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**THE POLITICAL ECONOMY OF FUNDING AGRICULTURAL R&D IN PAPUA
NEW GUINEA: A CASE STUDY**

By

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ABSTRACT

Adequate and reliable funding of agricultural R&D is critical for sustaining research activities. A breakdown in funding arrangements can be detrimental to the long-term existence of R&D organisation/systems. This paper first, reviews the trends in funding arrangements for agricultural R&D in Papua New Guinea (PNG) in recent years. Second, the paper explores the extent to which political influence affects funding arrangements for agricultural R&D in PNG in terms of a case study. Third, with insights from the case study, which are alleged to reflect the general nature of the way agricultural R&D has been funded in PNG, implications are assessed and suggestions are made about the need to diversify funding sources away from avenues that are dependent directly on political influence. The paper concludes with a brief summary.

Key words: political influence, funding agricultural R&D, cocoa and coconut.

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1. Introduction

It has been recognised that politics has always played a part in public agricultural R&D funding (Alston and Pardey, 1996). Whilst the types of influence may differ in different countries, these influences are likely to be more pronounced and frequent in small developing countries where there are frequent changes in the political hierarchy, mitigated by political instability than in large developed countries where governments usually are more stable.

In Papua New Guinea (PNG), public funding of agricultural R&D is an integral part of the national agricultural research system. This suggests among other things, therefore, that political influence at some point of transferring the earmarked funds is inevitable. Casual observation suggests that, as governments and commodity board compositions change, decisions regarding funding arrangements tend to be affected and research managers are often left to find solutions for short-term solvency and long-term sustainability of research programmes. Over time, political influences of this nature have become more predictable. In general, Eyzaguirre (1996: p. 5) captures this scenario as follows: ‘No national research manager in a small country needs to be reminded that his or her national research system operates in a climate in which the winds of political change can blow swiftly and, highly destructively.’ Under this likely scenario, it is crucial for research administrators to diversify their sources of funding away from ones that have direct political influence in disbursement of research resources (funds).

This paper is structured as follows: Section 2 presents a brief historical background of agricultural R&D funding policy in PNG. Section 3 reviews cocoa and coconut research funding. Section 4 explores the nature of political influence and assesses key issues and their likely effects and the long-term prospects for agricultural R&D. Section 5 presents some options that how research organisations can explore to ‘hedge’ against funding uncertainties of the kind that embodies some degree of political influence. The paper concludes with a brief summary.

2. Agricultural R&D funding in PNG

Until the 1980s, financing agricultural R&D in PNG was a responsibility of the National Government. Funds were allocated through the Agriculture Branch within the then Department of Primary Industries (now the Department of Agriculture & Livestock (DAL)). It is difficult to distinguish the break-up of these funds between research, and development and extension. The ISNAR (1982) report however estimates that 65 per cent of the total appropriation to the branch was allocated to crops research while the rest (35 per cent) went to the development and extension section. The former was allocated mostly to DAL’s experiment stations and sub-stations, which were strategically located in the major regions of the country.¹

2.1 Private funding of agricultural R&D

Little evidence exists of private firms investing in agricultural R&D in PNG. Even if they do exist, no attempt has been made in the past to collate the information, which would present

¹ These stations and sub-stations are now under the National Agricultural Research Institute, established in 1997.

meaningful interpretation of the magnitude of private funding of agricultural R&D in PNG. Evidence that does exist indicates three private firms funding agricultural R&D.

Firstly, Harrison and Crossfields; a UK-based company has been investing in oil palm research at Dami in West New Britain Province since the 1960s. The magnitude of this investment is difficult to obtain but, the structure of the industry is such (i.e., smallholders and private estate-based processors) that private participation in supporting research and extension is an integral part of the industry structure. In a recent survey of the oil palm industry, Koczberski, Curry and Gibson (2001) report that, smallholder contributions to oil palm research (Oil Palm Research Association) and extension (Oil Palm Industry Corporation) is matched by private companies. For example, smallholder farmers contribute K0.56 per tonne fresh fruit bunch and K3.50 per tonne fresh fruit bunch for research and extension, respectively (Ellingson and Burnett, 1998: p. 13, cited by Fleming and Yala, 2001: p. 129). The former is used by the Oil Palm Research Association while the latter is used by the Oil Palm Industry Corporation to carry out research and extension, respectively.

Secondly, Karkar Estates, who own and manage several cocoa and coconut plantations initiated the establishment of the Cocoa Black Pod Research Trust, in Madang Province and have partly funded some of the research undertaken.

Thirdly, Trukai Industries Limited (PNG), the biggest distributor of rice in PNG indicated recently that they have been investing in their own rice research for a number of years (Franklin, 2000). This was substantiated in a recent report in the *Post Courier* (June 2001) that in an ongoing agreement between Trukai Industries Limited and DAL, the former invests over K4 million on agricultural research. For example, scientists supported by Trukai Industries have established a laboratory in the Markham Valley, in the Morobe Province to combat one of PNG's serious insect pests, the corn stem borer (a grub that eats its way into the stem and husk of the maize plant, seriously reducing the size of the crop).

