PROS AND CONS OF AGRICULTURAL RESEARCH IN DEVELOPING COUNTRIES - A PROSPECT

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ABSTRACT

Agriculture research represents an excellent investment of public funds. The role of agricultural research in the economy and as a public sector investment is briefly discussed. The concept of research spillovers and their relevance to PNG and some success stories from PNG are highlighted in the paper.

***Key words**: Developing countries, empirical evidence, research funding, research approach.*

INTRODUCTION

Agricultural research represents an excellent investment of public funds. Investment in agricultural research is a critical step in improving productivity and generating income for smallholders (a large proportion of PNG population), and in lowering food prices for consumers. Most countries are under-invested in agricultural research and PNG seems to be no exception. From an *institutional* viewpoint, coffee research now seems to be on a sustainable footing and this may provide a model for the other export crops. Food crops are probably in need of a more concerted effort as they appear to have been relatively neglected in the past and they lack a vocal and coherent constituency.

PNG has access to a reasonable level of internally generated public funds and thus is in a better position than many countries to promote and fund agricultural research. The documentation of research success stories (as has been done in an earlier ACIAR project) can assist in making the case to governments for research funding. Careful targeting of research in terms of seeking high pay off opportunities, and focusing on research that is genuinely in the *public* interest, will also engender support for research funding.

As a small country, PNG should be seeking to profit from the research investments of other countries, including Australia, as much as possible. An appropriate structuring of personnel and funding is necessary if this is to be done successfully. A non traditional approach may be required and inhibitions regarding travel, communication facilities and journal subscriptions must be overcome. Within the same mode of sharing research results, a more regional approach to research, including other South Pacific countries and perhaps Queensland, should be considered. This need not imply sacrificing in - country research expertise.

1. THE ROLE OF AGRICULTURAL RESEARCH IN THE ECONOMY

While there remains an abundance of food in many parts of the world, the lack of purchasing power in many countries means that the problem is not simply one of food redistribution through trade. Trade in food must be linked to efforts to raise purchasing power of low income people.

Two basic strategies have been employed to raise income levels in developing countries:

- a capital intensive strategy focusing on rapid industrialisation
- an agricultural oriented strategy

Even if the first strategy is successful in the short term, it will eventually flounder due to a lack of food available at reasonable prices. This is so because any rise in incomes of poor people will quickly translate into increased demand for food. In the face of stagnant food supplies, a rise in food prices will act to slow economic development from industrialisation.

An agriculturally led strategy however, increases purchasing power of the poor. It does this through increasing the production of food - a labour intensive commodity to produce. The sheer size of the agricultural sectors in most developing countries

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ensures that technical changes in the agricultural sector will have important implications for the whole economy. Agricultural growth helps raise food access for both the urban and rural poor.

What then is the source of an agricultural growth strategy? Quite simply, it is improved agricultural productivity through research and infrastructure development. Increased agricultural productivity provides a combination of increased profits to landowners, increased demand for rural labour and lower food prices for consumers.

High values of the kina in international exchange rate markets result from a conscious 'hard kina' policy and from the effects of the high levels of mineral and oil exports. The high value of the kina makes it more difficult for rural producers in PNG to be internationally competitive. In this sense, agricultural development is hindered. However, there is also a positive side to the revenues from PNG mineral and oil exports. These revenues from the extractive industries provide a possible budgetary source for investment in rural infrastructure and research, as a means of capturing and preserving long run benefits from minerals.

Furthermore, investment in agricultural research provides a good mechanism for distributing mineral wealth to a substantial proportion of the PNG population. At present, much government budgetary support for agriculture is in the form of price supports for the tree crops. However price supports are not conducive to sustainable productivity increases of the type that result from technological improvement through research.

