BOOK REVIEW

Starved for science: how biotechnology is being kept out of Africa

By Robert Paarlberg

Harvard University Press, 2008

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This is a well written book, which raises many issues about African agriculture, and the local iinstitutional environment for development. The author has written before about gGenetically mModified oOrganismss (*The Politics of Precaution*). In his latest offering, new book hhe develops the thesis that the changes in attitudes towards agricultural sciences in developed countries has led to a resistance towards further scientific advances in science in agriculture, especially if those advances are just seen as benefiting farmers only without an impact onand not consumers. This resistance and a distrust of regulators have led to strong opposition to GMOs in Europe, but not in the USA. Given Because of the greater importance of Europe to Africa for both trade and aid, this European rejection of GMOs has been co-optedeffectively been exported to by all African countries except South Africa. Consequently, the future growth of agricultural development in Africa is threatened.

There are four central premises of in the book, which I will discuss in turn.

1) There is underinvestment in agricultural science in Sub Saharan Africa;
2) Many African policy makers and NGOs have not supported science based agricultural development;
3) There has been an excessive regulation of biotechnology in almost all African countries;
4) This overregulation discourages donors from helping scientists obtain drought resistant cultivars for Africa.

Point 1) is not well defined and probably not true except for export crops (why?). Point 2) is very important and will be discussed in detail. Point 3) identifies the culprits blocking more additional biotechnology activities. – Nnot only is Africa systematically discouraged from developing their own GMOs, even imports of GMOs for food aid and trade are now being shut out. But is this a central problem presently for African agricultural development? Point 4) raises suggests again that the prospect of a simple scientific solution for African agricultural stagnation being is available but out there just beyond reach.

First, the economic definition of underinvestment is that the returns are very high and probably within reach with additional investment. The returns to agricultural research are measured by how much their product benefits farmers and consumers and then compared with the costs of the supporting agricultural research and extension infrastructure. There is a substantial economic literature on this. Paarlberg cites two studies with average rates of return for agricultural science of 22 and 30% (p. 85). These are very high returns, but largely because of awith a disproportionate effect from thefrom export crops.

Both donors and policy makers have become discouraged with the lack of success of African research establishments in obtaining high returns for the staple food crops. Here the performance has been poor despite some recent exceptions for irrigated rice and new corn varieties. In general, the gains from research in root crops, sorghum, millet, cowpea, and peanut performance have been negligible in spite of substantial funding and research efforts since the great drought of 1968–1973. As a result, donors and national policy makers justly consider the returns to investments in agricultural science very low in Sub

Saharan Africa. The basic problem, however, is not a lack of performance by researchers. Rather, the researchers' output does rarely makes it beyond not get off the research station.

The critical bottlenecks arelie in improvements in extension, input and product markets, and the capacity of farmer organizations to move the technologies for the staple cropss from the research station into farmers' fields. [1] This is where science and practical application need to be concentrated to get the backlog of accumulated technologies out into the fields. Once this is achieved, there will be more domestic support from both farmers and policy makers for increased investment in both basic and applied agricultural science.

The research and educational commitments from donors following the 1968–73 Sahel droughts were never expected to last 50 years, but tt it was not unreasonable to expect two decades of substantial donor investments to create self-sustaining research establishmnents comparable to those observed in Asia and Latin America.

This brings us to 2), which can be repackaged into two questions. Why do policy makers feel frustrated by their agricultural research establishments? And, why should we care about the particular perspectives of the many numerous NGOs with their countless objectives and modus operandi? The answers are related.

The principal institutional development emphasis in Sub Saharan African agriculture in the last four decades was has been on short term training (with the international agricultural research institutes) and long term education (US and European Uuniversities) for the national agricultural research institute personnel. Both short and long term training built up the human capital for staffing these national agricultural research institutions as well as other African or Africa-n related agencies.

There was, however, much less donor investment in the human capital of these extension services.[2] When the World Bank focused on investing in the national extension service during the 1980s and into the 1990s there was an increase of highly trained extension personnel and a series of improved institutional performance measures. Unfortunately, an enormous cultural divide in the respective scientific backgrounds of the extension and research personnel remained. In spite of many memoranda of agreement between the two, the extension services often maintained their preferences for indigenous varieties and opposed inorganic fertilizers and other chemicals.[3] This stance precluded their collaboration with the national research institutions in order to get new technologies onto the farm. The extension viewpoint was so influential that much agricultural research eventually became directed towards low input solutions. Given the widespread nutrient deficient soils, this was like asking poor people to improve their incomes by eating less.