2.2. Public funding of agricultural R&D

Pardey, Roseboom and Anderson (1991) describe agricultural research expenditures in terms of 1980 purchasing power parity (PPP) for several countries of the world, including PNG. The figures for PNG, which are reproduced in Table 1, suggest growth in total research expenditure for agricultural research from 1971 to 1985, albeit slowing between 1980 and 1985. For example, research expenditure grew by 134 per cent between 1971-75 and 1976-80. Between 1976-80 and 1980-85 research expenditure grew by only 13 per cent. Figures provided by Pardey et al. also suggest slowing financial support for agricultural research in other regions such as sub-Saharan Africa and Latin America and the Caribbean. For PNG, a possible explanation may be that by 1980, export commodity boards began to establish their own semi-autonomous research institutions partly funded by commodity levies, thereby facilitating a reduction in public funded support for agricultural R&D.

Table 1
PNG public agricultural research expenditure

	<i>1971-75</i>	<i>1971-75</i>	<i>1981-85</i>
Total agricultural research expenditure (<i>millions 1980 PPP dollars per year</i>)	7.7	18.0	20.3

Source: Pardey et al. (1991).

The agricultural research intensity ratio², averaged over the 1981-1985 period for PNG was in the range of 1–1.5 per cent (See Pardey et al. 1999: Figure 7.4 p. 207). This is well above a large number of developing (less-developed) countries whose financing of agricultural research was at levels below 0.5 per cent of their agricultural GDP.

However, it is widely considered and argued that agricultural research in PNG has been under-funded (World Bank, 1981; ISNAR, 1982; Antony, Kauzi, Loh and Anderson, 1988; Jarrett and Anderson, 1989; Antony and Parton, 1991). Further, Jarrett and Anderson have argued that greater investment is needed in agricultural research, mainly in the export tree crop sector where PNG has had a comparative advantage.

The magnitude of public support varies between each of the major agricultural commodities, partly due to their structure and organisation. For example, the corporatised industries such as coffee and oil palm industries currently receive subsidies of about K10 million towards R&D and extension (Kannapiran, 1999).

3. A review of cocoa and coconut R&D funding in PNG

Initially, cocoa and coconut R&D in PNG was funded by variable industry levies and National Government contributions since the inception of CCRI in 1986 to 1992. International donor funding for cocoa and coconut R&D began in 1992. Since then cocoa and coconut R&D in PNG is being mostly funded by variable industry research levies, direct National Government funding, international aid agencies, and in recent years; income generated from cocoa and copra sales from CCRI commercial plantation operations and from sale of cocoa and coconut planting materials. This section examines the changes and evolving trends in these sources of funding.

3.1 Major funding sources

Figures 1 and 2 and Table A1 (Annex) depict the general trends in funding from industry commodity levies, direct National Government funding, funding from international aid agencies and CCRI between 1995 and 1999.

² Agricultural research intensity ratios are defined as the ratio of research expenditures to either the gross value of agricultural products or agricultural GDP (Alston et al. 1999).

Changes in the share of funds from 1995 to 1999 points to a declining trend in funding in nominal terms from industry commodity levies and overseas donors. Government funding has been fluctuating whilst funding from CCRI on the other hand has been (except for 1998) consistently increasing since 1995. For example, the proportion of funding from the industry commodity levies decreased from 22 per cent to 13 per cent between 1995 and 1999; external donor funding decreased from 52 per cent to 13 per cent; National Government funding increased modestly from 18 per cent to 19 per cent; and the CCRI contribution increased significantly from 8 per cent in 1995 to 55 per cent in 1999 (Figures 1 and 2).

Further, from 1995 to 1999 nominal funding from commodity levies and overseas donors decreased by 12 per cent and 75 per cent, respectively, while funding from the National Government and CCRI increased by 49 per cent and over 900 per cent. In real terms (1999 kina values), there were decreases in all sources except for CCRI (See Table A2). Some of the underlying reasons are highlighted below.

Figure 1: Proportion of funding 1995

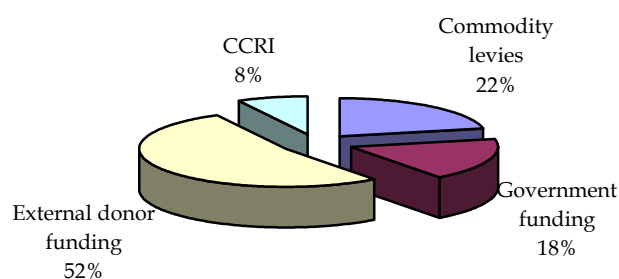
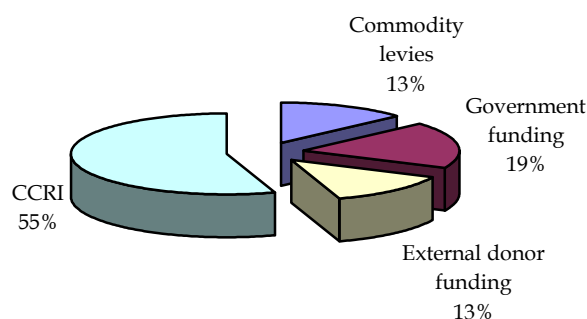


Figure 2: Proportion of funding 1999



3.1.1 Commodity levies

The cocoa and coconut industries or producers support research activities by a variable levy based on marketable tonnage of the crop produced. The levy from the cocoa industry is a fixed sum of K20 per tonne whilst that of copra was initially fixed at K2 per tonne but was increased to a fixed sum of K4 per tonne in 1997.