2. AGRICULTURAL RESEARCH AS A PUBLIC SECTOR INVESTMENT

Research expenditure is only one of many competing claims on the public purse. The limited capacity of many countries to generate any reasonable amount of public funds is happily not shared by PNG. Nevertheless, securing and maintaining domestic political support for public sector agricultural research is a fundamental issue for all national agricultural research systems. The performance of most governments in obtaining adequate levels of public investment in agricultural research have been poor. This is undoubtedly due in part to the lag time typically involved in observing a payoff to many forms of agricultural research. Although there are examples of quick payoffs, as in the spectacular example of oil palm research given below, more typical lags to 'full' adoption of agricultural technologies are in the order of 8 years or more from the completion of the research (Davis *et al.* 1987). Apart from the time lags, investment in research is risky and progress towards the objective can be nebulous, even with a research project that is ultimately successful. These factors may reduce the political attractiveness of investments in agricultural research, despite evidence of high economic return to such investments.

Another aspect of agricultural research concerns the issue of who should pay for it. There is a strong case for government funding, or at least facilitation, through levy collection or similar, for much agricultural research. This is because there is usually no mechanism available to withhold the benefits from agricultural research from potential beneficiaries. In turn, this implies that there is no incentive for those potential beneficiaries to pay for the research. Hence the role for government. However the benefits from some kinds of agricultural research can be captured exclusively (through patents and other mechanisms) by individuals who pay for it.

The difficulty comes with trying to identify when government sponsorship is appropriate and when it is not. When government drifts into funding what are more legitimately private sector research interests, this is economically inefficient in the sense of 'crowding out' the private sector. Furthermore, such research can be seen as a de facto subsidy to the private sector, thus weakening the case for government intervention in research which properly relates to the public sector. The point I am trying to make is that care must be taken to see that government sponsored agricultural research is genuinely in the public interest.

Specific recent data regarding levels of agricultural research funding in PNG were not available to the author, but Jarrett and Anderson (1989) claim that PNG was under invested in agricultural research during the 1980s. They based this conclusion on a comparison of the amount of research being undertaken in PNG compared with that of other countries. In addition, they also compared the value of agricultural output in PNG with the amount of research input being made. While Anderson and Jarrett's broad conclusion is probably valid, I question their conclusion that 'it would seem sensible to spend the scarse funds available for research and extension on enhancing the country's (PNG) comparative advantage in tropical tree crops and continuing to use the export revenue so gen-

erated to pay for some imports of preferred foods (p92). This conclusion does not seem well founded, relying upon a perceived desire by smallholders for cash income. However the economic development perspective outlined in the beginning of this paper hinges on the transition of subsistence agriculture into market driven agricultural production. With agricultural development, cash income is obtainable for food crops, not only from export tree crops. Failure to enhance food crop production in PNG, through research, will hinder development. The lack of an expressed demand for food crop research reflects primarily, a lack of an organised voice or structure in PNG for such a demand to be communicated. The relative dearth of food crop research over the years suggests to me that significant gains might be made in that area.

Empirical evidence, from studies in countries all around the world has shown that historical rates of return to agricultural research have been high relative to other investment opportunities, and are often in excess of 35%. These studies have used data both at the individual project level (see below) and at the commodity and agricultural sector level. In these latter cases, time series analysis has been used to disentangle the effects of research expenditure from production changes due to price and other changes.

These high rates of return from agricultural research might be contrasted with the low rates of return likely to be achieved with tree crop price supports that likely do no more than maintain the status quo. Considerable debate has occurred in the literature regarding the specifics of the calculations involved in obtaining rates of return to agricultural research. And there have been questions about why the public under investment is maintained in the light of the evidence. Yet the overall evidence that agricultural research represents an excellent investment (almost a pre requisite) to economic growth is persuasive in the extreme. Some specific examples of economic returns to research in PNG are presented in the next section.

3. SOME PNG SUCCESS STORIES

An ACIAR project in the mid 1980s entitled 'Priorities for Papua New Guinea Agricultural Research' undertook a range of activities including some calculations of economic rates of return to some cocoa and oil palm research in PNG. The cocoa part of the project focused on cocoa research from 1965 - 1980, a period when research costs were readily determinable. Expected yield increases based upon experimental (appropriately discounted) and farm level yields. All benefits were deemed to be captured by PNG, since prices to international consumers would not be expected to change as a result of extra production of PNG cocoa. Based upon conservative assumptions about yield, price changes etc., gains to PNG cocoa producers were calculated at 83m kina in 1987 prices. Details of the methodology can be found in Antony *et al*. (1988 a).

