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**COVER ILLUSTRATION**: growing of rice at Garaina in Morobe Province.

# SPECIAL ISSUE
# CURRENT TOPICS IN AGRICULTURE IN PAPUA NEW GUINEA

Proceedings of the Consultative Seminar
on
Agricultural Reforms and Delivery of Farming Services
to Papua New Guinea Villages
15 - 17 March 1994

DAL PRINTSHOP, HOHOLA, PORT MORESBY

**INFORMATION AND PUBLICATIONS**

# PREFACE

The papers contained in this volume constitute the Proceedings of a Consultative Seminar on Agricultural Reforms and Delivery of Farming Services to PNG Villages, held in Port Moresby from 15 - 17 March, 1994.

The PNG Journal of Agriculture, Forestry and Fisheries took the initiative to publish the Proceedings of this important workshop which is likely to determine the future directions of Agricultural Development in Papua New Guinea.

It must be admitted that in view of the variety of subjects discussed ranging from extension at village level to research at the frontiers of science, it was not possilbe to exercise uniformity in scientific standards and presentation. In some cases the authors failed to respond to queries or submit revised papers. Attempt has however, been made to bring into focus the current issues facing agriculture in PNG. These issues need to be discussed and debated by all concerned rather than becoming a part of the grey literature.

We would like to express our thanks to the authors for their contributions. The manuscripts submitted on diskettes were especially useful. The design and layout was done by Jackson Kaumana. The typing was carried out by Betty Aiga and Pukari Lora.

Editor-in-Chief

# WORKING FOR A BETTER TOMORROW FOR AGRICULTURE IN PAPUA NEW GUINEA

Honourable Roy Evara[1], MP.

Acting Secretary For Agriculture and Livestock, Mr Miri Setae, Honourable Guests, Ladies and Gentlemen:

It is indeed a very great pleasure for me to be with you this morning, not only to welcome you to this most important seminar but also to deliver the opening address. My task here is to outline some of my basic ideas, concerns and opinions in quest for a better tomorrow for Agriculture in Papua New Guinea.

I hardly need to remind the audience of the central importance of agriculture in the economic and social development of our country. It has always been and will continue to play a pivotal role in the provision of food, employment and income for over 85% of our population. Indeed small scale farming provides household incomes and preserves our cultures as well as ensuring social coherence in the society. Agriculture is the only resource renewable year after year.

The Agriculture sector currently accounts for 25% of formal employment. The proportion of GDP generated by agriculture has fallen during the 1990s from 19% to 15% as a proportion of total exports (about 3% per year) and rural sector employment has dropped by an average of seven percent. Meanwhile the importation of agricultural products (constituting mainly food and livestock) has increased from 26% to 34% of the total volume of trade during 1985 to 1989 and in the first half of 1990.

Seventy-seven percent of the agricultural export income in 1990 was spent to import other agricultural products (mainly food and livestock). These imports discourage agricultural sector expansion as it deprives the opportunities for domestic job creation and therefore keeps many of our people in perpetual unemployment. There is hardly any justification in spending some sixty million kina a year on the import of livestock products and a similar amount on rice alone.

Investments have to be made now in institutional development, technical skills acquisition, appropriate scientific research, market development and communication networks.

This is not a task, for some vague time in the future, ten or twenty years away when mineral and energy resources are exhausted.

If farming becomes uneconomical and unsustainable, the farmers would have to pack up and flock to the cities in search of non-existent work and other necessities of life, thereby increasing urban drift and the associated social problems. There is therefore, the need for sector modernisation, expansion and diversification of agricultural production to provide a long term sustainability and a continuing high level of employment. Dependence on few tree crops is clearly economically dangerous. For example, in July 1992 coffee prices dropped by 6% to the lowest price for 20 years. Yet there was so much of unsold coffee globaly that many major producers were unable to find buyers.

In order to increase the opportunities for employment, rural production and family incomes, a number of key constraints, need to be addressed. The major constraints include those related to improving the delivery of agricultural services and rural infrastructure, manpower development and equity in smallholder activities, expecially the lack of support services and rural credit. I therefore believe that revitalisation and consolidation of the agricultural sector can only be achieved through specific policies and strategies geared towards a better tomorrow for agriculture in PNG. For this purpose the overriding priority is to strengthen the delivery of agricultural services, focussing development at the district level. The small scale farmer must be the focal point and all strategies and policies must be geared towards increasing his productivity, living standard, market access, easy availability of relevant information etc. We would be hearing more about these in the seminar in the next couple of days.

Having made the above points I would now wish to

[1]The Minister for Agriculture and Livestock, Papua New Guinea

dwell briefly on my vision of the transformation of Agriculture in Papua New Guinea - to take care of domestic demand and substantially increase our share in the international agricultural trade. Here I would wish to see technological transformation of Agricultural Sector in PNG.

PNG should reap gains of new agriculture technologies without repeating the mistakes of green revolution in Asia. We must use modern technology in promoting sustainable agriculture consistent with minimum damage to our environment. The chief elements of technological transformation for agriculture are: mechanical tranformation, biological transformation, chemical tranformation and institutional (organizational) transformation.

The United States of America with large land areas has made great strides in mechanising agriculture which has made her the largest agricultural exporter in the world.

Japan with severe land pressures has pursued biological transformation which involves genetic improvement of crops and livstock to obtain higher stable yields per hectare.

Both countries have extensively used fertilizers augementation which is an example of chemical transformation. The question of biological fertility is also being seriously researched.

Organizational transformation requires rearrangement of our resources for optimum agricultural production and its distribution. This involves changes in mental attitudes and management methods and styles, changes in farm organization as well as changes in macro-institutional arrangements.

The million dollar question is who would in PNG generate, on a sustainable basis, technologies sufficiently adapted to local agro-ecological conditions. This function has so far been solely carried out by the Department of Agriculture and Livestock with a number of experimental centres throughout PNG. As I can see from the programme a National Agriculture Research Institue (NARI) is on cards to presumably carry out technological transformation of existing agriculture in PNG.

While we would provide all the assistance we can in establishing NARI, the performance of such institutes is as a rule unproductive and ineffective. The international Agricultural institutes are somewhat better given the massive resources at their disposal.

Should we in PNG not be bold in institutional innovations for Agricultural Research? Should we not go in for Postgraduate Agriculture Universities which have proved extremely successful national agricultural research systems wherever they have been established? The USA has moved from one (1) land grant university in 1875 to the present network of 75 such universities. The work of these universities has made United States the most successful agricultural country in the world.

The large Wageningen Agricultural University established in 1918 has made Netherlands world's third largest agricultural exporter. Similarly agricultural universities in Denmark, Norway and Sweden have made great contributions to successful agriculture in these countries.

Nearer home India has moved from two (2) agricultural universities in 1960 to 26 today. These universities together with the Indian Council for Agricultural Research have contributed immensely to on-farm adaptive research and made India a net agricultural exporter. Even the Indian Agriculutral Research Institute is a degree granting institution.

Ladies and gentlemen, Agriculture is a dynamic enterprise and we cannot rest on what we have achieved. Modern science and technology provides us tools to effect continuous improvements for the welfare of our farmers and our nation cannot afford to lag behind. We must have innovation which is a culture of continuous scientific change to attain and sustain economic well-being. Our long term prosperity depends on lifting the performance of all areas of agriculture and livestock using science and technology as the tools. For this purpose a vigorously functioning Agriculture University would serve as a catalyst considering the fact that we are in a stage of development where we don't even produce our own veterinary doctors and scientists.

# MANAGEMENT OF AGRICULTURE SECTOR IN PNG ECONOMY

Flora Carruthers[1]

***ABSTRACT***

*To ensure and achieve a sustainable economic growth on a medium to long term basis, a macro - economic framework defined as an intergrated policy stance with respect to the budget, monetary management, foreign exchange reserves and prices, needs to be in place. To establish a firm foundation with a sustainable long term, broad based, economic management, the interactions between prices, wages and exchange rate are to be carefully balanced. Emphasis on the manipulation of these instruments must take into consideration any side affects that may occur.*

***Key words:*** *Sustainable economic growth, macro-economic frame work, monetary management, foreign exchange reserves, economic management.*

The goal of economic management is a sustainable, medium to long term economic growth. Towards this end, the Government uses a macro-economic framework defined as an integrated policy stance with respect to the budget, monetary management, foreign exchange reserves and prices.

Since independence Papua New Guinea has maintained:

- an open economy with sufficient foreign exchange reserves to promote sustainable medium term economic development;
- a stable and easily convertible currency and a perception by the public that the Government and the Bank of Papua New Guinea are committed to maintaining such a policy;
- a stable level of inflation (CPI), interest rates and exchage rates; and
- the support of international agencies and prospective donors.

The main impediments to a sustainable medium to long term economic developments are:

- a very high cost structure that impedes the international competitiveness of the formal non-mineral sector;
- a regulatory system that complicates and discourages private sector investment in the non-mineral sector;
- a large public sector, which allocates a disproprotionate amount of resources to low priority administrative services, and
- a low level of expenditure on education, health, physical infrastructure and economic development, and a lack of commitment to systematically redirect public expenditure to these priority areas.

To establish a firm foundation on which a sustainbale long term, broad based, economic development plan could be based and progress towards achieving the ultimate goal of economic policy and management sustained broad based growth for the continuous increase in the stand of living for the majority of the population, parliament last week approved an emergency package of economic measures to correct an imbalance in the macro-economic framework resulting from divergent growth rates between revenue and expenditure in the past five (5) years. Expenditures, especially re-current expenditures continuously exceeded the Appropriation Bill, resulting in an accumulated excess expenditure for the last five (5) years of K415 million, 7.0 percent of the total grown by K606.9 million since 1989, and increase of 66.4 percent at an average growth per annum of 10.7 percent. Most of the growth in expenditure was on current activities and it cannot be anticipated that such outlays will increase the future

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productive capacity of the economy.

During the 1989 to 1993 period Government revenue fell short of the Budget estimates by K225.1 million, an average annual shortfall of 4.2 percent. During the same period, total revenue grew by 45.2 percent, an annual rate of growth of 7.7 percent.

The result of the over expenditure and the underestimation of revenue was a substantial deficit of K768 million, of which only K306 million was planned at the time the respective budgets were presented. K461 million of the aggregate deficit was unplanned; all of which were financed domestically.

The domestic financing needs of the Goverment of around K800 million in the last five (5) years represented vast injections of liquidity into the domestic monetary system, and put a burden on monetary management to ensure the stability of the economic and financial environment, prices, interest rates and exchange rates.

The emphasis put on monetary managment to correct uncontrolled fiscal stance constrains the instrument for macro-economic management.

In 1993, there was an actual inflow of K260 million into the MRSF. There is no doubt that this inflow into the MRSF in 1993 could have and should have been used to reverse the expansionary fiscal stance of the Government in the previous four (4) years, and re-establish a macro-economic framework which was sustainable in the long term and conducive to the development of areas such as agriculture.

There is also no doubt that the most pressing and immediate problem the country faces is productive employment and income generation for the growing labour force, the unemployed in the urban centres, and the underemployed in the rural areas.

It is estimated that over the next fifteen (15) years the number of new entrants into the actual labour force will be around 52,000 per annum. Assuming that in the short to medium term a major structural change in the formal and informal sectors does not occur, but that the formal sector expands at a rate that will maintain its relative share of employment. Every year 10,000 new entrants will have to be absorbed into the formal sector and 42,000 will have to find productive employment in the informal sectors. This is a mammoth task given that formal sector employment growth has been stagnant since independence.

Papua New Guinea's structural weaknesses require a two-tier approach of the development agenda. In the short to medium term, the emphasis should be on a concerted effort to ovecome the structural weaknesses, while continuing to utilise existing establishments and enterprises to enhance growth in activity in the non-mining private sector. In the long term, the removal of some of the existing weaknesses will allow the introduction of more diverse industrial activities and a substanital increase in local participation to support a more equitable distribution of income and accumulation of wealth among the population, **the main source of which is land.** For the foreseeable future, agricultural development will provide the most promising opportunities for productive employment and income generation. The country has abundant fertile land, excellent climatic conditions, and vast forestry and fisheries resources. Village and smallholder agriculture and forestry and fisheries development can support a steady increase in the standard of living of the more than 80 percent of the population who live in the rural areas and can absorb most of the new entrants to the labour force. But this will require a large investment in physical infrastucture, to improve access to markets and social services, thus making village life more attractive to the better educated in the labour force. It will also require a large investment in intensive cultivation systems that offer higher incomes and job satisfaction. I will just note here that the existing landownership and tenure system, that secures to some extent an equitable distribution of income and wealth, has posed difficulties for the utilisation of land for community use and economic development.

The contribution to GDP of the agriculture, forestry and fisheries sector is around 30 percent. It provides productive employment and income opportunities for 980,000 people, 84 percent of the labour force, of which around 40,000 are in the formal and 940,000 in the informal labour sectors.

In the short to medium term the *only* solution to the problem of generating broad based economic growth that benefits the great majority of the population is an increase in activity in this sector. In the long term, a better educated, more efficient and skilled labour force, and an overall reduction in the cost per unit of production will improve the country's international competitiveness and enable the introduction of medium income industries, (e.g. inten-

duction of medium income industries, (e.g. intensive agricultural cultivation, manufacturing and tourism) which will secure long term broad based economic growth.
The agriculture sub-sector is comprised of subsistence farming, food production for the domestic market, and cash crop production for export. The first two (2) activities have consistently increased in recent years while the third has declined since 1989 when world market prices fell to their lowest real values in three (3) decades. In the short to medium term, it cannot be expected that a major structural change in the agricultural sector will occur, although in the long term a move toward specialisation, intensive cultivation and full integration into the market economy is anticipated.

Restructuring the agricultural sector to a market based cash system poses major challenges in developing the physical infrastructure to provide access to markets, packing, storing, transportation and marketing facilities; providing education and training in methods of land development, cultivation and harvesting; undertaking research to identify suitable crops and eliminate pests and diseases, and maintaining land fertility and preserving the output per unit of land through interplanting to maximise land utilisation and the financial benefit to the farmer.

The restructing of rural PNG into a market cash oriented sector will require a large investment by the Government, far beyond the presently expected resources from the mineral sector and the grant and loan commitments by donors. It is for this reason, that we recommend that all available Government resources be applied to the rural sector in the priority areas of education, health, physical infrastructure, and research and extension.

Cash crop production for export has been the focus of attention in the agricultural development. There are (four) 4 main export cash crops, coffee, cocoa, oil palm and copra together with some minor crops, including tea, rubber and spices. As a result of the continuous decline in the world market prices of the four (4) major export crops from the mid-1980s, the exhaustion of the financial resources of the Commodity Stabilisation Funds and the consequent deterioration in producer incomes, the future of the agricultural sector looked bleak. In 1989, the National Executive Council (NEC) established the Commodity Working Group (CWG) with the objective of conducting a thorough appraisal of the industries affected. The CWG submitted recommendations to NEC with respect to long term plans for each industry. Based on its detailed reports and recommendations, NEC approved the establishment of several support schemes, which were designed to secure the survival of a typical efficient producer. The schemes consist of the following elements:

- a support price was fixed at a level which, at the time the scheme was introduced, would ensure that an efficient small or large holder could continue operating;

- a three (3) to five (5) year adjustment period during which the support price would gradually decline to prevailing world market prices;

- the support would be in the form of an interest free loan, to be repaid from levies imposed on growers when world market prices exceed the threshold price;

- to enable the industries to increase their efficiency and productivity, the Government would carry a higher share of the cost of research and extension in periods of low prices;

- a reduction in the debt service burden through the restructuring of agricultural development loans to longer maturities of eight (8) to twelve (12) years and a lowering of the average interest rate to 8 percent;

- the establishment of three (3) Industry Corporations, for Coffee, Oil Palm, Cocoa and Coconut, which replaced the Commodity Boards and be responsible for regulating the industries, developing research and extension services, and operating the respective Stabilisation Funds. The organisational structure of the industries will have to take into consideration the cost structure of the growers and their competitiveness in the world market. Wherever feasible, the structure should be modelled on the smallholder village grower.

A scheme with the above features was designed for the cocoa industry in 1989. It served as a model and after necessary modifications, similar schemes were introduced for copra, oil palm and coffee.

However, in November 1992, the downward adjustment programme was replaced with a

programme of guaranteed fixed prices for five (5) years from 1992 to 1997.

To complement the price support schemes, an interest rate subsidy scheme was introduced in March 1991. All existing and new loans for agricultural and livestock development for clearing and planting, drainage and any other capital project which improves the long term productive capacity of the property, were eligible for the subsidy. The scheme was abolished in 1993 in anticipation of a decline in interest rates and in view of the increase in the guaranteed price support for five (5) years.

The concept of diversifying the agricultural sector and introducing new export cash crops and food production may be a solution for the longer term. If such a process begins immediately, it will take three (3) to five (5) years for the first harvests to generate income. In the short to medium term, the solution is to expand production of existing crops, and increase existing know-how and expertise. The range of crops produced is already substantial, some of them such as rubber, potatoes, onions, tea, spices and temperate climate vegetables are at present produced on a very small scale and have great potential for growth. Combined with the major cash crops, tropical and staple foods, vegetables and livestock, should provide a significant source of employment and income generation in the short to medium term and a solid foundation for a more diversified agricultural base in the medium to long term.

However, diversification should only be considered if there is comparative advantage.

The international competitiveness of a country is influenced to a great extent by the interaction of prices, wages and exchange rate. A small open economy such as Papua New Guinea has no impact on the price of its internationally traded goods where it is a "price taker". Therefore, it has to accept the "terms of trade" (the relative change between the export and import prices) dictated to it by the world market. The country is dependent on international trade, with the real value of imports and exports of goods and services amounting to 60 percent.

There is a clear trade off between prices, wages and the exchange rate, in respect to the international competitiveness of a country. To achieve an increase in competitiveness there must be "a real devaluation of the country's currency in relation to its competitors". In principle this means that the cost structure must increase at a lower rate than that of its competitors. In a small open economy such as Papua New Guinea, with a high propensity to import, imported inflation will have a major impact on domestic inflation. Therefore in the long term it is not possible to maintain a lower level of inflation than our competitors. On top of this, the efficiency and productivity of capital, labour and other inputs is lower here than our competitors which have had more time to develop. This is compounded by other structural weaknesses.

In the non-mineral sector, the main variable over which the Government has some control is the price of labour. Given that the objective is to generate productive employment and income opportunities for the growing labour force, the unemployed and underemployed, the best method of achieving a reduction in the cost structure is through a real decline in salaries and wages. This process could be enhanced by a downward adjustment to the exchange rate but this could fuel an increase in inflation. The less salaries and wages are indexed to prices to lower the impact of a devaluation on inflation and real decline in salaries and wages. In addition, a downward adjustment in the exchange rate will increase both the local currency price of exports and the price of importing locally produced goods. This will encourage domestic production of traded goods by increasing production for export and import substitution.

In respect to the analysis of prices, wages and the exchange rate, one should consider three (3) distinct economic sectors, mineral, Government and the non-mining private sector.

The mineral sector remains largely unaffected by changes in domestic prices, wages and the exchange rate. Mineral developments are capital intensive, their success or failure is largely dependent on world market conditions and they are only marginally effected by domestic prices and wages. All mineral projects in Papua New Guinea are offshore funded and they service their capital (Debt and Equity) from export proceeds, therefore changes to the exchange rate will have little effect on them.

The mineral sector generates a large foreign exchange surplus, estimated at K434 million in 1992. The effect of changes in domestic prices and wages on profitability is marginal. Any downward adjustment to the exchange rate will bring a net benefit to this sector.

The Government sector produces a large foreign exhange surplus estimated at K245 million. The surplus is expected to increase substantially in future. Most of the Government expenditure is on domestic inputs, such as salaries and wages and local contractors and suppliers. Estimates indicate that the government sector will realise a net gain from any meaningful real devaluation. This gain could be productively utilised to increase the supply of goods and services to the public. However, by itself it does not provide an adequate reason for a downward adjustment to the exchange rate.

The public sector will be better off if a real devaluation can be achieved through a trade off between prices and salaries and wages. Government revenue is highly correlated with wages.

The non-mining private sector produces a large foreign exchange deficit, estimated at K646 million in 1992. The deficit is unevenly distributed between the sectors and sub-subsectors. The information required to fully assess, evaluate and measure the sectoral distribution of this deficit is not available. Estimates indicate that the deficit is largely generated by the formal non agricultural sector, while the formal and informal agricultural sector produce a small or no deficit.

In the agriculture, forestry and fisheries subsector, the relatively small formal largeholder sub-sector will generate a substantial foreign exchange surplus, estimated at around K50 million. This subsector would be the main beneficiary from a downward adjustment in the exchange rate. The small size of this sector which represents around 4.2 percent of total GDP, constraints its potential for expansion in the short to medium term. The high cost structure, land ownership and aquisition, and other structural weaknesses would limit the increase in the production and the economy wide gains that would be realised from the use of the exchange rate to achieve a real devaluation.

The smallholder, village grower's sub-sector seems to have a small deficit in respect to foreign exchange related consumption flows. The subsector has a great potential to increase its production of cash crops for export and to increase food production for domestic consumption and import substitution. This would more than compensate for any increase in the cost of production and increase in the purchase price of goods and services for consumption. The sub-sector uses few imported inputs, cultivation is by self or family employment, indebtedness to the formal financial system is close to zero, and the propensity to consume imported and formal sector supplied products is relatively low. Food, shelter and clothing are self produced to a great extent. This subsector will only benefit from a real devaluation in the form of a downward adjustment to the exchange rate. A trade off between prices and salaries and wages will at best produce a small gain or have a neutral impact.

Considering the economy as a whole it is clear that only an adjustment to the exchange rate that will result in a real increase in economic activity in the informal agricultural sub-sector can compensate for losses in the urban formal sector. Therefore, to justify a downward adjustment to the exchange rate from an economy wide point of view, the following conditions have to prevail in the informal agricultural sub-sector.

- the supply response in the informal agricultural sub-sector, through an increase in the production of cash crops for export and food for domestic consumption and import substitution, has to be greater than the impact of the increased kina cost of imports to the economy.