For copra, the Copra Marketing Board (Amendment) Act 1997 states that the research (extension) levy should be an amount ‘not exceeding 2 per cent’ of the per tonne producer price. This may be interpreted as any percentage equal to or below 2 per cent of the producer price. Whilst this implies an *ad valorem* tax on the producer price, in practice the levy has been fixed to marketable output. At current prices, 2 per cent equates to about K6 per tonne, and therefore the current rate of K4 per tonne for the copra industry complies with this regulation.

The size of levy receipts depends not only on the levy rate but also on the annual marketable volume of each crop. When production is high, levy receipts are relatively higher and vice versa. In the last twelve years, production for both crops has fluctuated markedly. As a consequence research levy receipts have fluctuated as well (Figures 3 and 4). In addition, price movements indirectly affect levy receipts. When prices are low, production tends to fall which in turn reduces the levy receipts.

An advantage of the current system is that the total R&D support is directly based on production, which does not fluctuate as much as prices. Therefore, there is greater certainty about levy receipts. However, when prices are relatively higher as has been the case in recent years, the current regulation cannot transmit any of these increases to R&D. For example, in the case of the copra levy in 1998, had the full 2 per cent of the producer price been used, the total copra research levy would have amounted to K1.2 million compared to the K497, 328.³ Further, only when the producer price falls below K200 per tonne (provided there is no increase in production to offset this), the total levy would be less than provided by the K4 per tonne rate. Producer prices for copra have averaged around K400 per tonne since 1997 when the rate was amended from K2 to K4 per tonne. The ‘not exceeding’ clause places an upper limit on research support from commodity levies in terms of the revenue share that can flow to R&D.

Figures 3 and 4 illustrate that the cocoa and coconut industries in general have contributed to cocoa and coconut R&D according to marketable output. There are divergences in some years due to delays in payment that were eventually made in the following year. This is more pronounced in Figure 4 because the Copra Marketing Board usually provided funds from its annual surplus to CCRI for R&D, in addition to the research levy, from 1995 to 1998.⁴ This extra provision in some way offset the difference described above.

In the five years, 1995–1999, these industries contributed an average of 23 per cent of total cocoa and coconut R&D funds (Table A1).

³ The Copra Marketing Board paid an additional sum from its surpluses thus bringing the total to 1 million kina.

⁴ The rest of the surplus was paid as rebates to copra producers based on their production in the previous year.

