

— FORUM —

**GETTING SERIOUS : THOUGHTS ON AGRICULTURAL RESEARCH
AND INCREASED SMALLHOLDER PRODUCTIVITY IN
SUB-SAHARAN AFRICA**

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(Received 14 November 1993; accepted 15 December 1993)

ABSTRACT

Increases in agricultural productivity are fundamental to the sustainable development of many African economies. While efforts are being made to provide more appropriate policies to encourage production, progress on technology development is disappointing. This is an area in which African science can, and must, make a greater contribution than in the past. Such an effort requires greater commitment on the part of African governments themselves, combined with improved focus and use of resources by African scientists.

RÉSUMÉ

L'accroissement de la productivité agricole est une condition sine qua non au développement soutenu des économies de la plupart des pays africaines. Tandis que des efforts sont faits dans le but d'encourager la production, le progrès dans le domaine du développement des technologies est décevant. C'est en effet dans ce domaine que la science africaine peut et doit plus contribuer que par le passé. Il faut plus d'engagement de la part des gouvernements africaines, combiné avec des objectifs précis et une utilisation des ressources par les chercheurs africaine.

AFRICA TODAY

Africa has many problems — poverty, disease, erratic rainfall and war are among them. In sub-Saharan Africa, these difficulties are compounded by growing evidence that a large number of rural families are unable to produce enough food for their own needs. This is a major break with experience. The

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The views expressed in this paper are those of the author and do not necessarily reflect those of the Rockefeller Foundation.

common assumption has been that, except in poor seasons, most smallholders can provide a reasonably adequate diet for their own families from their own production. Economic problems in the region have forced a growing awareness of the need for policy reform in Africa amongst many of the continent's policy makers. Often the results have included rising prices of services such as health and education, and also of food (Meller *et al.*, 1986; Eicher and Rukuni, 1993).

Smallholders need attractive prices and marketing services to encourage them to produce for the market. Several countries have begun to implement necessary changes, but the expected breakthrough of smallholder productivity has been mainly unimpressive. Two reasons for this phenomenon will be explored in this paper. Firstly (which will be expanded upon in following sections), the absence of suitable technology for more than a minority of farmers constrains the ability of smallholders to respond to improved policy environments. Secondly, higher prices put more cash in the pocket of the surplus producer - but take more from the pockets of families that cannot produce enough food for themselves. The poorest urban and rural families find themselves unable to afford food to meet the shortfall in their own production. In their scramble for survival, they are unable to devote sufficient attention to their land. A vicious cycle of increasing poverty results (Lynam and Blackie, 1992).

The data support this analysis. In most countries of the region, agriculture generates 30% or more of national GDP. The rural population is typically 80% or more of the total, but the daily calorie supply *per capita* is less than 2,300, barely above the minimum needed. Africa as a whole is one of the poorest areas of the world. Data from countries such as Malawi and Mozambique indicate critical levels of poverty amongst large sections of the community (World Bank, 1993). Solving the conundrum of raising smallholder farm incomes, while producing food at a price that the poor can bear, is essential to the peaceful development of the countries in Africa.

THE TECHNOLOGY GAP

African scientists have some remarkable achievements to their credit. For example, maize

is an important staple over much of the region. There is excellent (and often indigenous) research which has shown that it is possible to produce 10 tonnes or more of maize per hectare in the more favourable ecologies of the region. However, much of the agricultural technology available today is unsuitable for the more marginal areas where many of the region's smallholders live. There is little that science can offer the growing numbers of resource poor farmers who live in these areas, and who struggle to produce crops on depleted soils, with minimum inputs (Carr, 1989).

The superficially obvious solution is to encourage the poorest farmers to leave the land and move into the cities, creating opportunities for large farmers (or farms with modern scientific agricultural methods (for whom technology is available). But work is already scarce in towns, and the large cities in the region even now face growing levels of crime and intractable supply problems (especially of water as was made so evident during the recent drought periods in southern Africa).

The ancient, poor soils of much of the region cannot produce high yielding crops unless the soil nutrients are enhanced and replaced. In many smallholder farming areas of Sub-Saharan Africa, farmers traditionally maintain soil nutrients through shifting cultivation. But, once population densities exceed about eight persons per square kilometre (as in several major population zones today), the length of the fallow period is insufficient to allow an adequate build up of soil nutrients. The result is the mining of the soils - and declining crop yields. Smallholders know this and have tried to adapt to the circumstances of today. Unfortunately, their interventions typically delay, rather than arrest, the continuing decline in soil fertility. The green revolution will not happen in Africa until the potential for yield from improved varieties is matched by the capacity of farmers to put the necessary nutrients into the soil to support higher crop productivity (Blackie and Jones, 1993).

There are promising interventions. Trees are the traditional fertiliser of Africa. Tree ash is the basis of shifting cultivation. Tree roots reach down into the soil, well beyond the grasp of annual plants, to bring up and concentrate, the nutrients needed for plant growth. The leaves are often nutrient rich and quickly break down when

added to the soil. Leaf fall from *Faidherbia (Acacia) albida* has long been used by African farmers for improving crop yields.

The science of agro-forestry has developed as scientists learn how to manage trees sustainably in the changed circumstances of today's world. Researchers now know how to establish *Faidherbia (Acacia) albida* so as to get the benefits from falling leaf litter earlier than under natural establishment. Alley cropping, or the growing of trees as hedgerows within the crop, offers a non-destructive means for using trees to replace lost nutrients. Impressive yields have been obtained, even under farmer conditions, from a range of agroforestry experiments in Africa. The testing and refining of several practical management systems for agroforestry systems is underway - with the active interest and collaboration of farmers.