- the distribution of the existing deficit and the supply response in the informal agricultural sub-sector must enable the great majority of the population to fairly compensate themselves for the losses incurred; and

- the increase in the kina value of the export price of agricultural commodities must be passed on to the smallholder, village growers. At present, part of the problem is that the intermediaries, buyers, processors and exporters are the main beneficiaries of increased prices.

At this stage of our development it is unlikely that a sufficient supply response from the informal agricultural sub-sector can be assured. However, if the rural development agenda presented in this brief is adopted then in the medium term an adequate supply response may result from an adjustment to the exchange rate.

At this time, the exhange rate does not therefore appear to be the most effective instrument to achieve the Government's main economic objectives: sustainable medium term broad based economic growth that will benefit the great majority of the population, and the provision of productive employment and income generating opportunities

in the rural sector.

For the foreseeable future, the only objective of a real devaluation should be to increase the international competitiveness of the traded goods sector. The analysis of the present structure of the economy shows that in the short term the most appropriate instrument to achieve a real devaluation is a trade off between prices and salaries and wages. Only if there is a substantive supply response from the smallholder, village growers should be the focus of all commodity support schemes, as well as rural development plan by the Government.

Until such time that the economy's structural weaknesses are remedied the only way to substantially improve the welfare of the population is the development of agricultural and agro-based export oriented industries that can compete on the world market. All instruments available to economic policy makers should be used to achieve this objective. The exchange rate is one of many instruments that can be used and all of them should be considered on the basis of their effectiveness in achieving set objectives while taking into account any side effects they might have.

# DELIVERY OF AGRICULTURAL SERVICES IN PNG: ADB'S PERSPECTIVE

Robert May[1, 2, 3]

***ABSTRACT***

*The paper outlines the Asian Development Bank's (ADB) perspective on the delivery of agricultural services in PNG. The problems of research and extension are examined. Solutions which could improve the delivery of these essential services to the farmers are discussed.,*

***Key words**: Agricultural services, agricultural research, extension, services delivery.*

## A. BRIEF OVERVIEW OF THE AGRICULTURE SECTOR

Agriculture is the most important sector of the economy in PNG as it accounts for 27 per cent of gross domestic product (GDP), about 12 per cent of total export earnings and 85 per cent of total employment. Although the mineral sector makes the largest contribution to export earnings (about 60 per cent), agriculture is the only sector in the short and medium term that has the potential to absorb the new, largely unskilled entrants to the labor force, estimated at about 50,000 per year.

PNG with a total land area of about 460,000 square kilometers and a population of 3.6 million is one of the largest countries in the South Pacific region. It has vast natural resources, and a wide range of crops and livestock can be raised in the country to meet the needs of a rising population. Unfortunately, agriculture remains primarily subsistence-oriented and heavily dependent upon a few export cash crops. Four tree crops (coffee, cocoa, oil palm and coconut) account for about 95 per cent of agricultural exports. Production of all the tree crops except coconut increased considerably from 1982 to 1989 but during recent years has declined due to declining world prices. The "Hard kina" exchange rate policy coupled with high labor and transport costs makes it very difficult for PNG to produce tree crops at competitive prices.

Although there are no reliable data on the production of food crops and livestock, recent studies indicate that the country produces a wide range of staples, vegetables and livestock. In the food crop sector, sago and taro are widely grown in the wet lowlands; yams, banana and cassava in the drier lowlands; taro and sweet potato in the highlands; and potato predominantly in the high altitude valleys. The production of tomatoes, capsicums, spring onions, potatoes and other vegetables has been recently taken up by villagers who have access to urban markets. Cereal crops such as maize and rice are not widely grown although rice is becoming ever more popular over time in urban and rural communities. At present, the country imports about 135,000 metric tonnes (mt) of rice annually valued at K35.0 million to meet domestic requirements.

Livestock production at the subsistence level is largely confined to pigs, poultry and goats. The domestic poultry industry has developed to a level where it is now capable of supplying virtually all the requirements of the commercial markets. The annual production of poultry is estimated at 1.9 million birds. At the commercial level, PNG produces 11,500 mt of poultry meat and 48 million eggs. The domestic pork industry has also grown remarkably well, and its products now satisfy almost the entire local demand for pork. Domestic beef production has remained stagnant at 2,000 mt of beef annually despite growing consumer demand, now estimated at 13,000 mt per annum. The domand for sheep meat has increased eightfold over the last decade, from 5,000 mt to 40,000 mt as a result of lower prices of sheep meat compared with poultry, pork and beef, as well as increased total meat consumption. The Government has established a sheep industry in the Highlands with New Zealand assistance but local production of sheep meat is currently very small

[1] Asian Development Bank, Manila, Philippines.
[2] Manager, Agriculture Division 4.
[3] The views expressed in this paper are those of the author and not necessarily those of the Asian Development Bank.

compared to imports.

Despite price support and quantitative restrictions on imports, the production of foodcrops and livestock in PNG -- with the exception of poultry, pigs, and more recently vegetables -- has remained stagnant during the past two decades. As a result, the value and quantity of food imports has been increasing. In 1991, the value of foodgrains, meat and fish imports reached $22.6 million (K 21.9 million). To reduce food imports and to achieve food security, the Government of PNG has placed a high priority on the development of agriculture. A large number of projects have been implemented by the Government with the assistance of external donors to address the problems in the agriculture sector. According to DAL, the major problems or constraints in the development of the agriculture sector include the following: (i) low productivity, (ii) poor extension management, (iii) shortage of high quality trained manpower, (iv) poor program management and lack of accountability, (v) absence of relevant and reliable farm level data, and (vi) poor market access and infrastructure (DAL 1993). This list can be expanded to include other problems including complicated land tenure arrangements, high labor cost, an overvalued exchange rate, lack of effective research and extension, and inadequate credit and marketing facilities.

This paper will examine the problems of research and extension and discuss solutions which could improve the delivery of these services to farmers. Other speakers will address other problems in the agriculture sector.

## B. THE PRESENT STATUS OF AGRICULTURAL RESEARCH AND EXTENSION

Agricultural research and extension play an important role in the development of improved varieties and technologies and their dissemination to the farmers to enable them to increase farm productivity and profitability. Available evidence indicates that countries which have well developed agricultural research and extension services generally also have high farm productivity and profitability. Conversely, in countries where agricultural research and extension services are poorly developed and ineffectively linked to each other, agricultural productivity has remained stagnant. Of course, agricultural research and extension alone are not sufficient to increase agricultural productivity and profitability. Such increases also require improvements in the delivery of credit, marketing and other support services to farmers. Agricultural research and extension, however, are crucial in initiating changes in agricultural productivity and in increasing demand for agricultural credit and other support services.

In PNG agricultural research and extension are implemented by several agencies including the following:

(i) The Department of Agriculture and Livestock (DAL), responsible for research in food crops and livestock;
(ii) The Provincial Divisions of Primary Industry (DPI), responsible for extension in food crops and livestock;
(iii) The Coffee Industry Corporation (CIC), responsible for research and extension in coffee;
(iv) The Oil Palm Industry Corporation (OPIC), responsible for extension in oil palm;
(v) The Oil Palm Research Association (OPRA), responsible for research in oil palm; and
(vi) The Cocoa-Coconut Research Institute (CCRI), responsible for research in cocoa and coconut.

A recent review of agricultural research and extension conducted under the Bank-financed technical assistance for the Agricultural Research and Extension Phase II Project concluded that while research and extension services provided by the industry corporations (e.g. CIC, OPIC, OPRA, and CCRI) have made considerable progress towards improving the efficiency of research and extension in export crops, research and extension services on food crops and livestock provided by DAL and DPI have remained weak (ANZDEC 1993).

The major constraints on agricultural research services provided by DAL include the following:

(i) the cumbersome Government bureaucratic system in which they operate,
(ii) a complex organizational structure,
(iii) lack of research focus and prioritization,
(iv) poor communications between research and extension,
(v) research resources dispersed among many research establishments,
(vi) insufficient operational expenditure for conducting research,
(vii) insufficient well trained technical staff,
(viii) lack of motivation of researchers, and

(ix) lack of interaction with the international scientific community.

The major constraints on agricultural extension services provided by DPI include the following:

(i) inadequate organizational structure,
(ii) ineffective training of extension officers,
(iii) insufficient operational funding,
(iv) inappropriate extension messages,
(v) poorly motivated extension officers,
(vi) lack of linkage between research and extension, and
(vii) lack of extension policy. With these problems evident it is not surprising that the research and extension effort is widely perceived as failing to meet farmers' needs.

The Government of PNG is fully aware of the problems of agricultural research and extension services and since 1982 has undertaken a number of studies, including studies conducted by the International Service for National Agricultural Research (ISNAR) in 1982, McKillop Williamson in 1982, the World Bank in 1987, ANZDEC in 1989, and the Asian Development Bank in 1993, to prepare recommendations on how to improve and revitalize agricultural research and extension services in the country. These studies have produced excellent recommendations. However, except for those related to export-oriented tree crops, most of these recommendations have not been implemented. As a result, agricultural research and extension services in food crops and livestock have remained weak.

## C. NEED FOR ACTION

The development of improved varieties and technologies through research is a long-term process, often taking 5 to 10 years even though the varieties and technologies may be obtained from other countries and require only local adaptation in PNG. In addition, it will take at least another 5 years to disseminate the improved varieties and technologies through extension so that they will be eventually adopted by the majority of the target farmers. Thus, unless the Government takes urgent action to improve agricultural research and extension, the agriculture sector is unlikely to fulfill the role necessary to avoid a continual increase in the gap between domestic food production and food demand resulting from population and income growth. Furthermore, social problems will be exacerbated as rural incomes continue to decline relative to those in urban areas.

Based on the recommendations of the past studies, we would like to propose that the Government consider the following measures as a matter of the highest priority:

### 1. Reorganization of Agricultural Research

Many countries in the Asia-Pacific Region have established an autonomous national agricultural research organization to enable researchers to carry out research programs effectively without being hindered by government bureaucratic procedures and regulations. The results have been improved quality and productivity of research. In PNG where the bureaucratic system is a serious constraint, we support the recommendation that a statutory authority to be called the National Agricultural Research Institute (NARI) should be established with a Board representative of Government, producer, consumer and private sector interests. By combining most of the activities of the Research, Training, Food Management, Export crops, and Agricultural Protection Divisions of DAL, NARI would focus on research and training in food crops, livestock and minor cash crops and should be organized on a regional basis to enable it to coordinate, plan and implement agricultural research in consultation with local communities and extension staff.

### 2.Reorganization of Agricultural Extension

We support the recommendation that agricultural extension services be transferred from the provincial DPIs to the central Government as a means of strengthening extension activities and improving linkages with agricultural research. However, the Government should consider how extension services should be reorganized and whether (i) they should be merged with the proposed National Agricultural Research Institute, (ii) independently organized as a statutory authority such as OPIC, or (iii) kept within the DAL organization. The advantages and disadvantages of the three options should be carefully analyzed so that the reorganization will be able to achieve its objectives. In addition, the Government should improve the quality of extension personnel through retrenchment of unqualified extension staff and training of qualified extension officers. Until the reorganization of the extension system is effected, the needs of farmers for information and technology could be met, to some extent, by outreach programs from the existing research institutes.

### 3. National Agricultural Research Council

We support the recommendation to establish a National Agricultural Research Council (NARC) which will be responsible for policy formulation, program coordination and resource allocation in the research subsector. The establishment of NARC is essential because there are competing needs for research in various food crops, livestock, minor cash crops and tree crops while the Government's resources to meet these needs will always be limited. Therefore, NARC should be given a mandate to establish research priorities on the basis of the national agricultural policy, and allocate available manpower and financial resources accordingly. If this is not done, a single program could, for example, garner the major part of the research budget at the expense of other important programs. The Council should have authority over the allocation of public funds among the export commodities, NARI and other research institutes. It is suggested that the Council be chaired by a high- ranking Government official and consist of the secretaries of the Prime Minister's Department, Department of Finance and Planning, DAL and one representative each from NARI, CIC, OPIC, OPRA, CCRI and other agricultural research institutes.

### 4. Manpower Development

The reorganization of agricultural research and extension services as suggested above will not be effective if it is not accompanied by a systematic program to develop trained manpower. Despite the recommendations for manpower and training by ISNAR and McKillop Williamson in 1982, the number of research staff with Ph.D and MSc degrees is still very low and most extension officers have not received university or specialized training. At present, the country continues to depend heavily on the services of expatriate staff. The factors contributing to the partial implementation of these recommendations include the lack of commitment and funding by the Government, low production of high school and university graduates, and the decline in the standard of training at the Vudal Agricultural College and Highlands Agricultural College. Obviously, this issue is complex but the Government cannot afford to ignore the importance of manpower development if it is to succeed in developing the agriculture sector.

### 5. Support to the Private Sector

Agricultural production, processing and marketing, particularly in food crops and livestock, are and should remain primarily activities of the private sector. Farmers and entrepreneurs require assistance and support in a wide variety of areas, including production technology, selection of appropriate species and varieties, crop protection, soil management, post-harvest handling, marketing and others. Government agricultural services need to be reoriented towards providing services to the private sector so as to encourage and support a more competitive and market-oriented approach to agriculture. Such a re-orientation must include improved interactive linkages between research, extension and the private sector which ensure information flow in both directions. A basic goal of this re-orientation should be to improve private sector operations by strengthening the capability of Government agencies to focus on, and be responsive to, the sector's needs and to provide the required supporting services.

## D. SUMMARY AND CONCLUSIONS

Papua New Guinea has ample natural resources to grow its own food and livestock to meet domestic demand. A wide range of foodcrops and livestock have been raised by farmers, but their productivity and quality are low and have not increased during the past decade. Research and extension play a vital role in increasing farm productivity and profitability but this objective will not be achieved unless research and extension services are reorganized and an adequate number of staff are engaged and properly trained to handle their tasks. The Bank is ready to assist the Government in implementing these reforms in agricultural services if requested, since we believe that only the agriculture sector can absorb the rapidly growing, largely unskilled labor force.

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## DELIVERY OF AGRICULTURE SERVICES IN PNG:

# STRATEGIES AND OPTIONS TOWARDS THE NEXT DECADE - DAL VIEWS

Miri Setae[1]

***ABSTRACT***

*Despite the current boom in the mining and oil sector , agriculture remains and will continue to remain the backbone of PNG economy providing economic, biological and other needs of the vast majority of the population. The need to transform rural agriculture and improve their standard of living in the villages remains a challenge to successive governments. The government's political commitment to agriculture should be translated into budgetary releases that are prompt, stable and adequate. There should be a continuous upgrading and development of high level idigenous human resources with a view to generate on a sustainable basis, agricultural technology. To have a lasting impact, technological transformation of PNG agriculture must focus on small village farmers. The improvement of their living standards should remain our fundamental objective.*

***Key words:*** *Agriculture transformation, strategies, options, farmers, standard of living.*

## INTRODUCTION

The subsistence agriculture sector, together with smallholder producers (holdings of 10 ha or less) are the dominant crop producers in PNG. The country's agricultural systems are adapted to the local environment with a mix of staple food crops, livestock and cash crops. The need for Agricultural transformation at village level has remained a challenge to successive governments. The present government having recognized the deterioration in agriculture services to the farmers realizes that for the agricultural sector to continue generating employment for the bulk of our population, the delivery of services must be greatly improved.

To meet the above mentioned concerns the government established a Committee on Delivery of Agricultural Services to debate, consider and propose recommendations as to ways of improving the delivery services. The following is the report of the committee after inside and outside deliberations extending over a period of twelve (12) months.

## STATUS OF AGRICULTURE IN PNG

Despite the current emergence of mining and oil as the major export earning sector of our economy, the committee found it difficult to think of a time when agriculture would cease to be the backbone of PNG's economy providing for economic, biological and rural needs of some 540,000 households who constitute the majority of our population. The share of agriculture sector in the GDP has however declined form 33% in 1980 to 16% in 1990. Export earnings from this sector have declined from 35% (K350 million) in 1980 to 18% (K190 million) in 1990 and further to 11.7% in 1992. The decline in the earnings is mainly due to low commodity prices internationally which have more or less come to stay, as well as the Bougainville crisis. Actually the commodity prices have fallen by 50 - 60% since 1985. The World Bank predicts that prices will be lower still for all tree crops in 1995.

The availability of funds from the mineral and oil sector has resulted in the import of cheap subsidized agricultural products from overseas. This is making it extremely difficult to develop dairy and cattle industries. Drought, loss of soil fertility, inability to develop irrigation systems and pest and diseases are also contributing factors in the decline of agricultrual production in PNG.

## POOR IMAGE OF AGRICULTURE

Agriculture though very important is frequently equated with manual labour. Scientific basis of agriculture is often not appreciated. There is

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continued diversion of resources to more glamorous projects. By providing huge salaries and benefits to the staff in certain institutions, agriculture sector has been effectively **reduced to a 2nd class profession.** Little attention is paid to agriculture and rural development. DAL budget in 1994 was cut by some six (6) million kina (24%). There is no contingency for the nation for the time when mineral and oil boom would run out.

## SECTORAL CONSTRAINTS

In addition to the above mentioned poor image, a number of constraints plague the agricultural sector. These include low productivity, grounded extension services, poor research management output, lack of high level trained manpower, poor programme management and accountability. Farm data are negligible. Market access and infrastructure are poor or missing. Farmers frequently have little or no access to credit. Information systems and services are either under developed, negligible or missing.

## GOVERNMENT POLICY

Government's vision for 1994 and beyond in wanting to affect improvements in the delivery of rural services may be summarised as follows:-

1. Increased employment opportunities with a view to decrease, if not eliminate, urban drift and minimise social crime.

2. Revitalize rural sector.

3. Increased opportunities for the establishment of rural agro-industries.

4. Cut in food import bills.

5. Food security, especially to cope with the situation when the mineral and oil boom would run out.

## DAL STRATEGY

The focus of development programmes and projects is to improve delivery of agricultural services to rural areas. The intention here is to modernize and revitalize agriculture. For this purpose the smallholder shall be the focal point of production system. Both large and smallholders would contribute to the commercialization of agriculture. Joint projects with smallholders, industry and NGOs would be established.

As far as feasible export crop research would be transferred to semi-autonomous research institutes. Commodity specific agents would be encouraged, where possible.

Commodity Industry Corporations would carry out their own extension, research and regulatory functions. Other agencies such as the Department of Agriculture, Non-Governmental Organziations and Rural Bank would assist in these functions as appropriate.

## AGRICULTURAL SERVICES ASSISTING RURAL SECTOR

The following villages services were recognized by the committee:-

- Research
- Extension
- Human Resources Development
- Marketing
- Rural Credit
- Quarantine and Quality Control
- Information and Publication Systems and Services

The committee proposes a number of legislative, policy and institutional changes to greatly increase the effectiveness of the above services. For this purpose inter-sectoral issues such as roads linking various parts of the country, law and order require considerable improvement. Terms and conditions of professionals engaged in the providing of agricultural services need to be brought at par with those in the other sectors of the economy. This needs to be addressed with some urgency in order to motivate the staff who are currently "classed as second class professionals" in terms of their condition of services e.g. housing, salaries and fringe benefits. Steady decline in resource allocations to agriculture would have to be halted. Rural farmer organizations would be established to mobilise farmers to receive and deliver services.

## SPECIFIC SERVICES

1. **Extension** - It is quite clear that amalgamation of DPI and DAL into a single service organziation for extension purposes is a must. The reports of consultants and

consulations with DPIs emphasize that DAL should not have withdrawn from the National Extension Process. The amalgamation would enable DAL to provide expertise and resources through a network of extenison advisory linkages

2. **Research** - It is proposed to establish a National Agricultural Research Institute (NARI) to emphasize excellence in mission oriented research. There should be no dissipation of energy and funds in providing corporate services. NARI would carryout research into various aspects of food crops, Livestock, alternate crops and land use. Soil capabilities of each land type would also be investigated and socio-economic research carried out and close working relationship established with National Agricultural Research Council and Agriculture Research Technical Committee.

3. **Training** - It is proposed that PMTP should be merged with Mt Hagen Agricultural College which should become autonomous under its own academic council and Popondetta Agricultural College transferred to the Council of Higher Education. Farmer schools are to be revitalized and relevant staff retrained to provide tailored courses for client needs.

A **Human Resources** Division is to be established in DAL to cater for diverse training needs of the Agriculture Sector. An important function of this division would be to introduce higher degree in-country training programmes at M.Sc and PhD level to increase organizational effectiveness. General upgrading and further development of existing personnel through in-service and other staff training programmes would also be emphasized.

4. **Marketing** - Major tasks of the marketing unit would be to revamp DPI marketing, upgrade fresh produce markets, increase market information, introduce group marketing and disseminate marketing information, allowing private sector to carry out the physical marketing.

5. **Rural Credit** - Credit is to be inbuilt as a component of all projects and extension officers would be closely involved in the exercise. Smallholder credit would be subsidized and credit guarantee scheme to smallholders put into operation. Crop and livestock insurance schemes would be formulated and introduced.

6. **Quarantine Services** - Effeciency and effectiveness of quarantine service is to be increased. Strict quality control is to be exercised on local products, exports and imports with the intention of working towards the ready acceptability of PNG products in the world market. It is proposed to establish a PNG quarantine and quality control authority.

7. **Information Systems and Services** - Authoritative information is currently world's most prized commodity. Information servicing, information transfer, data managment and computer software information packages required by agriculturalists would be emphasized. Development, preparation, production and distribution of wide-ranging agricultural publications would be undertaken. Scientific journals, Extension periodicals and Rural newsletters would be published. It is intended to create a new information division by amalgamating scattered information units in DAL.

## INSTITUTIONAL ARRANGEMENTS

As previously indicated the focal point for agricultural development and planning must be easy access to the villages. When considering delivery of agricultural services it is important to consider the location specific approach and development plan by taking the message to the villages.

Keeping these aspects in mind the proposed institutional structure must consider the district as the planning unit to implement and deliver various services to the agricultural sector.

In order to create an institutional framework for improved delivery of services, the committee recommends that, subject to the necessary NEC and Parliamentary approvals, the Provincial DPIs be amalgamated with the Department of Agriculture and Livestock.

It is proposed that a three tier system for the delivery of services be developed, to provide back-

up support and to monitor and direct the programmes according to the national goals and plans. The three tiers would be as follows:

**District Level** - Delivery of agricultural services.

**Provincial Level** - Technical backup support services to District units.

**National Level** - Planning, managment, monitoring and evaluation of delivery programmes/projects and technical support to district units and DPIs. The National Department would also regionalise its activities in order to avoid a centralisation of the activities.