Figure 3 Cocoa exports versus research levies

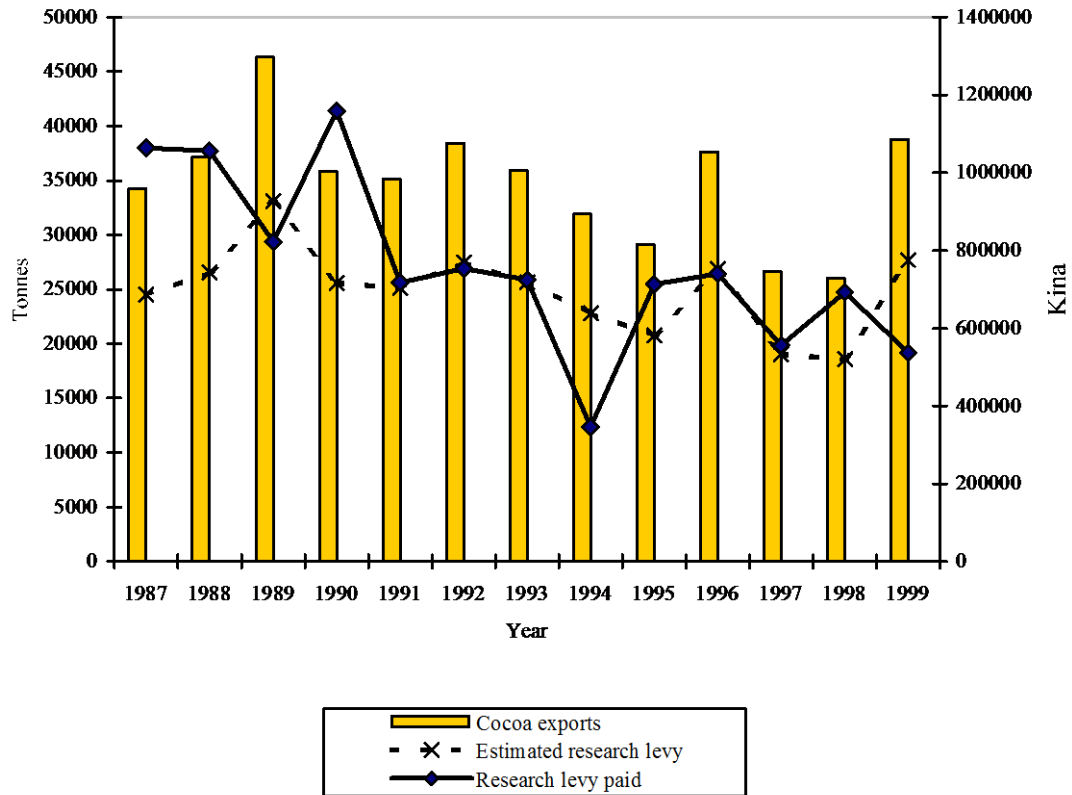
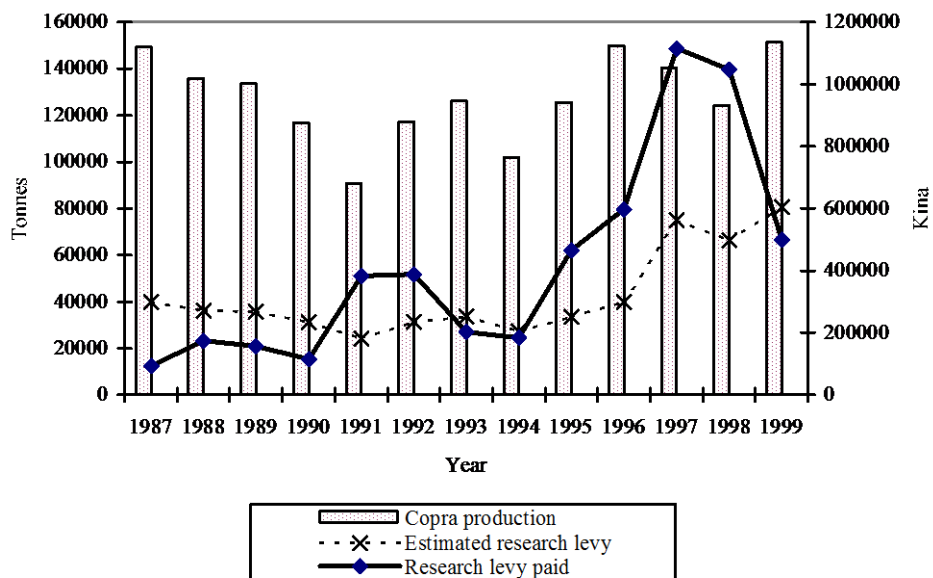


Figure 4 Copra production versus research levy



3.1.2 Direct National Government funding

From 1995 to 1999, direct National Government funding for cocoa and coconut R&D averaged 14 per cent of all cocoa and coconut R&D funding. Total public research funding (including other public funding) averaged 17 per cent per annum with funds allocated mainly as specific public investment projects. The share of public expenditure declined in nominal terms from 1995 to 1997 but recovered in 1998 and 1999.

The cocoa and coconut industries (Coulter, 1984; Turner, 1985) and PNG Rural Industries Council (Manning, 2000) have over the years proposed for a 'kina for kina' (matching grant) contribution from the government for agricultural research without success. The principle behind a matching grant is that, for every kina the industries contribute the government should match it up to a certain ceiling. For example, in Australia, the Rural Industries Research Act of 1985 facilitated for enabling legislation for establishing a research fund for any industry willing to impose a research levy on its producers, with a matching dollar by the Federal Government to a limit of 0.5 per cent of the gross value of production (GVP) in the respective industry (Alston, Harris, Mullen and Pardey, 1999). From a developing country perspective, Uruguay provides a classic example of where matching financial support from the government has been a success (Echeverría, Trigo and Byerlee, 1996). Industry contributions for cocoa and coconut R&D have exceeded government contributions. For example, between 1995 and 1999, the share of direct government funding for cocoa and coconut R&D was only 65 per cent of the industries' contribution (See Table A1).

In addition, National Government funding of cocoa and coconut research has fluctuated widely between 1995 and 1999. This may be explained firstly, by ongoing financial crisis faced by the government in the midst of a World Bank structural adjustment programme that began in 1994 and, secondly, by direct political influence (See section 4). Another plausible explanation given by Fleming and Yala (2001) is that, the National Government has yet to devise an appropriate funding strategy or formula on how it should fund agricultural R&D.

Whether relatively low investment by government is warranted or not depends in part on the characteristics of the cocoa and coconut R&D. Alston and Pardey (1999), for example, argue that agricultural R&D products may be a public good due to partial non-excludability and non-rivalry attributes but this does not mean that the whole country benefits and it does not mean that everyone in the country should pay. Much of the revenue generated from cocoa and copra production is from exports. Further, as PNG is a minor player in international trade of cocoa and copra, price-offsetting effects of quantity- and quality-enhancing R&D will be small. Hence, producers are likely to be the main beneficiaries of cocoa and coconut R&D. Accordingly, evoking the 'beneficiaries should pay' principle means their R&D contributions should dominate. This principle is based on fairness and the fact that it is cheaper to collect the funds from industries than through the public tax system (Alston and Mullen, 1992).