Yet, without careful management of the nutrient cycle, the continual removal of nutrients from the system will eventually deplete the rooting zone of the tree species and productivity will fall again. Agroforestry will need to be combined with improved nutrient cycling and management by farmers if it is to have a long term effect. African farmers will need inorganic fertilisers if they are to raise their productivity. But, like farmers in other regions of the world, African farmers should be able to exploit a combination of home produced organic fertilisers together with modest amounts of inorganic fertilisers to break through the soil fertility barrier. New agroforestry techniques offer considerable potential to assist in this process (Blackie and Jones, 1993).

Africa urgently needs technologies that can markedly increase the productivity of resource poor smallholders (Collinson, 1989). The agroforestry research described is illustrative of the type of work needed to release smallholder agricultural potential. Research needs to be based on a detailed understanding of smallholder agriculture, combined with thoughtful prioritization of possible interventions. Technologies will build on modern science as well as traditional wisdom. Careful attention will need to be paid to the many unanswered questions that will emerge as research progresses. None of these will happen unless there is a serious long

term investment in high quality African agricultural science.

MEETING THE CHALLENGE

Today's challenge is to generate a substantial increase in agricultural productivity from a predominantly rural population, dispersed over small farming units. The previous arguments suggest that this is not just a policy problem, it is also a technology one — and one of daunting dimensions. Vision, leadership, and determination are needed. Careful and correct prioritization of key constraint areas is required so as to select research opportunities that have the potential for making real impacts on smallholder productivity. Hard choices will need to be made in order to settle on those things that matter, and to ensure that sufficient resources are available to make progress possible.

African countries are poor - and they cannot afford large research services. Qualified and experienced scientists are few in number. Despite the evident importance of a productive agriculture in most, if not all, countries of the region, investments in scientific agricultural education have been largely donor driven. National support for agricultural education and research throughout the region is inadequate. Yet, despite these constraints, there are talented African scientists in post. Their needs, in order to undertake research, are often surprisingly modest. The support they get from their own governments is typically even more so. Research will not solve all the problems of Africa - but, without better technology, many of the problems will persist (Lynam and Blackie, 1992).

Research into difficult problems by its nature is slow otherwise research would not be necessary. Because resources are scarce, and the problems to be tackled are so large, the choice of the most appropriate research agenda is an essential component of African agricultural research policy. Today there are powerful tools that can be brought to bear on this critical analytical decision. But, as importantly, a minimum set of resources is needed both to do the work, and to provide evidence that governments themselves are truly committed to research that addresses smallholder problems. The provision of modest, but reliable operational

funds in a timely and efficient manner would be a major step forward in many instances. Agriculture is to do with growing, living things — and the agricultural scientist needs to be in the right place, and at the right time, to see what is happening. A delay of even a few days can cause the loss of a whole season's data.

Importantly also, national scientists need to be linked in to international science. The problems of African agriculture provide ample opportunities for fruitful collaboration with colleagues in neighbouring countries, and in overseas institutes. Without such bonds, it will be difficult to make sufficiently fast progress on the manifest difficulties facing African smallholders. Easy communication and travel by scientists both within their own countries, and internationally and regionally, would transform their capacity to produce results for African farmers (Blackie, 1989).

Enormous sums of money have been spent by donors in supporting agricultural research and education. Yet the waste is frightening as African scientists become discouraged and leave for more promising opportunities elsewhere. A strong indigenous cadre of scientists is essential to setting the appropriate research agenda. In its absence, there is inadequate guidance on the best interventions and approaches. The circle is closed as African governments ignore the need to build up their own scientific capacity, and rely on short term technical assistance — while the underlying problems of inadequate salaries and resources remain. Africa simply cannot afford to squander its resources thus.

HELPING OURSELVES

Yet there is more that African scientific community could do for itself. In many cases, a more rational use of existing resources would improve the focus or the productivity of research groups and teams. The management of funds and capital equipment often does not reflect their scarcity, with maintenance being poor and misuse frequent. It is difficult to persuade either donors or governments that anyone is serious about agricultural research in such circumstances. With better use of existing resources in many cases, national scientists have the potential in their own hands to start the job of producing better technology for farmers.

There is a need to build confidence in African agricultural science — which means a strong emphasis on quality and on focus. African scientists must set their own research agenda rather than passively accepting the demands of donors. The problems are urgent. There is no time for misdirected or poorly executed studies. All this requires serious commitment to delivering results to Africa's smallholders.

Africa can, and has to, do more to help itself. While funds and manpower are scarce, they are not so short (except in some of the poorest countries) that with effort, foresight, and determination, a critical mass cannot be assembled to work on the most difficult issues. If this is combined with a willingness to draw on the best of international science, and to collaborate with neighbouring countries on issues of common interest, major progress could become apparent quickly.

CONCLUSION

Africa has some of the most challenging agricultural problems on which to work. The opportunities, the resources, and the scientists can readily be assembled — often without needing an expansion of the government budget. There are ample examples of public sector waste on military and other expenditures that could quickly be channelled instead into high quality agricultural technology development. What is missing is a true appreciation, at the highest levels, of the costs of ignoring technology development, and of the opportunities that are available for the continent to break out of poverty.

In the end, the drive for well directed research will need to be articulated by the farming communities themselves. Researchers will learn to work with farmers to help them understand how to use research to improve their own conditions. Most importantly, African will direct and manage the effort to bring international science to the service of their peoples.

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