The Institutional arrangments to deliver the agricultural services are more related to extension and other line functions (technical services). Services such as Research, Quarantine and other National functions are equally important to ensure delivery of appropriate services. Institutional arrangements for strengthening these services are suggested in the policy recommendations and should be considered while restructuring the DAL.

The District as a planning unit would ensure bottom up planning and therefore the prime importance would be given to the district level institutional set up.

## DEVELOPMENT OFFICES

There are about 100 districts in the country and the present strategy to deliver agricultural services would, as stated earlier, recognises the district as an unit for planning and execution of the various development plans and projects.

Success of all plans heavily depends on the participation of people and the plans and projects would focus on the needs of the people. The District Development Office would be guided by a District Development Council (DDC) which would be an advisory body without an executive function or financial authority/responsibility. The DDC is proposed to be constituted as follows:

**Chairman of DDC:** Parliamentary Member for the District.

**Members of DDC:** Smallholders' representative, Largeholders' representative, Livestock farmers, Processing and Marketing agencies and representatives of NGOs. One representative for each/ group of villages with aggregate population of more than 5000.

**Secretary of DDC**: District Development Officer of DDC.The committee shall meet at least once in a quarter to deliberate on the plan of action, focus areas for development, review the progress and incorporate any strategy to make the approaches more field and people oriented.

## PROPOSED DAL STRUCTURE

**Option 1** *(Fig.1)*

In this option only six (6) directors would be stationed at DAL Headquarters. Other staff would be transferred to the regions.

**Option 2** *(Fig. 2)*

In this option some 15 directors would be stationed at DAL Headquarters. This tends to make the structure top heavy.

## LOOKING AHEAD

The excellent work done by our professionals dating back to colonial days shows that scientific effort under the right conditions can lead to high outputs of crops e.g. cocoa and coffee which have been the mainstay of PNG's economy before the current mineral boom.

But here it is essential, at the risk of repetition, to highlight some of the conditions necessary for the transformation of agriculture and these may be summarised as follows:-

1. Political commitment must be translated into budgetary releases that are prompt, stable and adequate.

2. We must continue to upgrade and develop high level indigenous human resources with a view to generate, on a sustainable basis, agricultural technology.

3. Service conditions of Agricultural Professionals must be drastically overhauled to provide them incentives to aspire for excellence in whatever they do.

4. To have a lasting impact, technological transformation of PNG Agriculture, must focus on farmers. The upliftment of their living standards must remain our fundamental objective.

*Figure 1.* **NEW STRUCTURE OF DAL - OPTION 1**

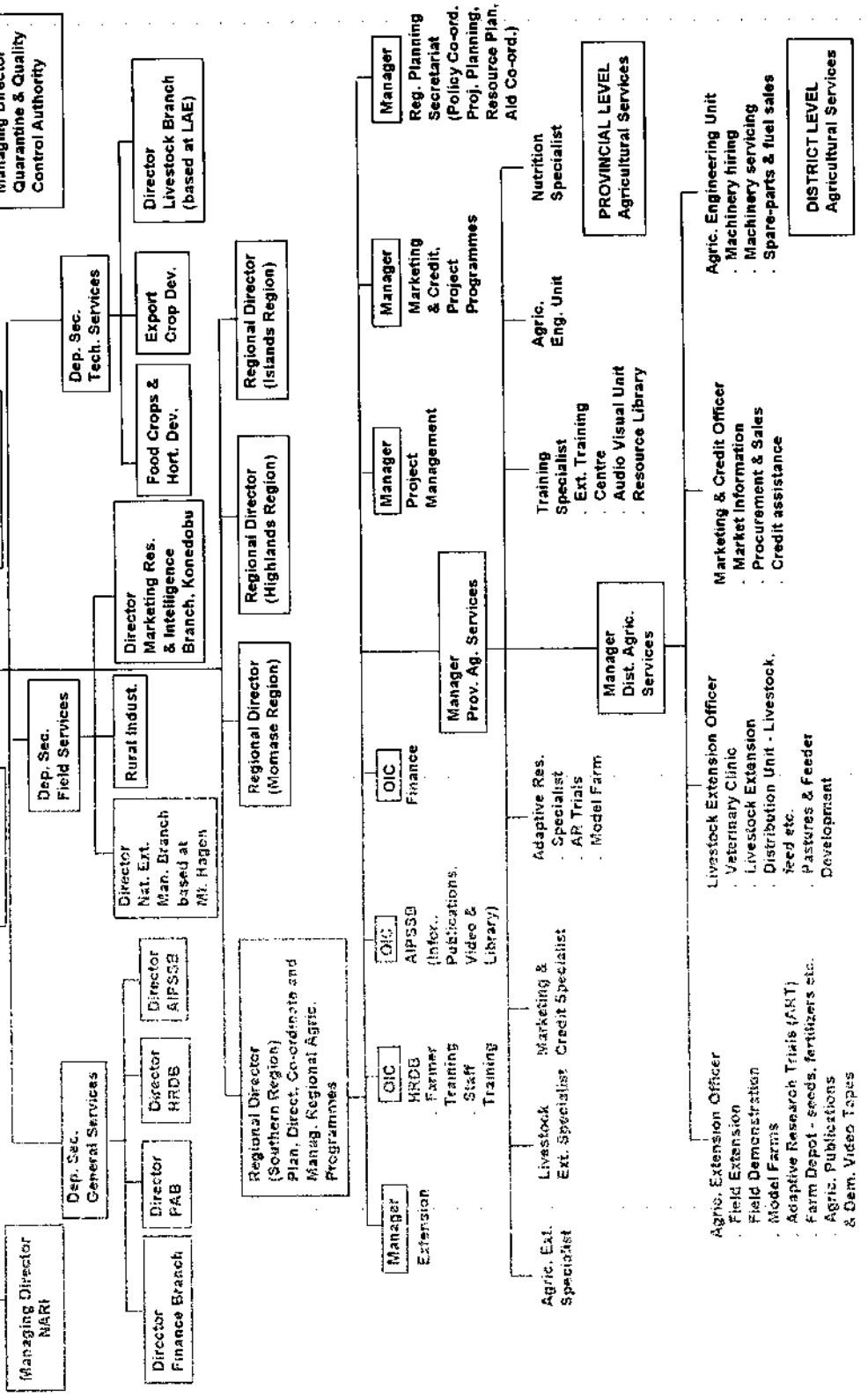
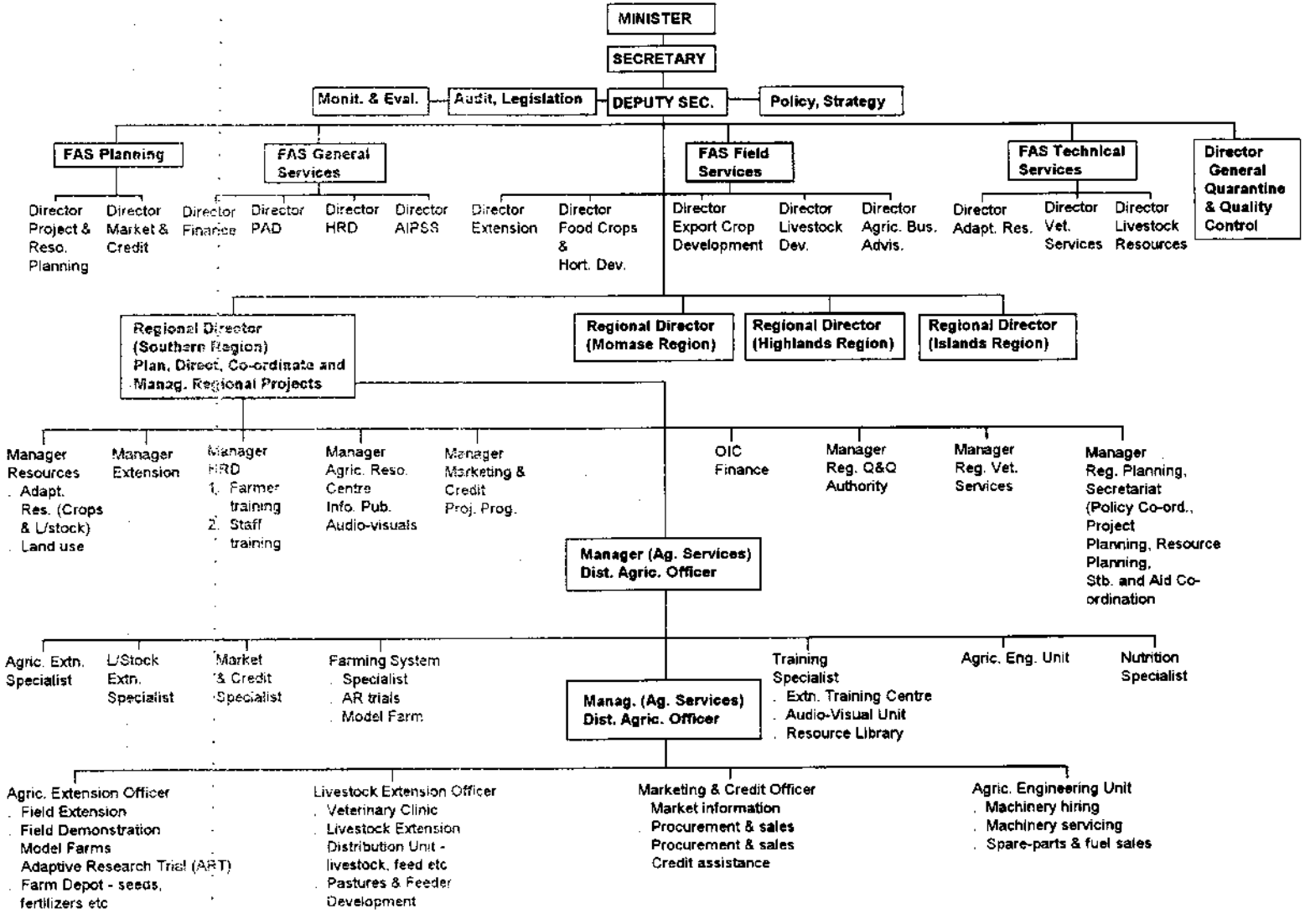


*Figure 2.* **NEW STRUCTURE OF DAL - OPTION 2**



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

Kenneth M. Menz[1]

***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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# TECHNOLOGY ASSESSMENT AND TRANSFER FOR SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT - AN FAO GLOBAL REVIEW

Bruce R. French[1]

***ABSTRACT***

*The paper considers the FAO global review of Technology assessment and transfer for sustainable agriculture and rural development. Some key concepts endorsed and promoted by FAO are outlined and attempts are made to interpret them in the PNG context.*

***Key words**: Technology assessment, sustainable agriculture, rural development.*

## INTRODUCTION

Due to my having been recruited last week for an FAO Consultancy as an Agro- Ecology and Food Crops Specialist under the Technical Cooperation Programme I can draw an over 20 years experience collating Agricultural Information for Papua New Guinea, but scarcely adequately represent FAO on this topic. So what I am going to do is highlight a few key concepts endorsed and promoted by FAO and attempt to interpret them for the local Papua New Guinea context.

Some of the current terminology on development speak of Farming Systems Research, on farm adaptive research, well being of smallholder farm families, a bottom-up approach to village development, involvement of women in development, accounting for the nutritional welfare of the smallholder family, the two way interaction and exchange of information for goal setting, low input plant protection, sustainable production, as well as farmer's rights, maintenance of biodiversity for sustainable development and utilization of indigenous knowledge.

These are more than words, and are attempts to face the reality of diverse systems as encountered in a country such as Papua New Guinea.

## INFORMATION TRANSFER

Lack of power, computers and other technologies means that much of this information is still being collated and exchanged in a less formal fashion. The UNDP FAO information centre at Konedobu is promoting CARIS for current Agricultural Research to reduce duplication and AGRIS to give a wider Agricultural Information retrieval system. These developments are vital.

The process of technology transfer can fail at a more human level. Examples from two significant reports by consultants can illustrate this human failure. The old SPC's careful and detailed study on Banana Scab moth recorded lots of good, useful and accurate information. But those involved obviously forgot to ask Papua New Guinea banana growers what they knew about the insect, its distribution and control. If they had been asked some of the better Tolai banana growers could have explained several simple appropriate cultural methods useful in limiting damage. A similar detailed report on sago production isolated overcrowding as a key factor limiting production. It then highlighted the difficulties of thinning out suckers because of the thorniness of palms and the difficulty of getting hormone herbicides onto the growing point. A Papua New Guinea sago grower, if asked, could have given a simply one minute costless demonstration. A small hole cut in the palm allows the sago weevil to gain entry to kill the sucker.. The bonus is a highly nutritional feed of sago grubs.

Information collation and transfer is vital but it must have a human face.

## GENETIC DIVERSITY

For at least 17 food plants Papua New Guinea is one of the worlds' major centres of diversity. In my view it has number of other food plants worthy of

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world attention but seemingly unknown outside this country and often even in only one region of the country (e.g. Ormocarpum, Rungia, Bukubuk, Karuka, Finschia nuts). FAO through its Global System and Agenda 21 programmes is committed to the recognition and conservation of these resources, but also to see that Papua New Guinea farmers who have actively worked with and selected land races within these plants have their farmer's rights recognised and that they receive benefits from the utilization of these resources.

## WOMEN, NUTRITION AND STATUS OF FOOD PRODUCTION

Only once in Papua New Guinea have I ever seen a traditional food served in a restaurant and this was for pitpit in coconut milk in Rabaul. I have never been offered a tropical/traditional food on the National Airlines. In Indonesia, plants such as amaranth (aupa), aibika, tuplip and sweet potato are regularly served in restaurants.

In Papua New Guinea, because of this attitude, the agenda is socially loaded against the foods that are agro ecologically suited to this country. People see food production as a low status activity, unless they are trying to grow certain introduced vegetables.

This attitude is reflected in the fact that several of the indigenous vegetables of high nutritive value do not even have a name in English or Tok Pisin (e.g. Oenanthe, Rungia, Amaranth, Polyscias, Ormocarpum, Talinum, Ficus). In a country of over 700 languages it is not surprising that little information transfer occurs with foods that only have a scientific name or a local language name. Plants such as these are incomparably more nutritious than cabbage and with minimal pest and disease.

Most food in the world is grown by women and Papua New Guinea is normal in this regard. FAO along with other groups continue to stress the need for women trained in agricultural information and technology transfer. The need for enhanced food processing and greater awareness of nutritional value is a high priority for wholistic farm family development. Improvements in this area could contribute greatly to reducing food imports.

Throughout the tropical world a new emphasis, is and needs to be, continually put on appropriate development which is based on working with the genetic diversity and sustainable production systems for the overall benefit of the whole family unit.

# THE PAPUA NEW GUINEA NATIONAL AGRICULTURAL RESEARCH SYSTEM: ITS POLICY FRAMEWORK AND DEVELOPMENT PERSPECTIVE

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***ABSTRACT***

*The Papua New Guinea national agricultural research system has undergone four decades of organizational evolution in order to adapt to an ever increasing and changing demand for technology and information of the agricultural sector. This paper gives a brief account of the development of the national research system to the present time and highlights the major constraints and problems to the effective generation, adaptation, assessment and transfer of technology and information. From a global perspective of research and technical change, the paper emphasizes the need for the development of national research capacity in Papua New Guinea for sustained agricultural growth. The paper considers certain key policy issues that are crucial for the enhancement of agricultural research in the country. One of the major policy reforms required for an effective research system is the establishment of an autonomous, statutory, and public funded research organization for improvement of food crops, livestock and alternate crops. A number of policy recommendations are then drawn for consideration by the Department of Agriculture and Livestock and relevant Government agencies involved in implementing these institutional reforms.*

***Key words:*** *National Agricultural Research Institute, policy changes, technical changes, problems, constraints.*

## INTRODUCTION

Agricultural research involves, by its very nature, the application of the principles of basic sciences to the solution of problems of immediate or prospective usefulness to agriculture. Its objective is to apply a wide variety of scientific disciplines to the development of new approaches to agricultural production, and to the solutions of the problems besetting the farmer. In Papua New Guinea (PNG), agricultural research has played a significant role in agricultural development and continues to be a vital function of central government. In view of its wide implication to national development and its service to the farming community, it is justified that agricultural research should continue to be an important concern of the national Government.

Formal agricultural research, as a conscious and institutionally separate activity, is a relatively new agent of technological change in PNG. Human inquisitiveness and economic interest were already driving technological change before this. It could be claimed that 'informal' research by farmers has been going on for millennia, and has resulted in well-balanced and sustainable farming systems. Only now, with population pressures increasing and people's aspirations changing radically, are the traditional farming systems showing strain.

Since 1980, the PNG national agricultural research system (NARS) has undergone a period of transformation, both in terms of its organisation and structure, and management. Following the separation of export-crop research from the Department of Agriculture and Livestock (DAL) to the export-commodity research institutes (ECRIs), the structure of the NARS has become more complex. Under the new arrangement, the ECRIs (for coffee, cocoa and coconut, and oil palm) are wholly supported financially by their respective industry organisations by virtue of the legislated level of commodity research levies. More recently, the Government through DAL has augmented ECRIs budgets through annual research grants because of the low prices of all commodities.

The responsibility for research into food crops,

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alternative cash crops (spices and essential oils) and livestock remains a function of DAL. This component of the PNG NARS has remained the most fragmented, and it is the intention of DAL to rationalise this programme to improve its efficiency and its services. This paper outlines the approach to be taken in achieving this, and further analyses the policy environment of agricultural research, the organisation of the research system, and the management of the PNG NARS.

## THE PNG NATIONAL AGRICULTURAL RESEARCH SYSTEM

### A Short History

The National Agricultural Research System (NARS) in Papua New Guinea (PNG) has rapidly changed and expanded during the last fifteen years. Prior to 1980 the bulk of the agricultural research in the country was funded entirely by the PNG Government and executed by the Department of Primary Industry, now the Department of Agriculture and Livestock. The sphere of agricultural research was very wide and covered a range of research activities in tree crops, food crops, resource management, livestock, and pasture agronomy. To an extent the research was biased towards tree crops because of the need to generate cash income from foreign exchange. Research on food crops, livestock and alternate minor crops was largely neglected.

Over the last ten years four semi-autonomous research institutes have been established for coffee, cocoa and coconuts, oil plam and sugarcane. These institutes are financed through a research levy on exports, and annual government grants through the Ministry of Agriculture and Livestock. The setting up of these research institutes was a major policy reform in the tree crop subsector. Whilst the performance and achievements of these institutes have, in general, been satisfactory up to now, their long term sustainability through their own industry funding is in question.

The PNG University of Technology is also developing a post-graduate research programme to link with research activities of other institutions within the PNG NARS. Although the University programme is presently directed mostly towards the support of its teaching function, its scope is being widened to undertake more basic research in the future. Several non-governmental organizations (NGOs) are also engaged in agricultural research, but their activities have been of modest levels. The most prominent of these is the Wau Ecology Institute. As NGOs they operate independently of other NARS components, and hence, there is scarcity of information on their nature of research and the resources available to them.

The Department of Agriculture and Livestock (DAL) operates seven research stations of varying size throughout the country and these are located to cover the highlands and coastal environments with substations in high and mid-altitude environments. The mandate of its programme is to carry out applied research on the major staple food crops and livestock, as well as on minor cash crops (spices, essential oils) and other tree crops (fruits and nuts). DAL also has a farming systems research programme with comprehensive on-farm research activities in several provinces.

The major aim of DAL programmes is to improve productivity of the various food crops and livestock, and to attain sustainable system of agriculture particularly for smallholder semi-subsistence farmers. The establishment of a land use management programme is aimed at achieving this, with a nation-wide agroforestry research and development programme. Several multilocation trials evaluating multipurpose tree species form the basis of the new agroforestry programme.

The field research and development programmes are supported by specialist laboratories in Port Moresby. The specialist disciplines in Port Moresby include agricultural chemistry, entomology, animal and plant pathology, veterinary science and soil science.

### Research Constraints and Problems

Resource contraints to agricultural research system over the last decade have undoubtedly affected the national capacity of the research system to assess and transfer technology. This is particularly evident in the food and livestock subsectors. In fact the present high bills of imported food and livestock products are the results of the inadequate and unsustained Government support to research on food crops and livestock in recent years.

A large number of constraints have been identified as being responsible for ineffective and inadequate agricultural research that is being undertaken by DAL. These can be summarized as:

(i) inadequately trained and insufficient scientific, managerial and technical manpower;
(ii) inefficient and inadequate institutional arrange ment and infrastructural facilities;
(iii) poor planning, coordination, direction and link age;
(iv) meagre and highly uncertain funding support;
(v) absence of a national agricultural research policy and focus for sustainable research and agricultural improvement; and
(vi) lack of effective linkage between research, extension, development and farmers.

These constraints have imposed serious setbacks on the present agricultural research system in catering for the ever changing and rising demand for appropriate technology and information. Therefore, there is a long impending and urgent need to build up national capacity and capability of agricultural research in PNG for effective generation, modification, adaptation, assessment and dissemination of technology and information that would be relevant to the present and future needs of the agriculture sector.

## RESEARCH AND TECHNOLOGICAL CHANGE

### A Global Perspective

Agricultural research is probably the first and the most widespread form of organised research in the world, and one in which both the most developed and underdeveloped countries are engaged. Whilst most forms of research activity, such as in the field of medicine, have world-wide application, agricultural research, by its very nature, has to be regional in focus; practically no research finding can be adopted without studying the results of its application under infinite number of ecological situations with which the farmers of the world are faced.

The improvement of agricultural production is the essential step whereby developing countries can hope to raise their standards of living. Research is therefore an activity in which no underdeveloped country can afford not to engage in; nor can countries in which agriculture has reached a high level of development and sophistication afford to neglect agricultural research. Even when the problems of overproduction weigh heavily on the economy, agricultural research is considered the essential key to further progress: the objectives and goals are simply changed and adapted to the needs of the economy.