However, the government's financing of R&D and support for the tree crop sector in PNG stems from a welfare perspective (Gumoi, 1993; Omuru, Fraser and Burton, 1997). As majority of rural households in the country depend on these crops (coffee, cocoa, copra and oil palm) for their livelihood, supporting R&D for cocoa and coconut acts as a form of welfare. The recent commitment by the National Government to support coffee and copra producers with K10 million and K5 million, respectively to subsidise the current depressed prices is a case in point (*Post Courier*, December 2001).

3.1.3 International donor funding

Various international organisations have also invested in cocoa and coconut R&D in PNG since 1992. The Asian Development Bank (ADB) was the sole investor for cocoa and coconut R&D from 1992 to 1994. By 1995 the European Union (EU) through their STABEX Grants, began investing in cocoa and coconut R&D, the same in year in which ADB funding ceased. In the last seven years, the ADB and EU have been major investors in cocoa and coconut R&D in PNG. AusAID/Australian Centre for International Agricultural Research (ACIAR) have also become important contributors since 1998. Other minor donors in recent years include the Common Fund for Commodities (CFC)/International Cocoa Organisation (ICCO)/International Plant Genetic Research Institute (IPGRI), which have funded an international cocoa breeding project of which CCRI is a participant, and INCO, which is funding a coconut beetle control project. On average, these organisations have invested 34 per cent per annum of the CCRI's annual budget between 1995 and 1999. The relative share of their contribution, however, has been declining in both nominal and real terms since 1995, by 75 per cent and 83 per cent, respectively (See Table A1 and Figures 1 and 2).

Among the international donors, the EU has been by far the largest investor, contributing about K1.8 million per annum from 1995 to 1999. This equates to 91 per cent of total international funding in the same period.

3.1.4 CCRI internal

CCRI also generates its own revenue from its plantation operations and sale of cocoa and coconut planting materials.

In 1997, the plantations and planting material units of CCRI were given more autonomy to operate as commercial entities. The intention was to make them more profitable and efficient in the long term. Contributions from these two units have increased significantly since 1998. In 1999, the relative share of funding from the commercial operations of CCRI alone accounted for more than one-half of the Institute's annual budget (Table A1). Between 1995 and 1999, funding from these sources grew by over 900 per cent, contributing on average, about K1.7 million per annum.

Part of this success has come about as a result of having an efficient supply chain for cocoa and copra production. Some of the elements of an efficient supply chain suggested by Bridges (1996) and evident in the CCRI experience are: (i) enlarged scale of its commercial operations; (ii) formation of strategic alliances; (iii) maintenance of high production; (iv) continuity of supply; (v) control of quality; and (vi) clear communication channels. The purchase of additional plantations created economies of scale. Alliances were established and maintained with reputable exporters. Production from a large-scale operation ensured consistency in supply of cocoa and copra and planting materials. Product quality is an important consideration and the Institute continues to maintain the quality of its output to standards required by exporters and manufacturers abroad. Communication along the supply chain has been an important factor, involving plantation managers, exporters, and the CCRI R&D staff.

4. Nature of political influence

In PNG, political influence in funding agricultural R&D occurs at two levels. First, at the National Government level, and second, at the industry level. Assessments of the nature of the political economy at each level are presented next.

4.1 National Government level

In general, there has been growing uncertainty in the allocation and disbursement of public funds for agricultural R&D in recent years. A major reason for this may be alluded to the point raised by Fleming and Yala (2001), that the PNG National Government does not yet have an appropriate strategy to support agricultural R&D. Therefore the present *ad hoc* way in which these funds are allocated presents problems and are subject to political manipulation.

Despite common knowledge among politicians and bureaucrats that over 80 per cent of the country's population dwell in rural areas and most engaged in agriculture as smallholder farmers, this understanding is often given insufficient attention when financial commitments are made in regards to developing the rural sector through advancements in agricultural R&D. The lack of an appropriate funding strategy has led to funds being allocated to agricultural R&D in an *ad hoc* fashion. Further, when politicians are ill advised, the consequences can be detrimental to the provision of agricultural R&D on a sustainable basis. For example, in 1999 the government led by Mr. Bill Skate abolished recurrent government funding for most research institutions, including agricultural R&D organisations in the country. This created apprehension and uncertainty in research organisations and placed their long-term sustainability in doubt.

However, a change of government in July 1999 rescinded this decision and provided funding for these organisations including CCRI in a supplementary budget (*Post Courier*, September 1999). Further, the new government led by Sir Mekere Morauta is again making agriculture a priority area for funding, as expressed recently in the ACIAR–PNG Consultations on Agricultural R&D Priorities (Igara, 2000) in Port Moresby and the National Agriculture Council (Prime Minister's Keynote Address) conference in Lae (*Post Courier*, August 2000). Only time will tell if this commitment is genuine.

The lack of an appropriate strategy or formula to fund agricultural R&D has often resulted in intermittent financial commitment by whoever is government, and situation that often leaves R&D providers at the mercy of the 'tides of political change.'