After a bitter internal fight, the "extension first" focus of the World Bank was abruptly changed. This left national extension services in Sub Saharan Africa with enlarged staffs and decreased financial support. With national extension services generally unable to fire employees, almost all their funds were needed to support salaries, leaving them dependent upon some type of outside support to implement action programs. Into this vacuum stepped many NGOs, either implementing their own extension, contracting some of the national extension staff to work with them, or subsidizing activities of the extension service. So the NGOs had to be listened to as they became the principal players in the extension activity. Unfortunately, the agricultural experience of many NGO members often consisted of growing tomatoes in their back yards.

This takes us to 3), the importance of over regulating bio-technology. The choice of regulatory regime between the American (Is the risk similar to something already approved?) and the European (Prove that there is no risk) variants will go on for a long time. Both Americans and Europeans, however, distrust their regulators and both sets of regulators responded poorly to the mad cow threat. The lower American standards regarding the acceptable risk of complicated toxins, such as aflatoxin, will probably be raised towards the European standards in the future as medical and food science knowledge increases.

The influence of both NGOs and European donors in pushing against science based agriculture, however, is diminishing as their alternatives are clearly not working. The most important technologies to get onto farmers' fields are already developed and tested. These include the new cultivars, higher inorganic fertilizer levels, improved agronomy and water harvesting techniques for the low rainfall regions. While there remain various problems in getting these technologies in the field, there is nonetheless an increasing number of success stories.[4]

While concerns about hybrids and biotechnology can be pushed forwarddelayed for five or ten further years, there is an exception here for the region I work in. The West African cotton producers (especially Mali, Burkina Faso, Chad and Benin) will continue to lose world market share if they do not introduce Bt cotton (Vitale et al, 2007). Bt cotton replaces a large number of sprayings of frequently very dangerous and expensive insecticides. Paarlberg summarizes evidence demonstrating reduced

insecticide spraying as high as 40 to 60% for the four countries reporting significant use of Bt cotton (p.29). Monsanto has been working in Burkina Faso for the last three years and the Burkinabe are apparently going to release new Bt cultivars to farmers with this gene crossed into local material in 2009. One would therefore expect even the most rabid environmentalist to support these advances.

Point 4, drought resistance, is the Holy Grail of agricultural research. This search for drought resistance is such a romantic endeavor that we can reasonably expect donors to keep supporting it in the foreseeable future. It was an important priority in the Bean Program at CIAT (Iinternational Ccenter for Ttropical Aagriculture located in Cali, Colombia) when I started working there in 1976. This search has supported generations of breeders and physiologists. Yet researchers can not even give a consistent definition of its objectives. Is their source of drought resistance a response to early, late or mid season drought or is it an attempt to get some of the drought resistant characteristics (Paarlberg, p. 150) of semi arid cultivars such as sorghum and millet into maize or other plants? The private companies are especially secretive on their drought resistance research, giving it a mysterious, elusive quality. "We have it but we are just not going to tell you about it!" seems to be their motto (Paarlberg, pp. 161–163).

The main accomplishment of drought resistant breeding has been shortening the growing season especially with maize.[5] Unfortunately, when we improve the agronomic environment through water harvesting and inorganic fertilizer, we want plants that stay in the field longer to take advantage of this improved environment (Sanders and Shapiro, 2006). We need cultivars bred for this improved environment rather than the elusive super cultivar.

Even with this challenging of some of the its basic premises, of this book, *it Starved for Science* is nonetheless very good, thoughtful and well worth reading.

References

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Notes

1. In contrast with the food staples, cotton yields more than tripled in the francophone producing areas in the 1970s. For comparison of the cotton successes with other crops, see Sanders et al, 1996.
2. Large scale investment in basic education for the rural areas would also have been expected to facilitate technology transfers from the experiment stations.
3. Paarlberg elaborates on this opposition to new cultivars and inorganic fertilizer from various sources especially NGOs in Chapter 3.
4. For the development recommendations I draw on 26 years of agricultural experience traveling to the Sahelian region, as well as on our present extension program which had over 1,000 ha in new technologies of sorghum and millet in the three Sahelian countries of Mali, Niger and Senegal in 2008. To introduce new technologies for staple food crops it was necessary to confront the seasonal and good season price collapses, obtain price premiums, for a higher quality product, and exert bargaining power through farmers' associations. All of the above marketing strategies help raise profitability sufficiently to pay for higher input levels, i.e. the necessary inorganic fertilizer and the improved cultivars (for a discussion of the interaction of technology introduction and marketing strategies see Tahirou and Sanders, 2006).
5. This earliness search is not really drought resistance. It is drought escape. Drought resistant maize already has a name. It is sorghum.