In almost every country, agricultural research systems have grown up from humble beginnings, without having been planned or directed. This has resulted in innumerable organisational forms, different for each country. The obvious explanation for this state of affairs is that each country has developed the agricultural research organisation adapted to its needs. A closer analysis of the situation will, however, indicate that the multitude of organisational forms is the result of lack of planning, and that inter- and intra-departmental power politics, institutional prestige considerations and personality problems have had a greater hand in shaping the organisations.

Most developing countries have either remnants of former research services, or are organising their NARS starting, from scratch.

### Role of Agricultural Research

The Mission of any NARS, as defined by Aldrich (1966), is:

- to apply all possible sources of scientific discovery to the solution of the technical and practical problems of agriculture;
- to engage in basic research where the lack of fundamental knowledge may impede progress; and
- to solve the specific problems with which agriculture is faced.

The primary objectives of agricultural research are:

- to increase productivity by increasing production per unit area (or animals), or in irrigation agriculture per unit of water, if water is the limiting factor;
- to increase efficiency by reducing the input of labour in relation to production or by making the work less onerous;
- to increase stability of production: by breeding varieties of crops and breeds of animals that are more disease-resistant or more immune to unfavourable environment conditions, by improving methods of crop protection against diseases, pests and weeds;
- to improve quality by breeding varieties

with inherently higher nutritive values, improved flavour or eye-appeal; improving production techniques that affect quality, improving post-harvest techniques;

- to produce the type of products required for consumption, industry and export. This involves the introduction of new crops or methods of production, with the attendant required research, increased control of environmental factors, investigating new uses for established crops, etc; and

- to avoid environmental pollution and prevent soil erosion.

The relative emphasis placed on each of these objectives depends mainly on the stage of development of agriculture in each country and its economic requirements. In the case of PNG, increased productivity can be taken as the first demand that can be made on agricultural research, because the agricultural sector is still relatively undeveloped, the population is increasing rapidly, and demand elasticities are still at levels which would justify and allow increased agricultural output.

**The Need for a National Agricultural Research Effort**

A tremendous amount of agricultural research is being carried out in all parts of the world, and there is already an enormous fund of knowledge available on how to increase the productivity and efficiency of agricultural production. This knowledge is freely available to all and at practically no cost. The arguments that most of this research has been carried out in developed countries, i.e. in physcial, economic and social environments totally inappropriate to the developing country, has lost much of its plausibility following the establishment of the International Agricultural Research Centres (IARCs) in tropical and sub-tropical regions, whose research is carried out under environmental conditions that are largely representative of those of the developing countries. Two of the IARCs (IRRI and ICRISAT) are located in the Asia/Pacific region.

The need for 'own' research in developing countries themselves can therefore be legitimately questioned. For instance, in many countries of the Pacific which are struggling to establish a sound economy, which lack trained personnel, and in which most farmers are illiterate, research may appear to be a luxury which these poor countries can ill-afford. It may well be asked whether elementary logic does not compel a developing country like PNG to concentrate on disseminating and applying knowledge already available in other countries, or in the international institutes. In other words, should the available limited resources and trained personnel be devoted to extension instead of research.

From a recent analysis of resource allocation in DAL over the last 5 years, it can be concluded that PNG has adopted this policy. This is clearly demonstrated by the establishment of several pilot projects under the Public Investment Program, most notably in food and livestock extension. That this policy has been followed in many developing countries is indicated by the finding that whilst the highly developed regions invest considerably more intensively in research than in extension, the developing countries in Africa, Asia and the Pacific are several times more 'extension-intensive' than the developed Western countries (Pardey *et al.* 1989). A negative correlation was actually found between the level of development and the propensity to invest in extension. The lower the level of per capita income, the higher the proportion of agricultural product spent on extension (Arnon 1989).

The apparent assumption that the already available technology is adequate to achieve production objectives in developing countries is a dangerous fallacy - and as a policy it is self-defeating. Basic principles can be established anywhere in the world, but their application to a specific environment requires a local research effort. Not only in each country, but several regions within a country, have unique combinations of soils, climate, social, economic and other conditions which are not duplicated elsewhere.

It is not necessarily correct to assume that the cost and duration of research can generally be significantly reduced by transfer of technology from one country to another, or from an international research system to a NARS. In all cases, adaptive research is required in the actual region in which the innovation is to be introduced before large-scale adoption can be considered. Without a national capability for adaptive research, the potential benefits of a technology to be transferred cannot be fully realised.

### The Need for an Agricultural Research Policy

Agricultural research policy flows from a national agricultural development plan which in turn takes its cue from a national development policy. In many countries, including PNG, agriculture is an important target for development. A policy that makes the most of what modern agricultural science can offer in research, extension, and development, appropriate to the country, is highly desirable.

The presence or absence of an organisation to frame agricultural research policy is a common issue in developing countries. The presence of an apex body in many countries, specifically in South and Southeast Asia and East Asia, has eased the task of agricultural policy formulation. These apex bodies may be permanent councils, agencies or boards, or temporary committees. In contrast, countries in Central and South America commonly have an autonomous or semi-autonomous national institute responsible for formulating research policy.

Apex bodies have invariably evolved from the conventional ministry model of agricultural research management. In many African and Pacific countries where there is no apex body, a ministry in charge of agriculture has to formulate policy through its research arm or with assistance of a transient policy group. In such a situation, formulation of agricultural research policy is generally weak. The principal challenge is to develop a permanent mechanism for national research policy and coordination. Such a body should have the freedom to interact with the political and administrative hierarchies of government. To this end, considerable efforts have been made by DAK in proposing a National Agricultural Research Council (NARC).

### Improving the Productivity of the Small Farmer

A major change that has taken place in recent years in agricultural development policy in many developing countries, is the greater recognition of the needs of the small farmer. Formerly, the dominant policy was to favour the agricultural sector that could respond most efficiently to economic inputs, and there has been little responsiveness to sectors of agriculture with poorly organised-small farmers, semi-subsistence farmers, and minority groups. However, since the 1970s the realisation has grown in many developing countries that a public funded research system has the obligation, both for reasons of equity and economic efficiency, to respond to the needs of the deprived rural sector in planning the research programme, not only to the clients who are most affluent and best organised.

At present, many development plans state explicitly that the top national priority is to improve the productivity of the small farmer. This emphasis reflects an awareness that without rapid progress in smallholder agriculture throughout the developing world, there is little hope either of achieving long-term stable economic growth or significantly reducing the levels of poverty.

A policy discriminating against the smallholder subsector, though it may possibly be based on short-term economic considerations, leads, in the long run, to a widening of the economic and technological gap between the two subsectors.

Overall national development requires a more equitable distribution of income which makes possible a wider and more effective demand. In a predominantly agrarian economy, it it likely that the level of saving and investment will be higher if the productivity of land and labour is increased by widespread adoption of new technology on a large number of family farms, than by concentrating resources on a relatively restricted scale in an advanced subsector of farming.

The White Paper on Agriculture (GOPNG 1989) states quite categorically that top priority should be given to addressing the needs of the small farmer. This is the challenge for any national research and development programme. Equally emphasised, is the need for agricultural research and technology transfer in aiming to achieve sustainable agricultural development.

## A NATIONAL AGRICULTURAL RESEARCH INSTITUTE

### The Conceptual Framework

To help alleviate the constraints to research and to build up sustainable research capacity, a substantitally improved and modified organizational structure is proposed. To appropriately reflect its scope and nature of activities, it will be called National Agricultural Research Institute (NARI).

The institute activities, besides covering the immediate concerns of research and development on food crops, livestock and alternate (diversified) crops, should include wider but closely related aspects of land, soils, environmental resources, labour, institutional and sociocultural issues.

NARI should be seen as a long term investment in research and needs to be developed through reorganization and rationalization of the current research and development activities of DAL. Its immediate aim would be to improve and develop scientific, managerial and technical manpower, and strengthen short term adaptive/farmer relevant research and long term prospective technology oriented research.

This institute should be the national centre of excellence for research, information, education and technology training in the country and basically be guided by the national research strategy and national development objectives. In absence of national agricultural research council, NARI should assume the responsibility of designing national research policy and of coordinating the research activities of other agricultural research institutions in the country. It should eventually become the nodal point for the country's national, regional and international linkage and collaboration in the field of agricultural research.

NARI would be set up on the basis of a direction from the National Executive Council and be established by an Act of PNG National Parliament by early 1995. The institute should be an autonomous, statutory and public funded authority in order to provide the flexibility and dynamism required for effective organization and implementation of agricultural research programmes. As there is very limited scope, at least at present, for the food crops and livestock sectors to generate their own revenue for research and development, NARI will have to be dependent on the public funds for its operation. However, there should be sufficient scope and flexibility for the institute to secure funds from other sources and to undertake cooperative and collaborative research programmes.

To ensure public accountability, long term sustainability and relevant programme directions, the institute's activities should be executed under the direction of an eminent agricultural scientist, to be called Director General, and governed by a board of directors representing the government, various organizations and smallholder farm families. The legislative process should ensure that the institute is empowered with desired level of autonomy, flexibility, control and accountability.

**The Focus of Research**

The long term goal of the institute should be to help improve and sustain the food production, human welfare and overall economic growth in the country. Equally important should be the consideration of income distribution among various segments of the population and different geographical regions of the country. PNG needs economic growth with equity in income distribution. This is essential not only from the view point of social issues but also for creating multiplier effect in growth and sustainability.

The initial focus of NARI should be on the development oriented research on food crops, livestock, alternative crops, integrated systems, relevant resources and associated cropping and farming systems. Other closely related activities to be included would be the generation and monitoring of farm management information, collection, evaluation, maintenance of germplasm and the multiplication and distribution of seed and planting materials. There should also be flexibility and scope to include, in future, other relevant crops and livestock activities.

The approach of research with farming systems perspective would continue to be used by various multidisciplinary teams of biological, physical and social scientists to capture complexities of the semi-subsistence farm households and their farming systems so as to design and disseminate realistic and appropriate methods, materials and changes to their agriculture.

**The Structure of the Programme**

The overall research programme would be organized into various regional research programmes to consider location specific constraints, needs, resources, opportunities and potentials and to develop appropriate changes in different agroecological, sociocultural and political regions of the country. Therefore, there would be regional research programmes for the Highlands, Momase, Islands and Southern regions with sub programmes at strategic locations within each region. This will allow the individual programmes to be based on the needs of local farming communities and be demand driven. Furthermore, the integration of the individual programmes into the national re-

search programme would ensure that the national objectives of the agricultural development are reflected and considered in these regional programmes.

The present agricultural situation and potential direction of agricultural changes in the country suggest that the regional research programmes should have inputs from the disciplines of agronomy, entomology, animal science, plant pathology, soils, economics, engineering, and extension with a strong component of adaptive research. The programmes need to be interdisciplinary in nature and will involve contributions from multidisciplinary activites. The type and level of individual disciplines in each regional programme would vary depending on the nature and kind of issues involved in respective regions.

NARI should have research programmes based on the programme thrusts such as sustainable agriculture, livestock-crop integration, and resource management. However, for the purpose of maintaining identity, the regional research programmes should be categorized into the following six subprogrammes.

1. **Crop Production Research** to encompass the disciplines of agronomy, horticulture, and crop breeding.

2. **Crop Protection Research** to include the disciplines of entomology, plant pathology, nematology and weed science.

3. **Livestock Research** to include areas of animal husbandry, animal nutrition, animal health, animal breeding and pasture agronomy.

4. **Resource Management Research** to encompass soils, agricultural economics, agricultural engineering and germplasm.

5. **Scientific Liaison and Extension Unit** to cater for technology testing, adaptation and transfer.

6. **Research Support Services** to include various analytical services, publications, information etc.

These programmes should be closely interlinked and involved in conducting adaptive operational research and in transfer of technology.

**Research and Extension Linkage**

Without development orientation, research would be meaningless especially in a developing country like PNG. The approach to research therefore should be demand driven and need based so as to make technology and information relevant and acceptable to farm households and their environment. In addition the research programme should be in line with the long term macro policies of the country. Some examples of such policies are self sufficiency in food production, import replacement, export orientation, income distribution and domestic economic growth.

Besides the scientific disciplines, the institute should have a strong component on scientific liaison and extension to provide an effective mechanism of research, extension, development and farmer linkage. This unit could alternatively be called adaptive research team (ART) and should have supplementary inputs from biological scientists, physical scientists, economists, and extensionists. Activities of ART would include descriptive and diagnostic research, research design, adaptive on-farm research, technology testing and assessment, technology packaging, exchange of material and information, publications, and technology training.

The institutionalization of ART would require a long term investment for improved facilities, trained manpower, and adequate operational funds. There should be a strong scientific and policy liaison unit at the national/institute level to ensure that research programmes are consistent with macro development policies.

The approach of farming systems research and development should allow the required linkage and will have a three-way cooperation and interaction between research-extension-farmer. In a cyclic process, it is assured that research is not divorced from farming realities and that innovations are adopted by consensus. In such an arrangement, the farmer is assured that his problems are brought to the attention of the researcher and that necessary attempts are made to provide a solution according to priorities determined under the farmer's own circumstances. The extension worker will be a full partner in the entire process of identifying problems/constraints, planning, technology design, testing, and adoption.

Adaptive research on integrated farming systems involving export tree crops would provide the mecha-

nism of linkage with the commodity research institutes and their respective extension organizations. NARI should be closely involved in providing technical inputs into and collaboration with the public investment programmes and extension activities of DAL, thus ensuring an effective linkage between research, extension and development.

In order to facilitate an effective research and extension linkage and transfer of technology and information, pilot operational research projects in representative areas of each region would be undertaken to involve local extension officials, voluntary agencies and farmers. These projects would be responsible for diagnostic research, design of technology options, testing under local farming environment and eventually for dissemination of technologies and materials. Such projects will eventually be increased in terms of their number and size as the capacity of the institute expands.

## POLICY RECOMMENDATIONS

### Institutional Reform

In order to alleviate the present constraints to research and to improve the national capacity and capability for technology assessment and transfer, an autonomous organization called National Agricultural Research Institute (NARI) for food crops and livestock be formed. To achieve this reform, it is necessary that the Department of Agriculture and Livestock obtains the approval of the National Executive Council to establish by an Act of Parliament such an organization.

### Financing the Institutional Reform

The establishment of NARI would initially require significantly higher level of funding than otherwise would be available within the DAL budgetary ceiling. This institutional reform should therefore be supported through supplementary external source of funding. The Agricultural Research and Extension Project (AREP) Phase II study has recommended that the Asian Development Bank provide the funding required to establish NARI. This loan funding should be negotiated and arranged for execution by NARI for its development and programme implementation.

### Resource Reallocation

The current resources - manpower, funding, infrastructural and institutional - of the Department of Agriculture and Livestock that are presently allocated to the activities related to research, technology adaptation studies, various technical and scientific areas need to be reallocated to NARI to form its core resources.

### Sustainability of NARI

For NARI to develop a sustainable research capacity and capability, it is crucial to have a consistent and adequate level of funding, both during its formative stage and after the cessation of the supplementary donor support.

### Research-Extension-Farmer Linkage

NARI through its scientific liaison and extension component, farming systems research approach, adaptive research teams and operational research projects should create and manage a strong linkage with field extensionists, voluntary organizations, development agencies and farmers.

NARI should be responsible for providing technical inputs into and collaboration with the public investment programmes and extension and development activities of DAL. This should further ensure an effective linkage between research, extension and development.

Adaptive research on integrated farming systems involving export tree crops would provide the mechanism of linkage with the commodity research institutes and their respective extension organizations.

### Regional Perspective to Research

The current research and development activities carried out by DAL are largely decentralized and located in various agroecological zones of the country. This regional perspective to research should be maintained but further rationalization and reallocation among the regional programmes would be required. The functions of research policy and coordination should, however, remain centralized.

### Research Policy and Coordination

In absence of an apex body for policy and coordination of agricultural research in the country, NARI

should assume the responsibility of formulating national research policy and of coordinating the research activities of other agricultural research institutions in the country. It should be the nodal point for the country's national, regional and international linkage and collaboration in the field agricultural research.

Establishment of the National Agricultural Research Council (NARC) as an apex body should be simultaneously pursued. NARC should be responsible for the overall policy formulation, coordination, and monitoring and evaluation of agricultural research in the country. In addition, it should be responsible for prioritization of research and allocation of resources to various components of NARS.

## CONCLUDING REMARKS

The issues discussed and the institutional reform proposed in this paper clearly suggests the need for a long term commitment by the Government for investment in agricultural research to attain sustainable development in the food crop and livestock subsectors. A better organized and well funded national agricultural research system would facilitate the enhancement of national capacity and capability for technology assessment and effective transfer, resulting in improved agricultural growth.

A national agricultural research system can only be considered efficient if it is able to transmit its findings to the extension service and the farming community at large. To enable effective diffusion of new technologies and information, it is necessary to develop appropriate mechanism for linkages between research, extension and farmers. In absence of effective linkages, the process of dissemination of innovations is disrupted and consequently, the effectiveness of research system and its relevance to farmers is substantially reduced.

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# MEETING THE DEVELOPMENTAL CHALLENGES OF THE LIVESTOCK INDUSTRY IN PAPUA NEW GUINEA.

Alfred Ihekoronye[1]

***ABSTRACT***

*The paper outlines livestock production systems in PNG, the economic aspects of livestock industry development, the nutritional needs, education and training as tools of rural development. Ways and means to foster production and slaugther facilities and value addition are briefly examined.,*

***Key words**: Livestock development, nutritional needs, education, training.*

## INTRODUCTION

Sustainable development of the Livestock Industry in Papua New Guinea as the next decade approaches will place a high premium on evolving a clear and comprehensive national policy on beef production, improvement of slaughter facilities, meat processing for value addition and matching of livestock production systems to the available resources in the country. At present the livestock industry operates at below potential levels of productivity. Government policy on beef production is not clear. For instance, it has been observed that when protection was provided to the domestic beef production systems against imports by expensive or cumbersome shipping in the late 1980's, local beef producers had a good market. The national herd, only able to satisfy about 30 percent of the fresh or chilled beef requirement, enjoyed the status of sellers' market. Recently the market status became disturbed, prices have declined since 1987 and there is buyer resistance against prices demanded by producers. Consequently, producers are disenchanted and wonder what to do with their herds, which represent considerable investment backed by expensive bank loans.

## LIVESTOCK PRODUCTION SYSTEMS IN PNG

Domestic livestock production consists primarily of beef, poultry and pork. Of these only pigs are considered indigenous to the country. Both pigs and poultry are raised in villages while cattle, which are comparatively new to smallholders, are beginning to acquire social importance. Pig breeding has remained a small-holder operation but both cattle and poultry production are based primarily on large-scale, commerical operations.

**Beef**: The cattle industry is organized around 4000 small-holders who account for about one third of the national herd of 100,000 cattle and about 270 ranches which comprise the remainder. Many of these ranches are owned by non-nationals; 12 of them, with 1000 ha or more, accounting for 25 percent of the national herd. Over half of the national herd is located in three provinces: Morobe, Madang and Central. Government policy in recent years has been to limit the expansion of ranches while promoting the growth of smallholders.

During the past few years, a number of problems have developed among small-holders, evidenced by the decline in the number of loans being requested from the banks and in the sale of cattle from ranches. On the technical side, difficulties have been experienced over grazing control and poor maintenance of pastures and fences. The net cash return has been declining in some cases because input costs have doubled while the gross return has risen marginally.

The pressure to increase beef production arises from the prospects for future growth in consumption. During the 1970s, beef consumption grew by 7 percent. Domestic production increased at an average annual rate of almost 25 percent, but because of the low base, it accounted for only about one quarter of the total supply in 1976. Assuming that total consumption continues to grow at the past rate and the rate of growth of domestic production declines to about 8 percent annually due in part to slowdown in small-holder production, beef imports could double over the next decade.

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**Poultry:** Over three fourths of the country's poultry production comes from several large scale, fully integrated commercial units located near the main urban areas. Annual village production is estimated at only 500 metric tons. The poultry industry is leading other livestock industries in terms of development by increasing its output to a level where it is estimated that the total value of the local livestock industry including village production is approximately K55.6 million at current prices. This increase can be attributed to the activities of the poultry industry through forward, backward and employment linkages as well as its investment in improving the quality of human skills.

**Porks:** Because of the complex role of pigs in the country's social structure, it is difficult to estimate production or consumption. However it is reported that commercial pig industry has increased its output to a level where it is capable of supplying more than 90 percent of apparent market demand. It is important to point out that the current level of self-sufficiency in the poultry and pig industry is related to the government protection policies introduced in 1983.

## ECONOMIC ASPECTS OF LIVESTOCK INDUSTRY DEVELOPMENT

Animals are grown and slaughtered to provided nutritious meat for humans, and without this utilization, few of what we consider "meat" animals would be allowed to exist except as examples of species in Zoos. As the economic stature of a country increases, there is often a shift in its diet and nutrition to include a greater percentage of tasty, well-balanced protein from animal sources. With all of the natural advantages of animal food products, there still remains a greater quantity, often in excess of 50 percent, of animal by-products of rather unusual physical and chemical characteristics which are not part of the normally consumed steaks and roasts. The efficient utilization of these edible and inedible products creates value added to the normal process. The economics of the meat industry demands that animal by-products be utilized so that the livestock industry can stay economically competitive with vegetable protein sources. Today the cost of the live animal often exceeds the selling price of its carcass; therefore the value of the by-products must pay the expense of slaughter and generate the profit for the meat slaughtering operation.

In addition to this, the meat industry has the obligation to eliminate waste by salvaging as much of the animal as possible, since this is a valuable natural source. Non-utilization of animal by-products would create a major aesthetic and catastrophic public health problem. The issues raised above have not been explored to any extent by the livestock industry of Papua new Guinea.

## STRATEGIC ISSUE AND POLICY OPTIONS

When looking at the viability of the livestock industry in PNG, one recognizes that there are some positive factors which give the industry an advantage. Temperatures are not extreme, there are no predators, there is very little competition for food from other ruminants and land is readily available although its usage is limited by customary constraints. However the need to achieve economics of scale in the industry has to be addressed.

**Institutional Needs**: The number of parastatal organizations operating and/or controlling significant components of the livestock industry needs to be addressed. There is substantial investment made by parastatal bodies such as the Agriculture Bank, the Investment Corporation and the Livestock Development Corporation in the livestock industry. These organizations are reported to be directly controlling beef cattle ranches, poultry and pig activities, abattoirs and small goods. The structural machinery of these agencies, interactive function and their individual roles and operation need critical re-evaluation, revamping and streamlining.

