initial steps which the two parties considered to be necessary are:

(i) Formation of an autonomous Tea Research Institute of Tanzania (TRIT) with both the industry and the government represented on the Board, to be responsible for all tea research in the country, funded by a part of the cess currently being paid to the TTA. Initially, this will be at 1.5% of sales proceeds.

(ii) Appointment of a senior, experienced Executive Research Director, through donor funding, and responsible to the TRIT Board for all aspects of planning, administration and execution of the work of the Institute.

(iii) An initial appraisal by the Executive Research Director of the research needs of the industry and the capabilities of the existing research units, followed by negotiations with the owners of these units and acquisition of those stations, assets and staff that are required.

(iv) Planning by the Executive Research Director of a program of research based on his appraisal of needs, agreement of the program by the TRIT Board and implementation.

(v) Establishment of links with other research and academic bodies, either by means of membership or possibly a management contract.

7. Participation, Financing and International Links

To summarize, the result of these reforms will be a research institute in which the MOA, all commercial tea growers, all tea packers and TTA are eligible for membership. Thus all tea growers will be represented, either individually or as smallholders under TTA. MOA through its membership will be able to guide tea research in order to achieve national tea policy objectives.

Financing of both capital and running costs will be by means of a cess on tea sales, with the result that all growers will contribute towards research in proportion to their production. Although the government will not contribute through the cess, it is expected that it will make an initial contribution to the institute in the form of the land and assets of the existing government tea research stations.

A major cost for the first few years will be the appointment of the Executive Research Director. Because of challenges in establishing the organization, a director will be needed with both senior research management experience and a distinguished research record. It is likely that such a person will be an expatriate and to meet this cost, aid funds are being sought.

Turning to international links, no tea research organization in a minor tea-growing country should operate in isolation. To do so is likely to result in much duplication of work being carried on elsewhere and to miss opportunities for synergies that may arise from collaboration. Collaboration may come from the appointment of another well-established research institute to manage TRIT, providing the Executive Research Director, carrying out supervisory visits and making available its own resources and know-how. Alternatively, TRIT may become a member of another tea research body to access its results or enter into an agreement to collaborate with such a body. Costs of such links are not within the provisional budget for TRIT but there is obviously a national interest involved and modalities for financing will need to be worked out between TRIT, the government and donors.

The problems of smallholders still remain. Many of them are outside the scope of TRIT and this paper and are matters for government policymakers. Finance, leaf transport, availability of fertilizer, deciding on which crop to use their labor, even deciding whether to plant tea are all matters which affect smallholders but which cannot be answered by research. They need an effective umbrella organization capable of conducting studies into the logistical, business and social issues and advising and persuading smallholders to adopt their recommendations. The same organization also needs to provide smallholders with ways of receiving and understanding research results, through experienced extension officers, through open days and through suitable literature.

The role of TRIT should be liaison with the smallholders organization, to establish their real research needs and working with their extension staff to find ways of providing smallholders with the results in a form they can understand and make use of.

8. Conclusion

The formation of TRIT is at an early stage. Many questions remain unanswered as yet. However, some clear goals can be identified. TRIT should be a small, cost-effective organization focused on research with minimum bureaucracy and low overheads. It should be autonomous, fully accountable to its members and free of external pressures. It should be capable of being financed by the tea industry, with assistance only in the areas of start-up costs and international collaboration.

In relating the history of the tea industry and its research experiences and plans in Tanzania, it is hoped that some parallels may be drawn that will help other sectors benefit in making policy decisions affecting research in their own areas.