4.2 Industry level

Figure 5 illustrates the procedures of collecting the research levies for the two crops. Off the K30 per tonne cocoa producers' pay as a management levy, K20 (two-thirds) is passed onto CCRI as a research levy whilst the rest is maintained by the Cocoa Board for its operations. The system is such that research levies are automatically deducted from the producer's gross income at the exporter's warehouse. The exporters then transfer the funds to the Cocoa Board, who should then pass it onto CCRI. Likewise for the copra industry levy, the Copra Marketing Board collects it from producers at their buying depots and transfers it to CCRI.

Until 1999, commodity levies have been disbursed using the procedure described above without problems. However, a trend began to develop in 1999 where disbursements of

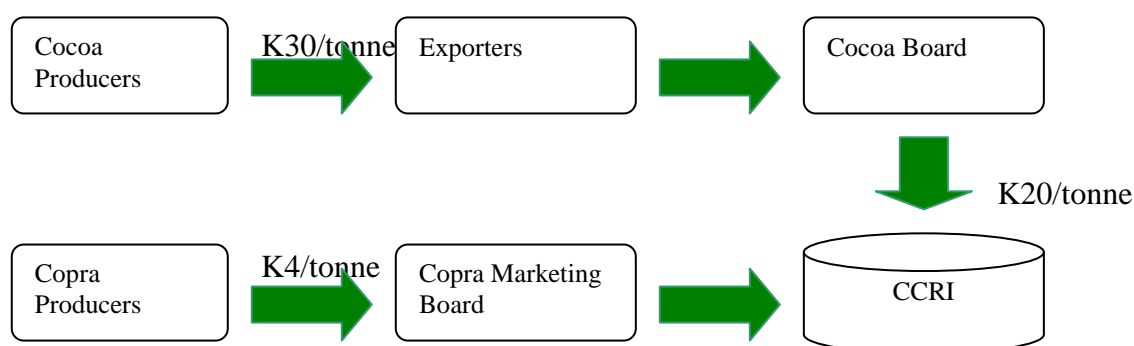
research levies have become more lagged than usual. By February 2001, CCRI was still chasing outstanding levies for 1999 and 2000 from the Cocoa Board and the Copra Marketing Board (Simon Tio, CCRI finance manager, personal communication, 2001).

Cocoa and copra producers have continued to contribute commodity levies, but the funds have not been transferred to CCRI as before. In some instances it has been alleged that the funds were redirected to fund the Boards' 'other' expenses (*Post Courier*, August 2001).

Since the funds are earmarked for R&D, for it to be used for its intended purpose, it may be necessary to transfer the funds directly to CCRI from the exporters. This would directly apply to the cocoa levy but another approach has to be suggested for copra, because the Copra Marketing Board is also the sole exporter of copra. For the former, at least the research levies are guaranteed to be transmitted without being misallocated and may also reduce the transaction costs entailed in its transfer by the Cocoa Board.

Figure 5

Procedures for Collecting Cocoa and Coconut Research Levies



The need for CCRI to become more self-reliant in financing its activities through commercial developments on its research stations arises from the uncertainty caused by inconsistent and unreliable government funding and the growing political economy of disbursing commodity levies. The latter has hampered the smooth transfer of funds to the Institute and, although negative in the short term, it has provided momentum to CCRI's attempts to diversify its revenue sources away from sources dependent on direct political influence.

4.3 Key issues

With the relative decline in the other sources of funding, combined with politicisation of public and commodity levy funding, the proportion of the Institute's own financing of R&D is likely to increase in the long term. However, this would also mean that research-induced technologies from CCRI are likely to take on more private good characteristics. Hence, institutes like CCRI may alter their R&D to accommodate changes in the R&D funding landscape. With the country currently in the process of privatising most of its public assets, semi-autonomous organisations such as commodity boards and R&D providers, are likely to

depend increasingly less on National Government funding. The possible consequences of these issues are explored in turn next.

4.3.1 Public good arguments

Several questions emerge as a consequence of declining ‘external’ funding and increase in CCRI’s share of total funding for cocoa and coconut research activities: With funding becoming more privatised, how should the innovative output be characterised and priced? How can farmers be encouraged to adopt these innovations if the cost is beyond their means? With credit already being viewed as a constraint to adoption of new innovations (Omuru, Nailina and Fleming, 2001), can such a change be sustainable? And would these changes be conducive to agricultural growth and development?