**Education and Training as tools of Development**: Livestock research should be directed mainly to breeding a more indigenous stock able to survive in PNG environment and with less demanding management systems. Since the cost of production in poultry and pig industry is linked to feed costs, the reduction of feed costs is another factor for research. Basic raw materials for feed formulation are available in the legume crops, cereals, root and tuber crops and waters of Papua New Guinea. Efforts should be made to use these in the production of livestock feeds. In addition to adaptive research, some increased support from government extension services is necessary.

**Beef Production Development:** The pressure to increase beef production arises from the prospects for future growth in consumption. Im-

provements in the conditions of small-holder cattlemen would require a widespread, intensive and extensive effort. Consideration should be given to developing different ways of improving management methods for small-holders, but under national ownership.

Feedlotting is not only meant for large enterprises; small-holders could do the same especially in areas where there is a dry season free-ranching problem, but also where farm roughage and industrial offal is available.

**Protection To Foster Production:** It is certainly necessary to give the producers some protection that will encourage the serious entrepreneurs to produce. Protection can take several forms. Increasing the import duty on selected categories of meat cuts, particularly the top grades, since local producers cannot as yet provide top quality beef for the manufacturing and canning industries. A further protective measure which has been suggested is to institute an officially posted floor price for the top grades based on the cost of imported beef with a theoretical import duty of 35 percent rather than the actual current eight and one-half percent.

**Slaughter Facilities and Value Addition:** All improvements on the farm have to be matched by increased efficiency in the abattoirs otherwise much of the good effort will be undone. It has been observed that even in places where abattoirs have been constructed, conditions are frequently unsatisfactory. Consideration should be given to a fully mechanised plant incorporating such activities as deboning and meat processing.

Satisfactory conditions for slaughter and processing are vital if the products from the abattoirs are to meet the standards set by the manufacturing and canning industries. By-product recovery and treatment must be examined in a way that aims for economic optimization rather than biological maximization.

# LIVESTOCK RESEARCH AND DEVELOPMENT IN PAPUA NEW GUINEA

B.J.K. Bakau[1] and K.K. Galgal[2]

***ABSTRACT***

*The paper provides an overview of livestock research and development in Papua New Guinea together with some of the major constraints encountered. Strategies and opportunities for improving animal production in PNG are examined.*

***Key words:*** *Livestock research, Livestock development, constraints, strategies.*

## INTRODUCTION

Traditional subsistence animal production in PNG is based on pigs and chicken. Pigs in particular have played an important role in the lives of people in nearly all of the 700 ethnic groups of PNG. There is no history of grazing animal management in PNG. The existing populations of cattle, sheep, goats and buffaloes were introduced into the country by Missionaries, Plantation Settlers and Colonial Administration as early as the 18th century mainly for the purposes of weed control under coconut plantations, draught power and self-sufficiency in fresh meat and milk supply.

Establishment of livestock industry in any country is a complex process. Adequate resources, appropriate technology, investments, proper planning, correct policies and above all participation of the beneficiaries (researchers, producers and consumers) and a realistic time frame are essential components of livestock development strategies. These are not easy to achieve. Early development strategies assumed that "technology transfer", not "research" was the key to progress. But it has been proved that, direct transfer of technologies from developed to developing countries like PNG has rarely been successful by any standard, technical or economical. The transfer of specialised animal production technologies from developed countries to PNG, occasionally had led to short term gains in animal production. However, the long term consequences have been a dependency on imported meat, feeds and superior animals to take advantage of the transferred system. Another negative side effect of imported technologies has been the serious neglect of indigenous breeds and local feed resources and frequently excessive high production cost.

In PNG it is not easy to introduce technological innovations in livestock production at village level. Without adequate knowledge of taboos, customs and the sociology of the village communities, the development agencies have little hope of establishing methods to improve traditional systems. Subsistence farmers must first ensure their families food supply. Only then can they think of improving their pastures and animal production throughout.

This paper presents the overview of livestock research and development in PNG and outlines some of the major limitations encountered, the current strategies and opportunities for improving animal production in PNG.

## OVERVIEW OF LIVESTOCK RESEARCH AND DEVELOPMENT

During the colonial era much livestock research work was done to evaluate the adaptability and performance of imported livestock species (cattle, pigs, chicken, sheep, goats and buffaloes) under PNG climatic, nutritional and management conditions. Major emphasis was focused on reproduction and growth aspects of genotype X environment interactions of exotic breeds and their crosses with indigenous breeds and naturalised breeds of earlier importations. These researches were carried out on research stations. Very little was done on farms.

Research activities to provide the technical foundation for livestock development carried out in the

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*Table 1.* **Comparison among Javanese Zebu and Droughtmaster breeds of cattle for growth and reproductive performance under two environments.**

| | Javanese Zebu | | Droughtmaster | | |
|---|---|---|---|---|---|
| | Erap | Urimo | Erap | Urimo | Source |
| Growth rate of calves (kg/d) | 0.5 | 0.53 | 0.72 | 0.35 | Holmes (1981) |
| | - | - | 0.72 | 0.46 | Schottler *et al.* (1977) |
| Calving interval (months) | 11.9 | 12.8 | 13.8 | 21.5 | Holmes (1981) |
| | - | - | 13.8 | 18 | Schottler *et al.* (1977) |
| Calf production per cow (kg/yr) | 122 | 122 | 162 | 61 | Holmes (1981) |
| | - | - | 153 | 82 | Schottler *et al.* (1977) |

1970s were mainly based on research stations at Erap, Bubia, Aiyura and Menifo. Apart from formal research there has been much trial and error practical application of ideas for pasture improvement. Unfortunately much of both types of experimentation has been inadequately documented, and the results have not become availabe for general application. Therefore, many of these studies can be regarded as preliminary and not conclusive but do provide some basic guidelines for expansion and improvement.

**Ruminants**

Earlier studies on the reproductive and productive performance of different beef cattle breeds and their crosses at different locations and nutritional conditions in PNG suggest that performance of beef cattle is generally poor with low reproductive rates and low growth rates of weaners at both pre- and post-weaning (Holmes *et. al.* 1974; Schottler *et. al.* 1977). There were marked differences in the performances of different breeds at different locations which were attributed to by Genotype X Environment interactions.

For example, when the Javanese Zebu and Droughtmaster breeds were compared for growth and reproductive traits at Urimo and Erap, the Zebu performed better under Erap condition (Table 1). This was because the Zebu (*Bos indicus*) was adapted to survive, produce and to reproduce on very poor nutrition under very harsh environments where as the Droughtmaster is a cross between the tropical and temperate breed (*Bos taurus* and *Bos indicus*) (3/8 Shorthorn, 5/8 Brahman). Therefore, the Droughtmaster was able to perform better only on improved pastures (*Cenchrus ciliaris*) at Erap.

Herd fertility is reported to be low (<60%) in PNG. Environment, genotype and management factors combine to influence the reproduction performance of beef cattle in PNG. Rainfall pattern of a local environment is an important factor that influences the growth of pastures and nutrition of the animal. Some breeds of cattle such as Brahman are known to have longer lactational anoestrus period which affect their oestrous cycles between calving intervals.

For example, Brahman cross cows at Erap calved 56 days earlier when their calves were weaned at 4 months compared to those weaned at 7 months (Schottler and Williams 1975). Delaying the weaning age from 4 to 7 months did not affect the average pre-and post-weaning growth of calves (0.70 kg/d vs 0.63 kg/d and 0.28 kg/d vs 0.27 kg/d respectively), except that the 7 months old calves were heavier than 4 months old calves at weaning (196.8 kg vs 120.0 kg). However, the growth of early weaned calves at 4 months was dependent on season of birth and pasture quality. The most favourable period for calf growth was found to be between Janaury - March, which is the main wet season.

**Pastures**

Much of the pasture research work in the past has been to evaluate productivity and nutritional quality of pasture types in terms of animal performance at different sites in PNG. Most research activities were carried out at Erap and Urimo (now abandoned) and was aimed at developing a sustainable pasture system utilising native grassland mainly *Imperata cylindrica* either with or without the addition of improved species or replacing the native grassland with fully improved pasture species.

Tropical pastures (native or improved) are generally of very poor quality (Low N content, high fibre content and low digestibility), thus, limiting indigestible protein and energy. These pastures are renowned for fast growth and early maturity during wet season. During dry seasons they have low nutrient concentration and digestibility, thus limiting voluntary intake and low animal productivity.

These were evident from a series of studies conducted at Erap by Holmes *et al.* (1980). The dry matter yield increased with increasing age while the corresponding nitrogen content decreased. The interesting thing noted was that the nitrogen concentration dropped by 23% within the first 6 weeks. This indicates that *Imperata cylindrica* can not maintain its quality after 4 weeks of regrowth while at the same time cannot sustain higher stocking rate at low dry matter yield. The digestibility of *Imperata cylindrica* was also lower even at early stage of growth compared to other improved species. It was shown from the same series of experiments by Holmes *et al.* (1980) that animal productivity were lower at higher stocking rates on native pasture (*Imperata*) alone than *Imperata* + legume, improved pasture + N fertilizer or improved pasture + legume. Thus, it is evident that the natural grassland in PNG dominated by *Imperata cylindrica* cannot sustain pasture quality and animal production at higher stocking rates, unless these grasslands are incorporated with other improved grasses and legumes or some forms of supplementary feeding are used.

The quality of diets selected by cattle grazing natural grassland in PNG is dependent on the seasonal rainfall pattern. At least for Erap in the Markham Valley areas, it was demonstrated that the nitrogen concentration from diets selected by Brahman cross steers were higher following higher seasonal rainfall pattern. At least for Erap in the Markham Valley areas, it was demonstrated that the nitrogen concentration from diets selected by Brahman cross steers were higher following higher monthly rainfall (Galgal, unpublished).

**SUPPLEMENTARY FEEDING**

If increased productivity from ruminants is to be expected, supplements with some provision of high digestible nutrient content should be given. However, supplements of such value are scarce and often expensive. In PNG feed resources in the form forage shrub/tree legumes and agro-industrial by-products such as copra meal, molasses, oil palm kernel cake, millrun, pyrethrum marc and brewer's grain are available and under-utilised.

Supplementary feeding studies with agro-industrial by-product at Erap and elsewhere have shown some positive indications on growth performances. Gwaiseuk and Holmes (1985) have reported a growth of 0.6-1.0 kg/d when Brahman-cross steers were supplemented with millrun at 3.3 kg/d over a 4 month fattening period. Galgal *et al.* (1990) have reported that a growth rate of up to 0.93 kg/d of live weight can be achieved from Brahman-cross steers grazing native pastures under coconuts when supplemented with 30% level of estimated daily DM intake with copra expeller pellets (CEP). In the same experiment, steers grazing native (*Imperata cylindrica*) pastures on open grassland gained 0.64 kg/d and 0.55 kg/d when supplemented with and without CEP respectively. Supplementary feeding trials of cattle in Australia using copra meal (CM) and cotton seed meal (CSM) have shown that even though copra meal contains half the level of protein compared with CSM (21% Vs 40%). Copra meal gave a similar growth response to the same amount of CSM (Hennesy *et al.* 1989; Gulbransen *et al.* 1990). In the study by Hennessy *et al.* (1989) weaner steers on low quality pasture given 500g/d copra meal gained a similar amount of live weight to those fed 500g/d CSM. However, when 30g of urea was added to 500g of copra meal, the weight gain was similar to those fed 1000g/d copra meal in 42 days.

Since then very little co-ordinated research and development work on livestock has been carried out in PNG. Research was done in isolation while producers were asked to improve the productivity of their animals using their animal husbandry knowledge. This saw some achieving little through trial and error while others had management problem mainly through not understanding the animal re-

quirements for nutrition, and other environmental factors. This is true in the case of ruminant animals for which the ranch manager or smallholders lack understanding of the soil and climatic requirements of different pasture species and the safe and optimum stocking rates of different pasture types, resulting in inappropriate utilisation of the abundant forage resource.

**Sheep and Goats**

In the mid-seventies the PNG Government decided to develop a sheep industry in the Highlands region based on smallholders. New Zealand Government assistance was sought and as a result New Zealand dual purpose breeds of, the Corriedale and Perendale were imported into the Highlands of PNG. The objectives of the project were to:

- test the feasibility of establishing a sheep industry in PNG; and
- develop management and husbandry systems suitable for farming of sheep under PNG conditions.

Research was aimed towards the development of suitable pastures for sheep grazing. Up to this day the small ruminants (sheep and goats) are still encouraged by the government. The expansion of these two species is slow because of the management problems and low extension input.

The imported breeds did not adapt well to climatic and pastoral conditions, consequently, they suffered major health problems from internal parasites, footrot and foot abscess, fly strike, clostridial diseases (tetanus, botulism, enteroximia etc,) and mineral deficiencies.

Breeding results were poor, due to the imported sheep being slow to adapt to their new environment because of heat stress, health and nutritional problems, lack of stimulus to oestrus from minor changes to day length and possible mineral deficiency. Performance, through increased and better understanding of tropical sheep farm management, has improved, but imported sheep performance is still inferior to those bred in PNG.

**Monogastrics**

Earlier research on pigs and poultry was aimed at improving village and peri - urban pigs and poultry. Breed upgrading through cross-breeding with exotic breeds and feeding studies utilising locally available feed resources for efficient feed utilisation were the two main objectives.
Apparently, these programmes were terminated in the early 1980s because of (i) there was no contribution to the cash economy by village level piggeries and (ii) large commercial piggeries and poultry industries have taken over commercial feed formulation and importation of commercial bred strains of birds and pigs with higher feed conversion ratios.

## CURRENT STRATEGIES AND FUTURE DIRECTIONS FOR RESEARCH AND DEVELOPMENT

The government's long term objective is to become self - sufficient in food production including livestock. In line with this broad objective the livestock sub - sector's short and medium term objectives should be to:

- increase reproductive efficiency
- develop a sustainable pastoral and animal production system
- genetic improvement of local breeds
- improve marketing infrastructure for local
- improve research, extension and technology transfer and
- increase self - sufficiency and import substitution.

To implement the above objectives, the research and development plans are set in the following priority areas:

- **Evaluation and utilisation of local feed resources for intensive livestock production**
- **Genetic improvement and diversification of indigenous livestock species and adapted breeds**
- **Permanent agriculture system**
- **Manpower development and institutional capacity building.**

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# [1]EXTENSION PERFORMANCE MANAGEMENT: INTERNATIONAL TRENDS FOR THE 1990s

Bob McKillop[2]


## ABSTRACT

*International experience from agricultural extension and related services is reviewed. The need for public sector reforms in Papua New Guinea is then assessed. The principles of public sector reform are applied to identify future directions for agricultural extension services. Since the task of improving the efficiency and effectiveness of delivering agricultural extension services is a world-wide priority, international experiences are also highlighted.*


***Key words**: Agricultural extension, future directions, PNG reforms.*

## INTRODUCTION

Improving the efficiency and effectiveness of delivering agriculture and livestock services is a world-wide priority. I have been a field practitioner and analyst of agricultural extension in Papua New Guinea since 1962. To this experience, I have had the opportunity of reviewing the performance of extension services in Africa, South Asia, South-East Asia and the South Pacific since 1978. In recent years, in association with the Asian Development Bank, I have been bringing international experience of extension delivery together in order to identify key lessons which should be applied to the process of improving performance. These lessons from international experience provide a useful starting point from which we might address the issue "where to from here?"

This paper reviews international experience from agricultural extension and related services. The need for public sector reform in Papua New Guinea is then assessed. The principles of public sector reform are then applied to identify the future directions for agricultural extension services.

## LESSONS LEARNED

### International Experience

There is now a wide body of evaluation experience from rural development programs and projects around the world which provides valuable lessons on the role and effectiveness of service delivery systems. The proportion of successful projects has been lower in rural development (agriculture, livestock and fisheries) than other sectors, reflecting the complex range of human, environmental, technical, economic and institutional factors which need to be considered in designing interventions in this sector. The overall lesson from evaluation experience is that the macro-economic and policy environment must be supportive for growth in the agricultural sector. Where sound policies are in place, project success is determined by:

- the levels of **incentives** and opportunities built-in or generated by the project;
- suitability of the **production technology** and level of the productivity increases achieved;
- the effectiveness of the local organisations and the adequacy of the institutional framework they relate to.

Projects located in isolated or poor regions usually lack the essential components for success, especially an economic engine that could stimulate development. Although area development projects (such as the East Sepik RDP, Enga Rural Development and the Hiritano Highway Projects) may

[1] The discussion in this section is based on the author's forthcoming publication, An International Handbook of Performance Evaluation, which is being prepared in consultation with the Asian Development Bank.

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have provided some local infrastructure, such as feeder roads, these generated only limited benefits because of lack of a marketable surplus.

Internationally, large investments have been made in agricultural services projects to increase agricultural production through the strengthening of services to farmers which develop:

- improved technology (research);
- provide advice on its use (extension);
- ensure the regular and timely supply of the inputs called for by the new technology.

As the supply of inputs can reliably be left to private traders and merchants, the majority of agricultural service projects have focused on improvements in research and extension delivery. International assistance has played a key role in augmenting the flow of resources to research activities and in promoting the World Bank's training and visit system (T&V) of agricultural extension. While projects have assisted in building part of the institutional infrastructure necessary for supporting a science-based agriculture, sustainable institutional strengthening has proved difficult.

The principal **internal factors** which generally result in reduced economic and financial performance of agricultural services projects include:

- over-reliance on public sector agencies, which may stifle private sector initiatives;
- an institutional culture orientated toward administration and allocation, rather than the effective management of resources to achieve performance targets or professional research ethics (the institutional culture);
- the budgetary and procurement procedures, salary scales and staff policies of public sector organisations, which stifle incentive and achievement;
- inadequate pricing of services to generate signals on which activities are saleable and to generate income to meet increased operating costs.

The **external factors** which can adversely affect the performance of agricultural services projects include:

- depressed **commodity prices** which suppress returns to agriculture;
- **exchange rate policies** which discriminate against agriculture;
- **government intervention** to influence the price of farm inputs (which generates artificial demand).

**Institutional Culture:** the rationale for agricultural research and extension services assumes an institutional culture supportive of innovation and scientific inquiry. In most developing countries, service delivery agencies are characterised by a bureaucratic culture which is the direct anthesis of an innovative and entrepreneurial approach. Agencies are dominated by rigid hierarchical power structures: innovation and challenges to traditional approaches are actively discouraged. Service delivery agencies are also characterised by limited planning and budgeting capability, poor management and accounting systems, inadequate funds, especially for recurrent operations, and reward systems which stifle incentive.

**Technical Issues:** The effective demonstration of improved technology which generates benefits for target beneficiaries is the critical factor for success in agricultural research and extension projects. This requires that the technology development and dissemination process produces innovations which generate financially attractive benefits to farmers within their context of resource constraints and socio-cultural values. It implies that research involves farmers in design and implementation of trials from a farming systems perspective and that extension has proven methods for demonstrating benefits within the context of target farmers' frame of reference.

The technology for developing and disseminating information (messages) needs to be appropriate in terms of the local resource base. Cost-effectiveness in reaching target groups and maintenance capability are the key criteria.

**Financial Performance:** Generally service organisations are characterised by low rates of efficiency and financial performance compared with private sector operations. They must

*Table 1:* **PERFORMANCE INDICATORS, AGRICULTURAL SERVICES**

| SECTOR | PERFORMANCE INDICATORS | UNITS | Standard |
|---|---|---|---|
| **Agricultural Services** | **Capacity:** | | |
| | Numbers and qualification of staff | Nos x qualif'n | |
| | Presence of active private sector and non-government organisations | Nos/role NGOs-private organis. | |
| | Agency planning and budgeting capability | qualitative assess. | |
| | Management and accounting systems | qualitative assess. | |
| | System of staff reward and incentives | qualitative assess. | |
| | **Output:** | | |
| | Area of response to new innovations (rate of adoption) | % adopters | >35 percent |
| | "Willingness to pay" for information or service | %/level of willingness | |
| | Performance of technical assistance inputs for institution building | qualitative assess. | |
| | Relevance of the skills provided by training to the work tasks of staff | qualitative assess. | |
| | Number of trained staff who continue to work in their target role | percentage | |
| | **Efficiency:** | | |
| Financial viability of service agency | | Ratio of salaries/wages to total budget | <65 percent |
| | Organisation structure (top heaviness) | Ratio of field staff to management/service staff | |
| >70 percent | Operating efficiency | Ratio of field staff salaries to total budget | |
| | Operating cost per farmer contact day | $/ contact day | |
| | **Impact:** | | |
| | Financial returns to technology promoted under farm conditions | FIRR | |
| | Farmer participation in design and implementation of trials | qualitative assess | |
| | Cost-effectiveness of technology for developing and disseminating information ("messages") | $/'000 adopters | |

generate significant gains in productivity and recover their costs of operation (improved financial performance) if the services are to be provided on a sustainable basis. This may require reform of civil service staffing and wages - covering reductions in number of agency employees and improved pay structures - and identification of activities which can be privatised, delegated to the local community or stopped altogether. Extension agency involvement in the operation of nurseries, input (eg, fertiliser and seeds) delivery and similar functions not only involves the inefficient use of resources, but also diverts staff away from the extension function and inhibits private sector operations where these outputs are provided at subsidised rates. Agency achievements against financial performance criteria, such as the ratio of salaries/wages to total budget, ratio of field staff to management and service staff (top heaviness), ratio of field staff salaries to total budget (operating efficiency) and operating cost per farmer contact day, provide useful indicators of the financial viability of the institution. Table 1 provides a summary of some of the key performance indicators for agricultural service delivery agencies.

**Economic Viability**. Inefficient resource allocation to agricultural services has persisted, in part, due to the use of classical economic approach to estimating the EIRR of research

and extension projects. This constructs economic models which identify an area of response to an innovation and compute a supply response, taking into account factors such as lags in adoption. The approach poses difficulty in identifying benefits attributable to the project (the problems of identifying "with" and "without" cases) and in obtaining accurate data on adoption response.

An alternative approach is emerging from contingent valuation methodology. This is based on farm level research to identify responses to research/extension messages and identify the "willingness to pay" for the information or service. Identification of the market value of a service is central to the generation of a performance orientation in the management of the service agencies.