Much of the benefit from the research was attributed to cocoa hybrids. At the time of the calculations (1988), much of the expected benefits from the research lay in the future (up to the year 2000). It would be an instructive and valuable exercise to re-do the calculations in the light of information available today. I understand that the cocoa hybrids may not have lived up to earlier expectations. However, the original calculations were conservative in terms of anticipated yield enhancing effects.

The second example comes from the same ACIAR project source, and for another tree crop - this time oil palm. The research under scrutiny was the introduction under quarantine of the oil palm pollinating weevil in late 1980. The weevil was introduced into West New Britain in 1981. Following quarantine testing and release the weevil spread rapidly, negating the need for hand pollination.

Results and methodology are detailed in Antony *et al*. (1988 b). Results are more spectacular in this case. Research costs were low, and not only was there a yield enhancing effect on oil palm, but also a saving in labour costs for pollination. The benefit stream was not regarded as continuing past 1986 in the calculations although substantial benefits did continue to accrue. A net economic benefit of 89 m kina was determined. While it is possible that some overestimation may, in retrospect, have occurred in the case of cocoa, an underestimation is more likely in the case of oil palm.

These two case studies are selected 'success stories'. Clearly not every agricultural research project has a net economic benefit. However these examples are so overwhelmingly positive as to be able to absorb a large number of research project failures. Research, almost by definition, is a risky business, requiring a portfolio approach to management. One or two major successes can counteract many failures. This is not to say that failures should be condoned. Indeed every effort should

be made to avoid them, but some failures are inevitable.

4. THE CONCEPT OF RESEARCH SPILLOVERS AND THEIR RELEVANCE TO PNG

A research spillover can be regarded as a productivity increase in a country or region separate from the place where the research was originally conducted. Research spillovers are widespread but may have been underestimated as a tool of research management. Some concept of agroclimatic homogeneity will normally be involved in generating spillovers. Research spillovers may be achieved more or less automatically at low or zero cost (as with a biological control agent moving across the borders of a country, or a new plant variety being transported from one country to another). Alternatively, some adaptive research may be required to capture the potential benefit from a potential research spillover. The implications for a small country like PNG could be pervasive. Especially for the smaller crops, a refocussing on capturing benefits from research conducted elsewhere could have a far higher payoff than 'original' research conducted in PNG. Given the lack of 'critical mass' existent for many agricultural research activities in PNG and given various logistical and other problems associated with research here, such a approach may have much merit.

The practical implications for the way in which research is conducted here could be substantial. Information on what is happening elsewhere is of overriding importance. Contact with external research organisations is critical. Research expenditures may shift from on-the-ground experimentation to focus more on communication, through journal subscriptions and travel. Overseas development assistance money could be similarly targeted.

A more regional approach (especially incorporating the other South Pacific countries) would be an excellent practical example of profiting from the concept of spillovers. South Pacific countries have in the past resisted a regional approach to agricultural research. However they may not have been adequately informed of the economic costs involved. While the desire to maintain in-country research capacity is understandable and indeed, desirable, this could be achieved through research specialisation by discipline or commodity within a country, followed by a sharing of results between all countries.

The oil palm example given above is a classic case of how PNG might operate. The running on that research was apparently taken by Malaysian researchers, with the PNG component being largely to inform themselves of Malaysian activity and to check the applicability of the Malaysian results in the context of PNG.

A common problem with agricultural research around the world, but especially in developing countries, is the inability to retain good quality staff in research. The tendency to move good people out of the research stream into managerial positions is hard to resist. Yet a core of quality people in key research leadership positions is an essential ingredient in achieving a payoff. A scheme that has worked with some success in the NSW Department of Agriculture is to create a specialist high level scientist stream with monetary rewards commensurate with those of senior administrators.

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