In a recent review of policy options for the export tree crop sub-sector (cocoa, coconut, coffee and oil palm) in PNG, Fleming and Yala (2001: pp. 130-131) outlined five plausible arguments for continuing public funding of a bigger share of research and extension activities:

- (i) There are social benefits that stem from effective research and extension, which producers cannot capture for themselves.
- (ii) Agricultural R&D has strong potential to contribute to the national development goal of poverty alleviation (CIAT, 1999). This is an important attribute given pervasive evidence of poverty among households producing tree crops (Gibson and Rozolle, 1998).
- (iii) Uncertainty and often long-term pay-offs from investments in research and extension, especially in rural areas of PNG, where the private sector has not matured, discourage funding in these activities. This causes socially sub-optimal levels of investment,
- (iv) Strong theoretical and practical cases can be made for public funding of food research and extension activities. Given that tree crop smallholders typically are also heavily engaged in food production, it is not possible to isolate their tree crop and food research and extension needs (Omuru et al, 2001; Koczberski et al., 2001). The research on intercropping is a case in point.
- (v) Any process innovation in the tree crop industries that lowers the unit cost of production is likely to yield secondary benefits elsewhere in the marketing system, creates greater employment opportunities and increase government tax revenue (Jarrett, 1985: p. 14).

Under circumstances where new innovations take on more private good characteristics and are priced as such, the cost to the cocoa and coconut farmers could be high. For example, the surveys conducted by Omuru et al (2001) report that 85 percent of the sample could not use chemical inputs (fertiliser and herbicides) because they were ‘too expensive’. Further, the CCRI board felt that the price of the new hybrid cocoa clones initially priced at K0.80 per budding was perceived to be costly. Hence the writer was requested to review the pricing formula with the intent of revising the price downward (Omuru, 2000). This has been a contentious issue because cocoa farmers feel, as expressed by their representatives on the CCRI Board that the price is too high and therefore should be lowered but CCRI management aims to generate extra revenue it needs to cover recurrent budget shortfalls. This brings into light the issue that if cocoa producers partly fund research through commodity check-offs, should they be charged again for the ‘fruits’ of their investment? It was therefore suggested in

the review by Omuru (2000) that the CCRI Board has to have a clear policy position on the sale of planting materials: whether the planting materials should be sold at 'production cost' or generate income, hence a certain level of mark-up. The former is based on public good arguments. For example, the growers have already (partially) paid for production of the technology through research levies. Hence to pay the additional charges is like 'double charging' them. The latter is mainly based on intellectual property right and solvency arguments. The property right argument emanates from the perception that the additional income can be used to do further research, to find improvements in the technology. In this way the industry still gains, because the gains are 'recycled' within the system, as opposed to the case where the plant breeder owns the right and the proceeds go to him/her.

4.3.2 Maintaining intellectual capacity

Competitive remuneration and a stable research environment are two important factors in attracting and maintaining a pool of qualified and experienced researchers in an organisation. Accumulation of institutional capacity in the form of knowledge and expertise facilitates quick and appropriate responses to research problems when they arise (Wright and Zilberman, 1993). However, the reverse is also true: poor remuneration and uncertainty within the research environment can force researchers out of an organisation.

Abolishing of recurrent public funding to the Institute in 1999 created uncertainty amongst both national and foreign research scientists.

CCRI accords high priority to training of national research scientists hence a lot of resources, time and effort have been committed to training them. The Institute aims to train its research scientists to the highest academic and practical level of MSc/PhD degrees, thus improving the capacity to provide the technical expertise, stability and sustainability necessary for PNG's agricultural future (CCRI, 1998b). This is illustrated by the increase in the number of local research scientists obtaining postgraduate qualifications since CCRI's inception fifteen years ago. By 2000, eleven of 16 national scientists at CCRI had acquired postgraduate qualifications compared with only one of 11 a decade earlier (Table 2). The former have acquired these qualifications whilst employed by the Institute. In addition, those undertaking research for PhD degrees are enrolled at overseas universities but the field research is closely linked to research conducted at CCRI. Thus, important industry problems are addressed by the training degrees. Three PhD degrees have been awarded through this 'sandwich type' programme since its inception in 1995. These tailored arrangements make the current national research expertise a scarce resource for cocoa and coconut R&D in PNG.

However, these investments can be jeopardised by inadequate or unreliable funding, and may render an intellectual capacity crisis in agricultural R&D organisations in PNG.

Table 2
Numbers of Research Scientists at CCRI, 1990 and 2000

<i>Qualification</i>	<i>1990</i>	<i>2000</i>
BSc.	10	5 ^a
MSc/MA	1	8 ^b
PhD	0	3
Total – local	11	16
Foreign	5	6
Total – Local and Foreign	16	22

Notes: ^a Two of these scientists were enrolled for MSc studies.

^b Two of these scientists were enrolled on PhD studies.

5. Options for sustainable agricultural R&D funding

There are two possible options that need to be explored by the agricultural R&D system in PNG. Firstly, there is a need to diversify or explore other revenue generating avenues from within each R&D organisation and, secondly, propose or lobby the National Government for enabling legislation for an appropriate strategy to fund agricultural R&D. These issues are examined below.

5.1 Diversification of R&D revenue generating sources

Unpredictability of the political environment in PNG and uncertainty in disbursing R&D levies by the commodity boards on a timely basis should stimulate research managers and administrators to prudently plan their finances and to identify alternative sources of funding.

Diversifying agricultural R&D revenue sources is an option that needs to be explored. The acquisition of three commercial plantations by CCRI in 1998 is a case in point. This investment has proved worthwhile; especially in providing support to CCRI's cash flow in 1999 when recurrent public funding which accounts for about 14 per cent of the institute's annual budget was abolished by the government led by Mr. Bill Skate. The contribution by CCRI commercial plantation operations continues to provide financial support to the Institute since then.