**Service Structure:** Typically, agricultural service delivery has involved great attention to institutional structures. Experience suggests that institutional capacity is more important than structure. Nevertheless, the modality of service delivery is also a significant factor affecting performance. On the whole, integrated industry-based services have performed better that generalist extension services which lack a clear focus for their activities. Efficiencies can be generated through agro-industry structures (e.g, dairy cooperatives, nucleus plantations/processing factories, intensive livestock and horticulture industries) which are able to provide integrated packages of technology, inputs and services on a commercial basis. Here the balance between service charges and the financial viability of outgrowers/producers is critical to the financial viability of the project and long-term sustainability. Where the market no longer requires the service, it cannot be continued without external support. The comparative advantage of the industry and the conducive sectoral environment including favourable markets and prices are key factors contributing to success.

However, a controlled, industrial production mode restricts the independence of the individual producer. Where smallholders are involved in supply of raw materials to central processing plants, significant communication difficulties can arise from differences between the institutional culture of the processor and the cultural norms of smallholder producers. In the absence of decision-making and arbitration mechanisms which retain the mutual respect of both sides, irreconcilable disputes can quickly arise which can, in turn, lead to complete project failure. For the bulk of smallholder farmers, there is an ongoing role for the traditional generalist extension service.

**Papua New Guinea Experience**

Development project experience in PNG suggests that too often, activities have been imposed from above with inadequate consultation with and commitment from target communities (Grittenden and Lea 1989). A lesson learned has been the importance of community participation in the design process. However, the process of consultation is difficult to implement in an effective manner. Government departments have a top-down communication structure and have difficulty making effective linkages at the community level, while officials and community leaders alike reinforce expectations that projects will provide tangible handouts to rural communities. As a result, there must be increased emphasis on a community development approach which encourages communities to take more responsibility for their own development (e.g, through the Village Services Program). The aim is to identify communities and individual entrepreneurs who are prepared to take more responsibility for their own development and assist these groups to mobilise their own resources.

The experience of bottom-up planning of programs and projects has been that rural communities tend to express their priorities in terms of improved social services (education and health services) and infrastructure provisions (roads and market access), rather than economic development. This is a desire for improved living standards without establishing the economic base to sustain the social services, infrastructure and consumption patterns. Effective development requires the planning process to match community desires with feasible and sustainable activities.

The effectiveness of support services and infrastructure influences the response of small-business operations to economic opportunities. Local groups complain they receive inadequate financial advice and skills training from Government extension services[3]. There is also a constant demand for enhanced access to credit. In reality, evaluation experience suggests that over liberal credit provision by financial institutions burden businesses with debts they are unable to service[4]. Moreover,

the lack of commercial experience within civil service agencies means that extension advice is often of limited value.

## GOVERNMENT IN THE 1990s

International Trends: Papua New Guinea is being integrated into the global economy. This means that PNG is under pressure for its economy to become more competitive, while ensuring that its natural resources are managed wisely for the benefit of future generations.

Traditional agricultural service delivery agencies were based on the institutional culture of the industrial era. These procedures, rules and regulations treated cases in a detached manner, thereby ensuring an even-handed and equitable response to individual clients. These mechanisms were also used to control what went on inside government so that resources were not misappropriated for improper use. Over time, regulation of the process (or controlling inputs) became to be the dominant feature of government.

Modern knowledge-based economies demand institutions which are flexible and adaptable. Public perceptions of government now characterise the slowness, inefficiency and impersonal nature of the bureaucracy in responding to community needs. In PNG, the government has experienced difficulty in delivering basic services in rural areas. The outcome is a dramatic fall in public confidence in the government.

The challenge of the 1990s is to revitalise government to be responsive to community needs and accountable for the efficient management of public resources. Transparency and the measurement of results, or outcomes, is central to this process. The demand is for entrepreneurial government agencies which:

- measure performance in terms of outcomes, rather than focussing on inputs
- are driven by their goals, not by rules and regulations; empower citizens, pushing control out of the bureaucracy into the community;
- are customer-driven, meeting the needs of the client, not the bureaucracy;
- promote competition between service providers, rather than controlling the delivery of services themselves;
- are anticipatory, preventing problems before they occur, rather than simple offering service afterward;
- use market mechanisms rather than administrative allocations;

And catalyse all sectors - public, private and voluntary - into action to solve their community's problems.

These principles set the framework for public sector reform in PNG to improve the performance of agencies involved in the delivery of agricultural services. These agencies need to respond to new development challenges, including indiscriminate exploitation of natural resources, inappropriate land management practices and policies, reduced forest areas and marginalised agricultural land.

## FUTURE DIRECTIONS FOR PNG

### Service Delivery Options

These principles of public sector reform establish the parameters for the future directions for agricultural extension services in Papua New Guinea. Future extension services need to devolve power from central bureaucracies to local and regional bodies, with entrepreneurial government agencies which are responsive to their customers, performance driven, market-orientated and anticipatory of forthcoming problems. The task is primarily one of achieving fundamental changes in the institutional culture within extension agencies in order to achieve desired performance outcomes.

Structural changes are of less importance. However, PNG is a diverse and unpredictable nation which does not lend itself to standard solutions. Therefore, several themes for service delivery

[3] Initial findings of the AIDAB/PNG Renewable Resources Sector Study indicate widespread frustration among producers over claimed shortcomings of extension services and recognition of the need for access to technical information and improved management skills for both improved production and sustainable business.

[4] Although there are regular political demands for easier access to credit, the real constraint is the capacity to identify viable projects and manage them well. The East Sepik study and other surveys of credit requirements have identified the over liberal provision of credit by financial institutions as a significant constraint as ventures are burdened with debt levels beyond their capacity to service the loans.

systems are likely to emerge con-currently. These include:

a) **Industry-based service delivery agencies:** The emphasis here will be on efficient corporate bodies which are focuses, controlled by the industry and are financially autonomous through levies or direct charging for services. In the case of Ramu Sugar and Niugini Tablebirds, the central processing agency delivers a total package of inputs and technical advice and deducts the cost from the commodity payment due to the client. Such models are financially efficient and sustainable so long as the industry retains a comparative advantage, but are vulnerable to commodity price fluctuations and the volatility of outgrowers in response to central control. The industry extension model, developed initially by the Coffee Industry Corporation, offers the opportunity to develop a performance-orientated institutional culture. To the extent that this is achievable in PNG, this approach is much more focused and cost-effective than the generalist model.

b) **Private sector delivery:** That the private sector can provide input supply and marketing services much more efficiently than government agencies is not in dispute. Public sector involvement in the provision of these services, often at subsidised rates, generates market distortions which inhibit the development of a vibrant private sector (McKillop Williamson & Associates 1982). For extension services, the international trend has been one of increasing involvement by professional consultants in the provision of technical, financial and managerial advice on a fee for service basis. The author's 1982 report contained a proposal to transfer the agricultural extension function to the private sector on a fee-for-service basis (Tovue 1982). Subsequently, management agencies became active in service for delivery to agricultural enterprises promoted by the Agriculture Bank and a fledgling professional cader of agricultural consultants has emerged. Efficient agricultural enterprises in PNG depend on sound professional advice which, in turn, suggests a need to strengthen the professional standards of consultants.

c) **The voluntary sector:** Given the high cost of professional services, there has been an international trend to use non-government organisations (NGOs) to deliver low cost services to rural communities. NGOs have been active in so-called landowner awareness programs in PNG. However, such programs have suffered from an inadequate technical and economic base, often resulting in messages which are false, impractical and/or confusing to rural communities. NGOs have a useful function where they can build on and extend sound technical advice to rural communities in a cost-effective manner, but are unlikely to provide magical solutions to the service delivery problem.

d) **Government administrative services:** Despite widespread disillusionment over performance, government agencies continue to provide the main vehicle of contact between the state and its rural constituents. Several approaches have been tried under various aid-funded projects, but the trend has been towards a district management team under a unified chain of command to provincial headquarters. The staff of these district teams represent the major public sector resource in PNG for linking rural communities with central services. The issue at hand is not the restructuring of these teams in some new form, but the development of a stronger performance-orientation which ensures that the resources invested achieve effective outcomes. A major weakness of the district teams is their lack of a sound technical/economic base and proven messages to extend. Therefore, the institutional reform process needs to address the strengthening of capacity in this area.

## Target Groups

In the past, agricultural extension has focused on individual farmers or farm households. Experience suggests that this approach is financially inefficient and ineffective in the PNG context. Sustainable development depends on the capacity of local institutions at the household, area and industry level to manage the new and expanding activities upon which economic growth depends. Typically, local economies in PNG are characterised by smallholder agriculture, with several large producer organisations providing marketing, processing and input supply services to thousands of village farming or fishing families. Increasingly, resource-owner groups are seeking to establish their own institutions which can enhance their role in resource management activities. Such institutions should increasingly take up responsibility for

servicing the needs of their individual members. The incentives for expanded production depend, to a large extent, on the efficiency of these service organisations and associated commercial operations such as banking and retailing.

These fledging institutions have faced difficulty in obtaining access to the necessary information, skills and technology to operate on a sustainable basis. The target group for research and extension services therefore needs to become these institutions - including NGOs - rather than individual families.

**Extension Messages**

Extension services in the 1990s must be market-driven. They need to identify incentives which are attractive to their clients and provide practical advice on the necessary steps to generate these benefits. This requires a fundamental reorientation of the institutional culture within research and extension agencies. They need to measure performance in terms of outcomes, not inputs, and to understand market mechanisms rather than administrative allocations. The former public service approach, with its emphasis on encouraging dependency through hand-outs, is no longer sustainable. This generates a need for more in-depth professional training in agricultural systems and economics on the part of both researchers and extension personnel.

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# REORGANIZATION OF AGRICULTURAL EXTENSION SERVICES IN PAPUA NEW GUINEA

Felix Bakani[1]

***ABSTRACT***

*The need to reorganize agricultural extension services in PNG is discussed.The background of agricultural extension services, past and present and the constrains in the system in PNG are briefly outlined. The future extension management issues and existing reports and recommendations on extension serivces are highlighted. Policy implications in terms of urgency to re-define extension policy and consistent plans in order to achieve government's desire to improve the quality of life of the farmers is highlighted in the paper.*

***Key words:*** *Constraints, extension management, recommendations, policy implications, consistent plans.*

## INTRODUCTION

The Papua New Guinea (PNG) economy is predominantly agricultural. It provides income and employment for about 540,000 households or 85% of the population. Even though the mining sector provides 60% of the total export earnings, agriculture is traditionally the most important sector of the PNG economy and it will be so for a long time. At present Agriculture contributes 25% of GDP and 24% of export earnings.

Despite the importance of the agriculture sector, its performance since independence in 1975 has been disappointing. Its proportional contribution to GDP has declined over the years, partly because of the expansion of mining and other sectors; declining world commodity prices resulting in declining output and the lack of private sector investment in agriculture.

The agricultural sector is characterized by low productivity partly due to lack of skilled manpower, poor infrastructure, poor management and accoutability, lack of credit facilities, poor markets and farmers lagging behind adopting changing crop technology. These constraints result in poor extension at the farmer level.

Besides, agriculture in PNG is predominantly subsistence, though most farmers heavily depend upon a few exportable cash crops to meet their family needs. Food crops are mainly grown for home consumption and cash crops like coffee are for family income.

Cocoa, coconut, oil palm, rubber and spices are grown for meeting family cash requirements. Most village farmers are self sufficient in food crops, but this may not be so in the future, unless food production can increase faster than population growth. The same is true with the cash crop sector, where productivity of farmers has stagnated for many years.

These fundamental constraints to the whole agricultural sector need to be addressed before the country could face food shortages and a reasonable disposable income is obtained by the farmers from cash crops in order to provide decent living conditions for his family.

It is crucial for policy makers to investigate the present extension delivery system and improvements should be made in order for the farmers to respond to government's various initiatives.

## BACKGROUND OF AGRICULTURAL EXTENSION IN PNG

Prior to 1977, agricultural extension was the responsibility of the Department of Agriculture, Stock and Fisheries (now Department of Agriculture and Livestock), operational from Port Moresby with the help of four regional officers (controllers). The Agricultural Extension Service was well disciplined, funded, staffed and managed. The Organic Law of

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1977 led to the creation of 19 Provincial Governments and was also delegated the responsibility for extension activities to Provincial Governments. Agricultural Research, Education and Quarantine Inspection remained the national responsibility. Those activities remaining under the national DAL had been well staffed with qualified nationals and expatriates. The establishment and maintenance of a provincial departmental administration, with additional functions of development, planning and provincial ministries, absorbed a high share of staff capacity, funds and time previously devoted to extension. This coincided with the exodus of experienced expatriate officers resulting in a sharp decline in the availability of staff for extension services. Contacts with the farmers and links with research stations, particularly those located outside the provincial capitals and remote areas became minimal. Younger and less experienced extension officers also had the difficulty in being accepted by the villagers.

The problem was further aggravated by the fact that many officers worked in areas where they had kinship ties, which also adversely affected their performance. The provincial extension services deteriorated rapidly over the period. The service continued to suffer, among others, from lack of direction due to dearth of experience, lack of finance, poor planning and inadequate organisational structure, poor information, inadequate links with research and insufficient training.

## PRESENT AGRICULTURAL EXTENSION SERVICES

The following four types of extension services are provided in PNG;

(1) national extension,
(2) privatised extension,
(3) combined national and provincial extension, and
(4) managing agents.

The national extension has been provided to special rural development projects that receive foreign assistance from organizations such as the Asian Development Bank and World Bank. The projects are implemented with the assistance of project management units from DAL. One major difficulty faced by this approach has been the lack of continuity, once the project funds have been used up. The newly formed Industry Corporations of Coffee and Oil Palm are providing privatised extension for specific cash crops.

A combined national and provincial extension service currently applies to joint projects for cocoa, coconut, spices and rubber. The National DAL through its National Program Managers provides coordination, undertakes training of provincial staff, overall project administration and provides project funds, while the Provincial Governments fund the counterpart staff in implementing the projects under this system. The approach has been aimed to gradually strengthen the extension effort and is expected to provide continuity of services to smallholders and village settlements. However, this approach suffers from a lack of qualified personnel, inadequate funding, poor industry involvement and overall integration.

Private management agents represent the fourth extension approach practised in PNG. This was developed as a result of Government's Plantation Redistribution Scheme and the Agricultural Bank of PNG's credit conditions. This system was mostly for tree crops, offered little continuity, since services of most management agents were terminated, once the loan had been repaid. This system has been very costly for many plantation owning groups and has not been taken up whole heartedly by the people.

Even with the implementation of the four types of extension systems in PNG, the overall agricultural extension service remains weak in all the provinces.

## CONSTRAINTS IN THE PRESENT EXTENSION SYSTEM

The following are the various constraints identified in the present extension system:

a) Differences in extension priorities between national and provincial authorities;
b) Too much bureaucracy, too many levels in the system and lack of clear direction to Field Extension Officers;
c) Lack of experience and training to plan, implement and monitor at various levels in the present DPI system;
d) Lack of coordination between research, extension and farmers;
e) Non-availability or very little support to secure inputs, credit, markets and other support services;

f) Irregular farmer contacts by extension workers as a result of lack of organisational support and supervision;
g) Poor selection procedures of agricultural personnel, resulting in large number of unqualified and underqualified extension officers in the field;
h) Lack of housing, transport and attractive terms and conditions for extension workers;
i) Too little extension efforts directed to women, when they are the backbone of PNG agriculture;
j) Introduction of inappropriate technologies to PNG farmers without proper training and back-up services.
k) Lack of Agricultural Service Centres, which gather integrated management functions such as credit, extension, tractor hiring, input supply, crop storage, marketing etc, especially in remote areas;
l) Lack of infrastructures (easy access to many areas).

In view of the above lessons learnt over the last 17 years in implementing agricultural extension, a serious thought into finding alternative methods has become unavoidable.

## FUTURE EXTENSION MANAGEMENT ISSUES

In order to plan a workable, simple extension policy, it is important to divide main administration issues into:

a) Organisational issues, involving the internal structure and management processes of the extension agency;
b) Personnel issues, which concern the selection and training of staff, and mechanisms for dealing with the loss of morale amongst field staff;
c) Methodological issues concerning the contact between extensionists and farmers.

## EXISTING REPORTS AND RECOMMENDATIONS ON EXTENSION

In the last 20 years there were many reports and recommendations in regard to ways of improving the Agricultural Extension in Papua New Guinea.

Some of them were highlighted in the World Bank Agricultural Sector Review of 1980. Mckillop (1976) had written on extension as early as 1976 in an article "A History of Agricultural Extension in Papua New Guinea".

The most important of these was the Agricultural Extension Improvement Study (ANZDEC 1990). It was a comprehensive report on the state of Extension in Papua New Guinea. As a result the AREP Project is being implemented to improve the Extension in Papua New Guinea.

The more recent of findings from the Workshop on Delivery of Agricultural Services has touched on important areas which need to be considered. The Working Committee recommended four major areas which need improvement. They are:

1. Research, Extension and Training;
2. Marketing and Rural Credit;
3. Plant and Animal Health Services;
4. Information Systems on Agriculture.

The Committee also highlighted that there are a number of pre-requisities to improving the delivery of services, which fall outside the jurisidiction of the Department of Agriculture and Livestock. They are:

- improvement in the current road infrastructure system.
- improvement in the terms and conditions of Government employees.
- adequate resource allocation to the agricultural sectors.

The major outcome of the workshop was that the Provincial DPIs be amalgamated with National DAL.

### DAL Functions and Boundaries

Even though Department of Agriculture and Livestock is the main thrust to Agricultural developments in Papua New Guinea, it has its limitations to implement policies and programmes on various aspects due to past political decisions. The main areas are:

#### i) Extension

The major extension function is carried out by the Provincial DPI's, thus National DAL could not enforce policies pertaining to Agricultural Extension. DAL's inputs are basically through

joint programmes and funded projects. However these types of inputs are only in selected provinces. Different provinces have different priorities and it has been difficult to implement effective extension at farmer level due to two layers of Extension policies and implementation. It is evident from the results that Provincial extension is ineffective.

**ii) Research**

It has been recognised that the Agricultural research activities in the country need to be streamlined to meet the farmer's needs. Most research in Papua New Guinea is carried without any thought of the benefits to be accrued, and to whom. Research should be based on what is needed for farmers to improve his crop output. There is a lack of co-ordination between research and extension. Even there is a lack of contact and co-operation between various research institutes in the country. The recommendation that a Crops Research Institute should be established to undertake all Government Agricultural Research needs to be studied. The link must be established with such institutes together with the present commodity based research institutes who can also assist in many ways to improve the extension - research link.

**iii) Training**

Training has been and is still the most talked about subject in Agriculture. Training for extension officers, farmers etc is an on-going activity. The present situation is that there is a neglect on the part of the government in ensuring that funding is provided to improve the capabilities of the training institutes, above all the ability to impart knowledge by the trainers to the extension officers and farmers. Again co-ordination is vital to draw up curriculum for the needs of the recepients rather than running courses for the sake of running a programme or course. Various recommendations suggested the need to be taken further in this seminar.

**iv) Marketing and Credit**

For successful Agricultural Extension, these two areas are vital. My other collegues will elaborate in detail about the importance of it. Here, I like to mention that internal marketing services are poor, particularly in remote areas of many provinces. DPIs are short of funds, private operations are few, thus resulting in the farmer losing interest in production.

Credit continues to be a major constraint. Small farmers are unable to get any form of credit to improve his quality of life though this subject has been raised in many Seminars such as of today. We have yet to find simple and effective credit facilities for farmers.

The key to small farmer credit lies in the linkage between various functions. Above all we need qualified extension officers who could liaise between credit institutions and farmers.

The present system of credit serves only exportable cash crops, but what about farmers' of food crops? Food security is more important to a farmer and the nation as a whole. If he has the credit facilities, to buy inputs, even our forests will be saved from being depleted by stopping him from practising, shifting cultivation!

**Linkages between Institutions, DPIs and DAL**

The present linkages between various departments and institutions are weak. It is not surprising to see at farm level that there is no basic support to farmers from important institutions. The major setback is the lack of regular contacts. Remote farmers are always the victim.

The Provincial DPIs have little resources to undertake trials and research, nor they are able to direct research institutes to concentrate research on crops which their farmer grows.

The Commodity Corporations are carrying out specific crop research in isolation. Linkages between other research and even Provincial DPIs and DAL are minimal. Such resources should be redeployed to optimise delivery of services to farmers.

Various other NGOs in this country also are working in isolation. Every organisation in this country is targeting the same farmer. This warrants proper linkages from all those involved in the delivery of services. This seminar should look into ways to establish these links.

## POLICY IMPLICATIONS

There is an urgent need to re-define the extension policy. There must be long term and consistent plans in order to achieve government's desire to improve the quality of life for the farmers.

The main weakness at the moment is too many recommendations and continuous change of policies. This should be addressed. Extension means change. It cannot be realised in a year, it takes 5 - 10 years before some changes could be observed. What is needed is a well defined, simple to implement type of policy, which is well understood by all, from the top administrators to the extension officers who contact the farmers.

The idea of Integrated Extension is important. DAL and Corporations need to identify each other's boundaries in extension. The Corporations must provide services other than cash crop extension services. Since the officers are in regular contact with their farmers, the farmer's other crops and needs must also be attended by corporate extension officers.

## EXTENSION APPROACHES TO ADOPT

In order to implement an effective extension approach, options existing around the world should be investigated.

Types of Extension Approaches and their Characteristics

### i) Conventional Agricultural Extension Approach

- Generally aims at increasing national agricultural production, including food crops, export crops and animal production.
- Due to its general aims and objectives, it is usually difficult to prioritise objective of farmers with the national objectives which causes conflict in the policy of the organisation.

### ii) Training and Visit System

- Aims at improving the *effectiveness* of conventional agricultural extension organisations. Successful in many third world countries.
- Main focus on increasing individual farm production.
- Extension is tied with Research through the assistance of Subject Matter Specialists.

### iii) Commodity Development and Production System

- Presently practised by corporations, funded projects and PIP's in the country.

### iv) Integrated Agricultural Development Programmes

- In order to achieve increased agricultural output, all institutional components that affect this process must be co-ordinated and applied.

### v) Integrated Rural Development Programme

- This approach reflects a broader concept of rural development, including both social and economic factors.
- Has a strong emphasis on participation of the rural people in planning, implementation and evaluation programmes.
- Increased participation is a central concern of these programmes particularly to increase self reliance and local initiatives. Rural Development Programmes also pursue objectives to improve health, nutrition and basic education.
- By aiming these programmes at the rural poor, there is a direct attempt to achieve increased equity in terms of the new or expanded rural services.
- Pilot projects are established in the target areas to workout the methodology of establishing rural development programmes.

## METHODOLOGY TO ADOPT

- Mass media, such a Radio/TV must be used effectively in disseminating information to farmers.

- On-going Demonstration and Field days conducted both by Extension Officers and Research Institutes.

- Contact Farmer Approach, Group Approach and Clan Approach should be used according to the situation (remoteness of the area and knowledge of farmers etc.).

- Use of Subject Matter Specialists when and wherever needed to impart technical information to farmers, especially in the group or clan approach.

## EXTENSION APPROACH TO ADOPT IN PNG

The best approach applicable to PNG is "Integrated Rural Development Approach". This approach continues to reflect a broader concept of rural development including both social and economic factors. In doing so, there is a concern that these programmes provide an income - producing component which involves new agricultural technology. At the same time there continues to be a strong emphasis on the broad based participation of the rural poor in planning, implementation, and evaluation of programmes. These efforts are also clearly designed to enable rural people to strengthen their indigenous institutions.

## A WORKABLE EXTENSION SYSTEM

The idea of linking national extension with provincial extension is the right direction in today's context. A single line of command will definitely improve the farmer contact, this in turn will make the government's policy of delivering services more effective.

In order to plan an effective extension system the extension agents need information about:

a) The goals, that an extension program intends to achieve (short term and long term)
b) The target group
c) The media that could be used
d) The resources that are needed to achieve the goals.

In order to implement an effective extension to meet national and farmer goals, the following tasks are important:

i) The Extension Organisation to undertake a nation wide agricultural census to ascertain the current status of agricultural activities in the country. Important data like, number of households involved in agriculture, actual hectares of each crop, cropping patterns, inputs used, marketing, other services, etc., will give policy makers true situation and actual fund need to be diverted to particular region, crops, etc.

ii) The present situation of staff involved in extension both at national and provincial level. Data on their personal particulars including qualifications, training undergone to-date, facilities available to them need to be ascertained if a major reorganisation could be effected.

iii) The research support needs to be ascertained and their present role in agricultral development has to be studied, also the role of agriucltural training and its capabilities need to be ascertained.

iv) There must be a bottom-up exercise to document the farmer's aspirations and should try to match it with nation's food production and export goals. No system will succeed without farmer support.

Once this exercise is completed then drawing up of extension program will become more meaningful and effective. With these clear facts and figures the task of each level in the single system will be clear.

## SINGLE LINE ORGANISATION CHART

The Department of Agriculture will undertake the implementation of the new extension program at all levels in the country.

Funding for the agricultural development in the country should be through the Department of Agriculture and Livestock.

The Minister for Agriculture, through his DAL Secretary will be responsbile for the effective implementation of the proposed single extension program throughout the country (including the Commodity based Corporations).

The DAL will create a new Division under the

Deputy Secretary for Field Services (Appendices 1 & 2) - Extension Division, headed by a Director. He will be assisted by four regional Managers, who will be responsible for extension management in the regions. In each region the present Assistant Secretary for the province will be known as Provincial Managers (Appendices 2 & 3), who will be responsible for the direct implementation of extension programs with the assistance of District Rural Development Officers, and Rural Development Officers and Rural Development Technicians.

The Director's duty will be to ensure that the government agricultural policies are taken to the "grassroots" level by liaising with other Divisions such as Food Management, Livestock, Crop Protection, Research, Agricultural Education and Training, Export Crops, Corporation, Plantation Companies, Forestry, Fisheries and Statutory Bodies in order to ensure that extension workers are equipped with the knowledge and resources to provide effective extension to their target farmers. Other Divisions and Departments should assist the Extension Division at all levels with the subject matter specialists whenever the extension workers need his assistance to provide information to his farmers.

The Regional Managers (Appendix 4) form the key link to regional agricultural aspirations. They would ensure that all the provinces under his supervision are provided with sufficient resources for the provincial managers to carry out provincial programmes without delay. They would liaise with all other supporting departments and divisions to see that his region is well organised to provide effective extension to all his provinces.

The Provincial Manager (Appendix 4) will be fully responsible for implementing provincial extension programs. He would ensure that his farmers' goals are in line with the national goals. He would ensure that goals for food and cash crop production are quantified and targets are set for extension officers at District levels. Close supervision and monitoring is the key to successful implementation of extension at farm level.

He would ensure that he reviews monthly targets and is able to advise and assist his staff to ensure that his plans are being realised. He would see that discipline is maintained amongst his subordinates.

The District Rural Development Officers (Appendix 4) play very important role to ensure that their extension workers are working according to plan. To-date most of the extension workers are left in the field without supervision and support by the senior field officers. This has to be addressed instead of Senior Officers becoming 'travelling tourists. They must get out to farms to understand the farmers' problems. They should constantly give guidance to junior extension workers in order to ensure that they have the knowledge and experience to provide delivery of services to farmers.

The field extension workers who are in the "frontline" need to be motivated to ensure that all the plans are taken to farms and feed backs are discussed with senior officers to ensure that problems are solved faster. The extension workers must be provided with adequate resources for doing their jobs. The main constraints at the field level, are of poor accommodation, inadequate camping allowance, poor transport, inadequate extension tools and lack of updated extension information.

Implementation of the reorganised structure should be carried out in phases.

**Phase I (1-3 Years)** - The amalgamation of the National/DPI Extension Unit into one. The Director (Extension) liaises with the present A/Secretary to continue the programmes with effective linkages established with Research, and credit institutions.

Phase II (4-6 Years) - The Director of Extension could appoint Regional Managers (if need be) to assist the A/Secretary in order to ensure effective implementation at regional basis.

The Extension division needs time to show results, unless it gets such support from various institutions, including political support, it will be continuously facing the same problems.

## MONITORING AND EVALUATION DIVISION

This Division in DAL should be revived to ensure that the extension programme throughout the country is monitored. They may regularly visit provinces and evaluate the actual field progress and give the necessary feedback to the Headquarters about the inadequacies. They should act as "check and balance" for the Department in order to ensure

that the government's long term policies are being implemented at all levels.

## CONCLUSION

The proposed reorganisation is timely. After more than 15 years of extension "experiments", it is about time that the country plans new strategies from the lessons learnt to deliver the goods and services to the man on the land. Performance at all levels is important. Officers should be made accountable for targets and achievements. The Government has a vision, a goal for the people, that is to improve their quality of life. As the saying goes "If you have no goal, then any road is the right road". Now we have a goal and we will take the right road!

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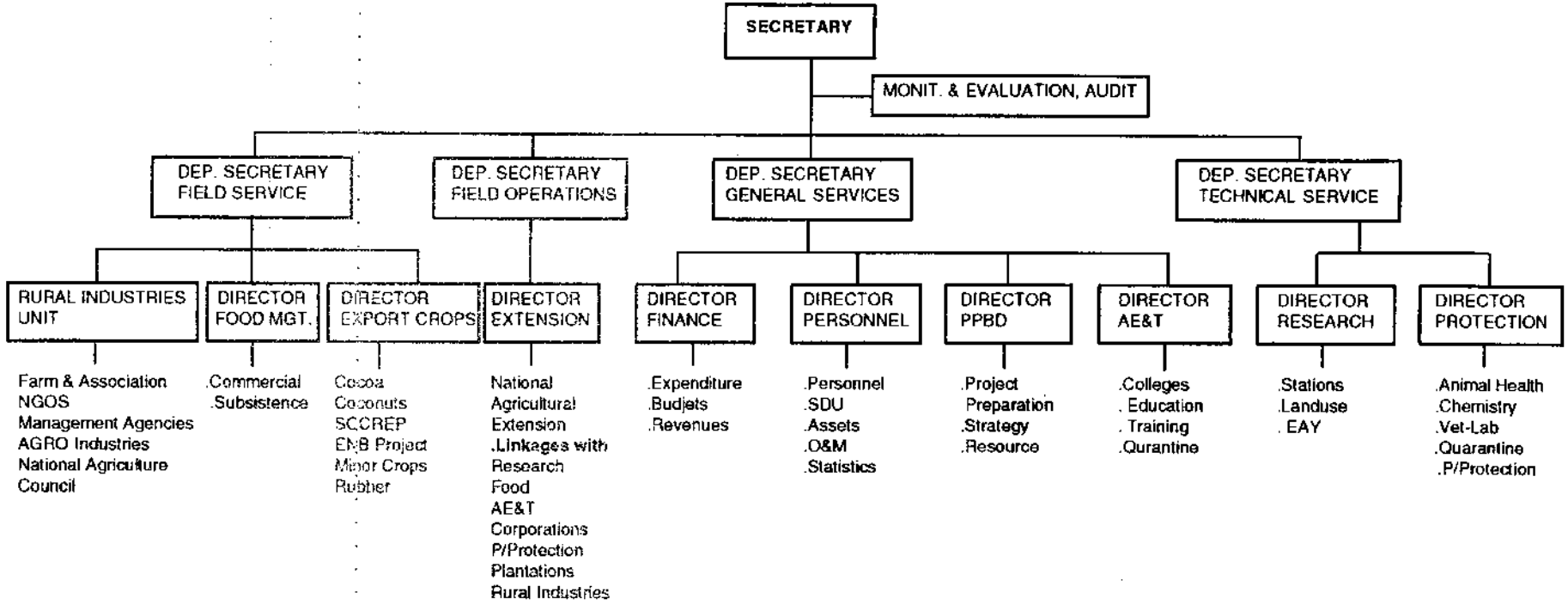
**McKillop, R.F. 1976. A history of Agricultural Extension in Papua New Guinea, Extension bulletin No. 10, DPI, Port Moresby.**

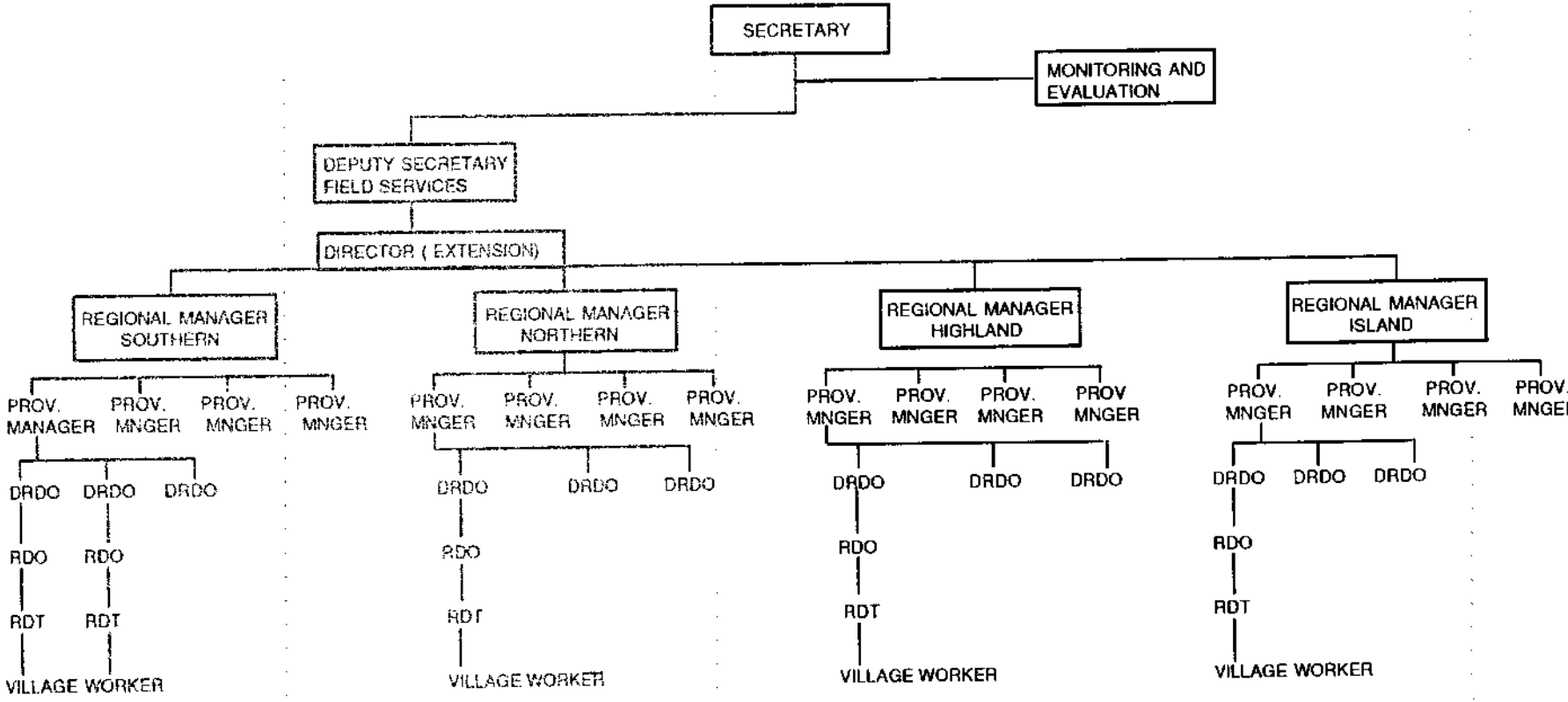
## *Appendix 1.* ORGANISATION STRUCTURE

## DEPARTMENT OF AGRICULTURE AND LIVESTOCK



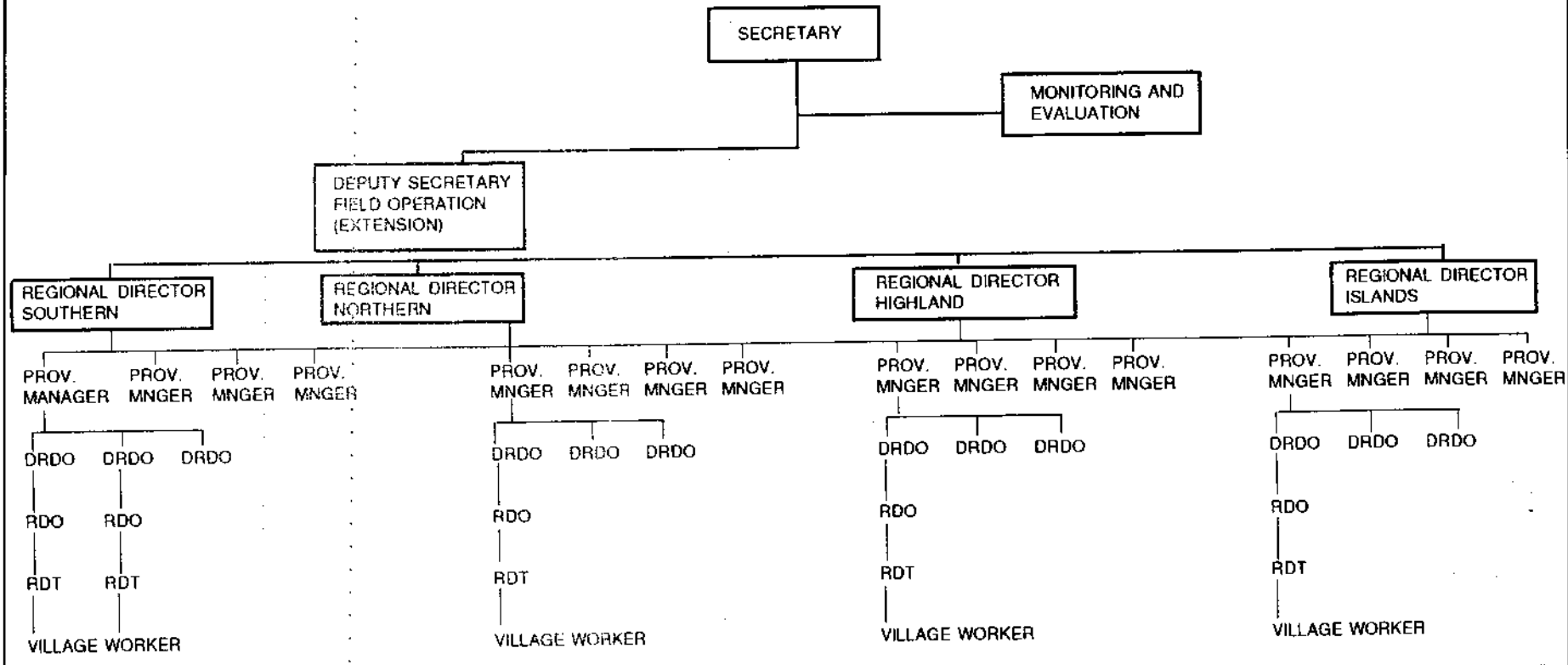
*Appendix 2.* **SINGLE AGRICULTURAL, EXTENTION ORGANISATION CHART**

**OPTION 1**

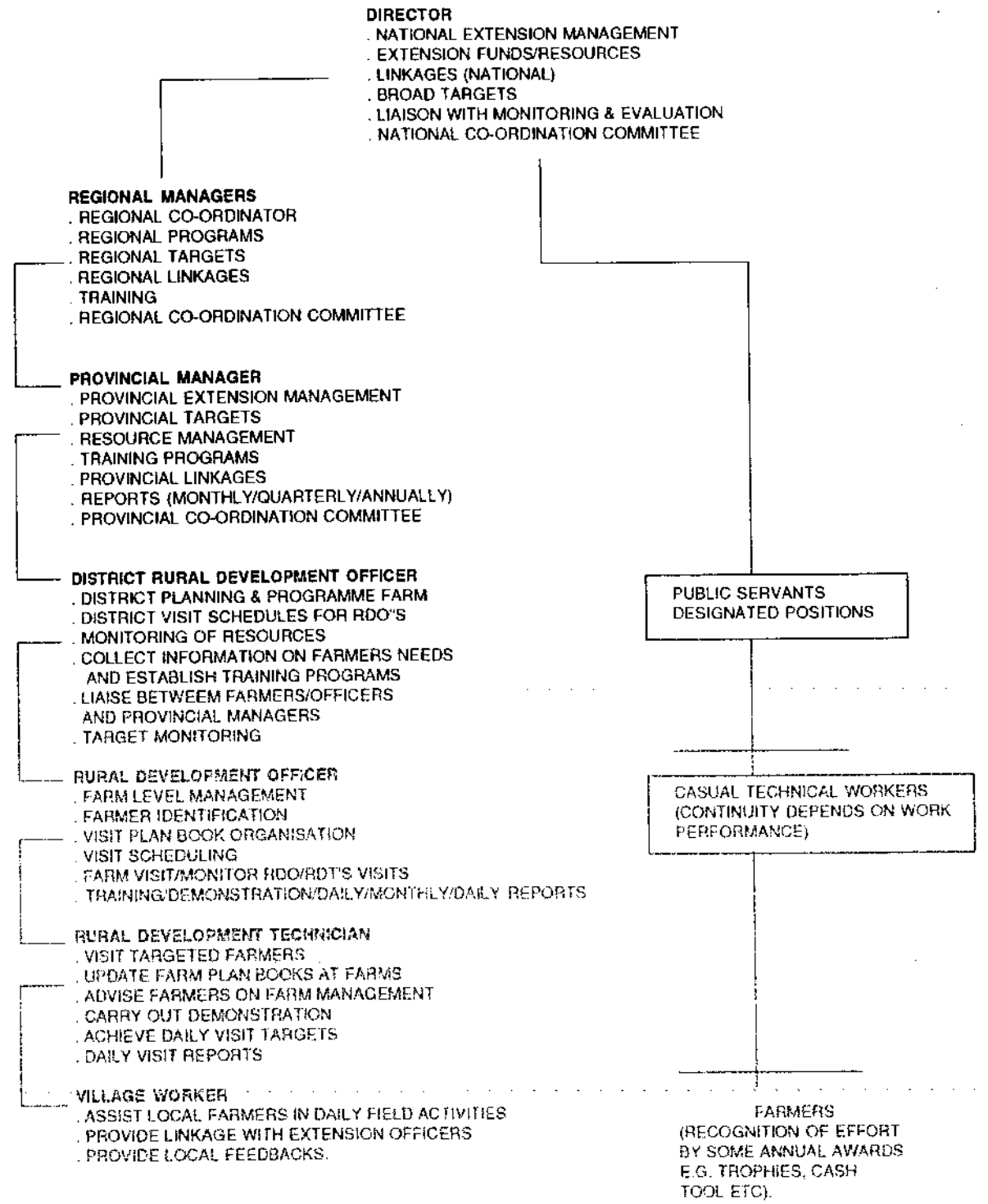


*Appendix 3.* **SINGLE AGRICULTURAL, EXTENTION ORGANISATION CHART**

**OPTION 2**



## *Appendix 4.* BROAD RESPONSIBILITIES OF EXTENSION OFFICERS



# AGRICULTURE EXTENSION SERVICES IN MADANG

Lawrence Daur[1]

***ABSTRACT***

*The provision of agricultural extension services to the rural farming communities in the Madang Province and how these could be improved are examined. The past extension services and the current practices in the province are briefly reviewed. Also discussed in the paper are the experiences of Madang in terms of problems and staff training. Future directions for extension services in the province are outlined.*

***Key words:*** *Madang Province, extension services, future directions, staff training.*

## INTRODUCTION

The purpose of this paper is an attempt to highlight experiences of the writer in the provision of agricultural extension services to the rural farming communities in the Madang Province and how these could be improved.

## FACTS AND CONSIDERATIONS

### a. Methods of Extension

When we are trying to address the problems of ineffective extension services, we should reflect on what and how it has been done in the past, present and consider improvements for the future.

From experience since independence there is no standard extension methodology either for agriculture or for all other related agencies (Manual of Procedures & Extension Manual) so these agencies, officers have been going their own ways in delivering goods and services. Which means there could be no real co-ordination.

### b. Past Extension Services

In the past majority of needs for agricultural developments were determined, planned and encouraged by the Government through its agencies (Agriculture, Health, Social Welfare etc). That is to say all planning has been done unco-ordinated from top down even as far as the implementations of these.