However, this is likely to have policy implications because, with agricultural R&D funding becoming more privatised, research output may take on more private good characteristics. Under these circumstances, institutional reform may be inevitable.

There are additional commercial opportunities, which CCRI has yet to fully develop. These include the production and sale of publications or information, conducting cocoa and coconut management and training courses, providing contract consultancy services (e.g., NARI), and creating an exporting company to export its cocoa and copra directly.

5.2 Public agricultural R&D funding strategy

The point raised by Fleming and Yala (2001) about the National Government not having an appropriate strategy or formula to fund agricultural R&D is worth exploring.

For many years, agricultural R&D funding has been appropriated on an *ad hoc* basis. Therefore it has fluctuated over the years and at times intermittent. However, had there been enabling legislation for an appropriate strategy on how these funds were to be allocated, there is likely to be consistency and predictability in its allocation and distribution.

6. Conclusions

Politics has always played a part in influencing allocative decisions for agricultural R&D resources (funds) in both developed and developing countries. These influences are more frequent in small developing countries where governments usually are unstable and lack institutional arrangements that enforce timely distribution of designated R&D funding, than in developed countries.

This paper examined the extent to which politics influences funding and disbursement decisions for agricultural R&D funds in PNG. In particular, the case study focussed on the political economy surrounding cocoa and coconut R&D funding in recent years, from which conclusions were deduced about the likely effects for the provision of agricultural R&D in PNG. Further, this paper pointed out two levels – National Government level and the industry levels at which allocative decisions are affected and described the extent to which these influences have affected cocoa and coconut research provision. The scenario described in the case study reflects the general trend in which political influences in allocation of agricultural R&D resources has flourished in PNG in recent years.

This raises the need for agricultural R&D providers to diversify their sources funding away from sources where there is direct political influence. This approach however, means that R&D outputs take on more private good characteristics and therefore raises questions for public good arguments in R&D provision. Further, political influences in hampering allocation and disbursement of agricultural R&D funds render uncertainties among R&D providers with the potential to jeopardise investments in intellectual capacities of agricultural R&D organisations.

Two possible options were proposed as ‘hedging’ mechanisms against political influences. Firstly, there is a need to diversify or explore other revenue generating avenues from within each R&D organisation and, secondly, propose or lobby the National Government for enabling legislation for an appropriate strategy to fund agricultural R&D.

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Table A1
Major sources of funds for cocoa and coconut R&D in Papua New Guinea

	1995	1996	1997	1998	1999	<u>5-year Average</u>	
	(Kina)					(Kina/year)	(%)
Total commodity levies	1 178 905	1 338 541	1 681 236	1 739 797	1 036 786	1 395 053	23
<i>% share</i>	<i>21.6</i>	<i>24.5</i>	<i>29.4</i>	<i>25.4</i>	<i>13.3</i>		
Total Public Funding	979 710	841 346	1 249 187	793 400	1 459 800		1
064 689 17							
<i>% share</i>	<i>18.0</i>	<i>15.4</i>	<i>21.8</i>	<i>11.6</i>	<i>18.7</i>		
Total International funding	2 865 921	2 311 203	2 213 928	1 696 160	1 014 549	2 020 352	34
<i>% share</i>	<i>52.6</i>	<i>42.2</i>	<i>38.7</i>	<i>24.8</i>	<i>13.0</i>		
Total CCRI	422 939	979 925	577 611	2 619 802	4 312 855	1 704 757	26
<i>% share</i>	<i>7.8</i>	<i>17.9</i>	<i>10.1</i>	<i>38.2</i>	<i>55.1</i>		
Grand Total	5 447 475	5 471 015	5 721 962	6 849 159	7 823 990	6 262 720	100

Source: Audited account reports, CCRI.

Table A2

Nominal and real growth in cocoa and coconut R&D funding, 1995 – 1999

<i>Nominal (kina/millions)</i>					
<i>Year</i>	<i>Commodity levies</i>		<i>Government</i>		<i>Donors</i>
1995		2.71	0.98	3.82	0.42
1996		2.75	0.84	1.59	0.98
1997		1.86	1.25	4.93	0.58
1998		1.58	0.79	1.49	2.62
1999		1.04	1.46	0.71	4.31
<i>1990-1999</i>	<i>Growth (%)</i>	<i>(-18.1)</i>	<i>(+1360)</i>	<i>(-14.5)</i>	<i>(+573.4)</i>
<i>Real (1999 kina terms/millions)</i>					
1995		1.79	1.48	4.35	0.64
1996		1.82	1.14	3.13	1.33
1997		2.19	1.63	2.88	0.76
1998		2.00	0.91	1.71	3.01
1999		1.04	1.46	0.71	4.31
<i>1995-1999</i>	<i>Growth (%)</i>	<i>(-41.9)</i>	<i>(-1.4)</i>	<i>(-83.7)</i>	<i>(+573.4)</i>