### c. Current Practices

As there are no standard extension procedures, every agency and individual extension staff are doing their bit their own ways and in most cases the people are often confused as to what they need to do.

However, for agricultural extension it is pleasing to see that some changes are being made in regards to planning and implementation of projects, through formal training and workshops for field staff.

Example of some of these would be SMAFSP RRA workshop, planning and managment training offered in agricultural colleges or other institutions (Administrative College) and reviews. Also we are respecially working closely with the Department of Agriculture and Livestock.

### d. Objectives

What should be our future directions/objectives. One most important objective as I see should be to identify problems and their under lying causes and then devise a system.

Some of these have been done through consultancy work (training needs, resource allocations and maintenance etc) which have been conducted in PNG and have been identi-

[1] Assistant Secretary, DPI, Department of Madang, Madang, Papua New Guinea.

fied. As a result of this In-Country Training Programme has been devised and funded through European Economic Community.

## EXPERIENCES OF MADANG

### a. Problems

Madang Province, like all other provinces, has its own problems. Some of these are communications, road access, financial resources, lack of staff and training of staff.

During last five (5) to ten (10) years, alhough faced with the above problems, Agriculture and Livestock Branch (DPI) has tried its best to effectively implement projects funded from both national and provincial levels, as well as maintenance of recurrent services.

### b. Staff Training

Currently Madang Agriculture and Livestock Branch has a ceiling of 75 including clerical staff. And of these about 18% are based in Provincial Headquarters while 82% are distributed througout the districts. When talking about how staff can be effective in providing services, I consider that such areas as most important for my staff are;

1. Training
2. Commitment
3. Co-operation
4. Morale of staff

For training I believe there is already a wealth of knowledge in existence among my staff therefore to really make use of these they need to be trained on how to effectively use or disseminate this knowledge to farmers.

Of course if there are specific training needs these should be identified and arranged for participation by interested people.

In-Country Training Programme (ICTP) funded through DAL by European Economic Community was conducted in 1991/92 for all field staff through out the country and Madang was included in that.

This was then followed by second phase of the programme in 1993 which Madang was chosen as pilot province for implementation.

This was for practical applications of know how through agricultural extension and support activities. After all the courses, an evaluation of programme was completed in July 1993. This included activities such as:

(a) Conduct regular monthly technical review workshops at both provincial and district levels.

(b) Identify and contact farmers.

(c) Establish demonstration plots for farmers.

(d) Organise field days for contact farmers and farmer groups.

In the above process Madang has involved Lecturers from Highlands Agriculture College and Research personnel from Bubia during the course of Technical Assistance, whereby these staff have provided on the spot informations necessary to field staff (District Rural Development Officers and Subject matter Specialists) for dissemination of information to farmers.

During the last eight (8) months i.e until March 1994, the exercise of getting together on monthly basis to discuss and share ideas in problem solving and setting new objectives for the following month has been appreciated by all parties (District Rural Development Staff, Subject Matter Specialists, Highlands Agriculture College and Provincial Headquarters staff).

Getting together on regular basis has enabled us to have access to the information provided which has reached the farmers in ample time and also understood by field staff and farmers. This goes also for objectives set for the month.

#### Commitment by staff

It is most important that an officer must have commitment to his work. Therefore having regular workshops can indicate to supervisors whether the officer is really putting everything in implementing any planned programmes.

For Madang's case it is considered we have the most dedicated staff who try their very best to implement development programmes. So with this idea of getting together for reviews as well as considering support to be provided really does create high morale. The other factor is the co-

operation which the field staff have.

We believe that the staff in Madang are co-operative in assisting each other in any problem solving ventures.

The draw-back to this is the conditions of housing (deteriorating). This sometimes affects morale and willingness to accept challenges or added reponsibilities.

With above remarks it is recommended that,

1. More support should be given financially to improve skills to field staff in transferring technical knowledge to farmers.

2. More time should be given to such programme (ICTP) especially the second phase to really assess the success.

# AGRICULTURE EXTENSION AND ASSOCIATED FACTORS IN EASTERN HIGHLANDS PROVINCE

Ian Mofafi[1]

***ABSTRACT***

*Agriculture remains (and will for sometime yet) the economic base of the subsistence farming population of this province. Changes are continually being seen and adopted in the varying species of livestock and crops and in their management practices.On the scene are now, more progressive and responsive farmers who, if guided and assisted well can become effective and efficient producers. In doing so, the need for extension services may be removed and diverted into other areas such as Infrastructural Developments, Rural Credit, Down Stream Processing and Marketing etc,.*

***Key words***: *Eastern Highlands Province, extension, infrastracture development, rural credit, down-stream processing, marketing.*

## CURRENT AGRICULTURAL ACTIVITIES DEVELOPMENT

Within the "economic belt" line of this province, agricultural activities and their levels of development are varying.

We are seeing changes from the more accepted long term cash crop (Coffee, Chilly, Cardamon) to short term quick return (vegetables) activities.

This has largely been due to the drop in prices of the cash crops and to some extent, the kind and attitudes of the farmers that are on the scene now.

"Community Social Status Symbol"and direct household food security, reasons for farming not so long ago are not so much important now.

Producers are now cash driven, having been exposed to likings that they have developed for these things.

Although, not seen in large areas due to topographical reasons and the high cost of developing such areas, there is a shift from multi-intercroped traditional system to mono semi-intercropped commercial/commerical farming.

As a result of this, Eastern Highlands Farmers, probably the most progressive in the country can be seen selling their produce in almost all the coastal cities and towns of the country without DPI help.

[1] Assistant Secretary, DPI, Goroka, Eastern Highlands Province, Papua New Guinea..

## FURTHER DEVELOPMENT LIMITING FACTORS

### Farmer Training

As the farmers are having to deal with more and more foreign species of vegetables and livestock, they need to be, as best and as much as possible trained in the basic aspects of that activity's management.

Besides that, these activities are the basis of their livelihood unlike extension officers that have a pay packet at the end of every two (2) weeks.

### Rural Credit

A lot has been said at different forums on rural credit.

Whilst the farmers in most cases may have the land, time, skill experience etc, they never usually have the financial means to undertake any project.

Relevant Government lending institution's lending policies need to be revived and revised.

Many Provincial Governments have come up with their own credit schemes, defeating the purpose of the Government established institutions.

### Produce Marketing

Apart from the domestic consumption of food produced, large proportions of the produce are usually marketed for cash.

Good return with total effective disposal generally means continuous production to the farmer.

On the other hand, less sales and poor return means a reduction or a complete stop in production.

Government at all levels (if not in farmer training & rural credit) should look deeply into this area and develop the infrastructure network. The machinery can then be taken over at a cost by farmers or farmer organisations.

## FURTHER DEVELOPMENT CONSIDERATIONS

### Farmer Organisations

Farmers of today are quite affluent and capable of looking after themselves.

For far too long, extension officers have tended to "Shove" things down the throats of farmers.

It is probably time now, we facilitate their get together and observe how they go.

Their weak areas should become our action areas and their strength areas might become our learning areas.

### Down Stream Processing

The absence of simple processing means a poor returns to farmers.

To maintain a high level of consistency in production and the return spread widely, Government initiative and input is required initially to have the processing set ups.

## "GOOD WILL" FACTORS

### Resources

As in every profession, extension officers require specific "tools" to undertake effective extension/ advisory work.

Good will and appreciation from the high up "Masters" on the roles of agricultural extension officers and the importance of agriculture is never there.

### Infrastructure

For meaningful sustainable development, infrastructure such as roads is an important consideration. Government, at all levels, need to be constantly reminded of the importance of maintaining all weather roads at all times.

## CONCLUSION

Agriculture is a renewable resource activity area. This has been said many times. Successive governments, at all levels, have been ill advised to the point where resources have been negligently thrown around.

A concerted effort needs to be instituted where streamlining and rationalisation take place, where the input is justified by the outputs.

# AGRICULTURAL EXTENSION SERVICES IN MANUS PROVINCE

Kulen'en Hamou[1]

***ABSTRACT***

*The types of Agricultural Extension Services in Manus Province are outlined. How the farmers are pursuing the developments to faciliate for the attainment of their basic minimum needs on a sustainable basis are examined. Emphasis is given to the past socio -economic trends and experiences, current situation and future forecast of socio -economic conditions. Active and interactive education and trainig component of agriculture extension services in Manus to build knowledge, skills and attitude of target farmers are discussed.*

***Key words**: Manus Province, agriculture extention, socio-economic trends, forecasts.*

## INTRODUCTION

I am grateful indeed to the organisers of the Seminar for extending me the invitation to deliver this paper on agriculture Extension Services in Manus.

On this occasion, I will present to this seminar the type of Agricultural Extension Services that are available in Manus and how Manusian villages are pursuing these developments to facilitate the attainment of their basic minimum needs on a sustainable basis. This I hope will offer some insights into Agricultural Extension Services in Manus. More importantly, I hope to share the experiences of the Manus Government and her people on the subject to help in developing a national response in relation to the objectives of this seminar.

Before discussing the subject, I consider it important that the subject is properly defined right at the very beginning so as to enable us to set out with a common perception on the subject. I want now to look at the definition of Agriculture Extension and Village.

**Agriculture** - I define this as the process of developing the knowledge, skills and extension attitude of farmers so as to enable them to meaningfully and effectively participate in the utilisation and management of their land, labour and capital resources to supply their basic minimum needs on a sustainable basis.

**Village** - A small group of houses in a country area and larger than a hamlet.

From these definitions, I take Agricultural Extension Services in Manus in the context of this seminar to mean:

> The process of developing the knowledge, skills and attitude of Manus farmers in their small groups of communities so as to enable them to meaningfully and effectively participate in the Utilisation and Management of their Land, Labour and Capital Resources to supply their basic needs on a sustainable basis.

Prior to discussing the agricultural extension services, it is important that I provide a brief insight into the current state of natural resources development and village development in Manus.

## NATURAL RESOURCES DEVELOPMENT

Major natural resources activities in Manus include smallholder cash crop development in coconut, cocoa, rubber and vanilla. In the food sector main staples include taro, sago, sweet potato, banana, fish and marine products, rice and can fish and meat and poultry. We have only in the last couple of years introduced sheep into Manus.

Other income generating activities include log exports in the West Coast of Manus and exports of live fish and other sedentary resources.

[1] Acting First Assistant Secretary, Resource Management Division , Department of Manus, Manus, Papua New Guinea.

Production of major cash crops have declined whilst the export of logs and fisheries and marine resources are increasing. Meanwhile the import of natural resources based products on the other hand have continued to grow.

The Division of Natural Resources is functionally responsible for Agriculture and Livestock, Fisheries and Forestry and has lead agency status for the basic minimum needs of food, shelter and money. It has an establishment Ceiling of 37 positions and a Staff Ceiling of 22 officers.

## VILLAGE DEVELOPMENT IN MANUS

Village Development in Manus is as old as the Manus man and is a process that Manusians have shaped over time through the experience and interactions of their many generations in developing their social, economic and environmental resources.

The process has continued through the years until today, where it is being carried out by 32,840 people in 192 villages comprising of 31 islands, 126 coastal and 35 inland villages including Lorengau.

Some of the primary activities which people in these villages engage in are mainly subsistence food production, shelter production, cash production, family life, education, spiritual development, sports and recreation, traditional and cultural activities, land dispute settlement, village courts settlement, community work, communication and economic transportation.

The type, intensity and management practices used to perform these activities varies from village to village depending on the available social, economic and environmental resources and factors.

The performance of these activities are facilitated and implemented by the various population groups such as individual men, women and children, families, households, clans, village communities, social and economic interest groups, government and non government workers and organisations, leaders and many more.

These activities are performed either at different times or simultaneously depending on the situation which abounds to the facilitators and implementors of the respective activities. It is important to take note of this time element for these reasons. Firstly, unlike the other resources time is finite in that every person and or organisation has been given the same number of hours in a day, weeks, months and year in which to perform their activities.

Secondly, it is the manner in which time is used by different population groups to perform their activities. For example, if three government departments carry out 3 separate extension patrols to a village in a week then the village people will have to forgo doing other activities and devote the three days to the Government Department.

Many diverse activities are performed by individuals and organisations in almost all the 192 villages everyday and when one comes to think of it all, it is just like 192 assembly lines operating to produce quality and healthy people. The task of coordinating these processes is very difficult and challenging. Since development is all about process of peoples quality of life and in this instance the quality of life for 32,840 people, (Anonymous 1990), the task is extremely difficult.

Up till now I have limited my presentation to the subject of village development. We have seen from the definitions what village development means. Why do we talk about village development? What do we really talk about? What should be the focus of our attention? What should be our objective?

The people of Manus have attempted to respond to these questions in many ways. I want to look at how Manus Provincial Government has attempted to respond to this complex issue.

Manus Provincial Government was established in 1979 and the pioneering leaders then in working towards the goal of developing the province search for ideas to lead the province and her people at this infancy stage of the decentralisation process. Manus Local Government Council was abolished in 1982 and was gradually replaced by Community Governments commencing the same year.

The first community government was established in 1982 and the sixteenth in 1990. The establishment of community governments within 8 years demonstrates the Provincial Government's resolve in devolving further political authority to the people. Villages in Manus come under the political structure of community governments. The number of villages in each community government area var-

ies with an average of 12 villages. The distribution of villages within each community government area is duly recorded..

In Manus community governments are the lowest level of political government and consist of constituent assembles made up of representatives elected by the people from villages in the community government area. Community governments are allocated annual budgets based on a current per capita expenditure of K13 broken down into K3 as administration grant and K10 for projects. Allocation of funds for projects is done by the constituent assemblies and villagers have an influence on this through their elected representative.

When Manus Provincial Government was established in 1979 the province already had extremely high level of social services but on the other hand had a very poor economic base. In consultation with the National Government, it received in 1980, under the National Public Expenditure plan less developed areas programme, funding for the Manus Integrated Rural Development Programme. The programme hired a team of foreign consultants who prepared the first Provincial Five Year Development Plan 1985 - 1989 which places priority on economic development. Since the province then had a very high level of social development, priority was given to economic development to work towards seeking an equitable balance between social and economic development.

The major objectives were:-

i) increase rural income and equalize development opportunities throughout the province; and:

ii) maintain existing standards of social services, currently enjoyed by Manusians.

In 1989 the Provincial Government instigated a review of the first five year plan to evaluate the performances and develop new plans and strategies for the second five year plan and the future. A week's planning seminar was organised for this review in 1989, attended by representative of village people, community government representatives, Provincial and National Government leaders and officers, and Non Government organisation representatives. One of the major findings of the seminar was that despite the large expenditure in economic development projects the quality of life of Manusians saw no real improvement.

The seminar was a turning point for development in Manus in that the cross section of Manus people who deliberated on the future development of Manus Province accepted the fact the "Man is the Object of Development".

It was generally accepted that the Principal Objective for development is **"TO ACHIEVE TOTAL DEVELOPMENT OF EVERY MAN, WOMAN AND CHILD OF MANUS TO THE MAXIMUM LEVEL THE PROVINCE'S RESOURCES CAN AFFORD".**

Based on this principal objective other objectives accepted by the people were:-

**"CONTROL THE RATE OF POPULATION GROWTH IN THE PROVINCE IN ORDER TO PREVENT FUTURE ASSOCIATED PROBLEMS".**

**"TO PROVIDE OPPORTUNITIES FOR EVERY MAN, WOMAN AND CHILD OF MANUS TO MEET HIS/HER BASIC MINIMUM NEEDS AS DETERMINED FROM TIME TO TIME".**

**"TO INCREASE RURAL INCOME AND EQUALISE DEVELOPMENT OPPORTUNITIES THROUGHOUT THE PROVINCE".**

**"TO INCREASE THE CAPABILITIES OF MANUS PROVINCIAL GOVERNMENT IN GENERATING AND ACCOUNTING FOR PUBLIC MONIES, EFFICIENTLY DELIVERING OF GOODS AND SERVICES TO THE PEOPLE, IMPROVING QUALITY OF EXTENSION WORK AND ESTABLISH AN EFFICIENT INFORMATION SYSTEM".**

**"TO IDENTIFY AND DECENTRALISE AUTHORITY, SERVICES AND RESPONSIBILITIES TO COMMUNITY GOVERNMENTS AND DISTRICT CENTRES TO BETTER SERVE THE NEEDS OF THE PEOPLE".**

**"TO ENSURE THAT THE RIGHTS AND WELL BEING OF EVERY MANUS PERSON TO LIVE AND WORK IN PEACE AND HARMONY IS RESPECTED AND PROTECTED".**

The **TOTAL HUMAN DEVELOPMENT POLICY** became the principal development objective for the government for the second five year plan (1990-1994). This was the turning point because prior to this time the focus of development was directed at systems, goods and services such as

economic development, roads, hospitals, agriculture and livestock, forestry, fisheries, income generation and wage employment rather than man and his quality of life. In implementing this policy the government in 1990 adopted and identified this principal development as **INTEGRAL HUMAN DEVELOPMENT.** (Pokris 1990).

The integral human development policy maintained man as the object of development and went further to identify what his basic minimum needs were and since his continued existence depended on interacting with other people and organisations, how these needs can be facilitated on an integrated basis at all levels including each village of the sixteen electorates (community governments).

Thus in 1990 a province - wide basic minimum needs survey was designed and carried out randomly using thirty percent sample of the total 1,071 households in the province based on the 1980 census data. The survey was the first of its kind that was designed and administered by Manusians through one hundred and six leading and open ended questions. Most of the interviewers were staff of the Department of Manus while the respondents were heads of households.

Through the survey Manusians showed to the government that they had twelve basic minimum needs. These needs and need elements in order of priority on a provincial basis are:- (see Appendix 1):

NEED ELEMENTS

| Need | Elements |
|---|---|
| i) Shelter | Improved Housing |
| ii) Spiritual Development | Self realization of the purpose of living |
| iii) Medical Care | Healthy person, family & community |
| iv Family Life | Healthy/Happy marriage & family |
| v) Peace & Harmony | Self respect, caring & understanding of other people |
| vi) Population & Family Planning | Sustainable control & management of the population growth rate |
| vii) Water | Adequate supply of safe water |
| viii) Food | Sufficient quality food |
| ix) Communication | Improved communiction network |
| x) Money | Wise and careful use of money |
| xi) Education | Education for living |
| xii) Land | Rational & productive use of available land. |

The priority ranking of needs varies on a community government basis as can be seen in Appendix 1 and the same is the case of other villages in Manus though there are variations as indicated by the respondents on a village, electorate (community government) and provincial basis. The variations and relationships depend on the social, cultural, economic, environmental resources, institutions, systems, values and forces that work from within and without the community of the respondents.

The basic minimum needs survey has brought about another system of planning for development. One that promotes the bottom up planning approach to development as compared to the conventional top down approach. The basic minimum needs approach provides the opportunity to Manusians living in their villages to participate and help to develop, direct and more importantly implement their own policies and plans.

The basic minimum needs identified here are not exhaustive and will be subject to review and change periodically. The next review is planned for 1994, the end of the second five year plan period.

The village, community government and provincial government institutions take on the role merely as facilitators.

## IMPLEMENTATION OF BASIC MINIMUM NEEDS

The basic minimum needs and their need elements indicate to the village leaders, community government leaders, and provincial government leaders and planners alike the basic minimum development indicators of the people.

Leaders at various levels including the planners are then required to analyse the needs in the context of the particular situation, develop integrated strategies and translate these strategies into action programmes and projects to provide for

the basic minimum needs of the people.

For example, in the case of Improved Shelter, the Division of Natural Resources has developed a programme in which it trains people in their own environment in the operation of chain saws, production, treatment and drying of sawn timber and furniture production. On the other hand the Division of Works and Transport trains people on basic house profiling, house plans and house building. Village people having obtained the knowledge and skills then buy their own chain saws, produce treated timber from their own trees, purchase roofing iron and either with clan or hired labour build their own houses at relatively cheap prices. Three such model houses have been built to date.

For the outlying islands the villagers will be trained in sand brick production, coconut timber production and house profiling after which they will use their own resources to build their improved houses.

The emphasis is on using available resources on an integrated basis to satisfy a particular need.

Similar strategies will apply for the other needs.

In the case of money the responsible agencies including the Division of Finance, Commerce, Community Government and Natural Resources have to determine the amount of money required by households, clans, village or target groups and develop an integrated plan to enable the target group to utilise their land, labour and capital resources to generate the money to finance their basic minimum needs.

The emphasis on money in relation to Natural Resources is not to get the target groups into producing products to generate income but to educate and inform them on the options available along with the opportunities and constraints and let them (target group) to decide on what to do.

It is insufficient to address just the generation of income. Target groups have to be educated further on the wise use of money to improve and sustain their quality of life.

## AGRICULTURAL EXTENSION SERVICES IN MANUS

Numerous studies, seminars and other forums have been conducted or held either directly or indirectly relating to the delivery of agricultural extension services. The results of these studies and proceedings of the seminars have been published and distributed for information and action. This seminar is the latest of such forums, the proceeding of which should significantly contribute to reforming agriculture and the delivery of agricultural services to our farmers into the year 2000 and beyond.

Recognizing the volume of information that is already available I will restrict my presentation to what Manus Province has and plans to go about delivering agricultural extension services to farmers in the 192 villages and or census unit in the Province.

Agricultural Extension Service in Manus is policy driven in that it is tailored to facilitate the implementation of the Government's fundamental development policy of Integral Human Development.

That is to say that it must contribute to the implementation of the Integral Human Development Policy by facilitating the total development of every target farmer, fishermen and forest owners and staff to the maximum level the organizational resources can afford. This is to enable them (farmers, fishermen and forest owners) to facilitate primarily the satisfaction of their basic minimum needs of food, shelter and money as well as contributing to the other needs.

The Division of Natural Resources which comprises Agriculture and Livestock, Forestry, Fisheries and Environment and Conservation has been assigned a lead agency role in facilitating the basic minimum needs of food, shelter and money and supportive roles in land, communication, water and education.

The Division's organization structure is designed to reflect this policy emphasis on the basic minimum needs of food, shelter, money, land, education, water and communication. In the structure the priority in manpower allocations is given to the Community Government sector where our extension officers are located to serve the target farmers, fishermen and forest owners in their respective villages and community government areas. The relationship between the Division of Natural Resources and the other Divisions of the Department of Manus and the political and bureaucratic linkage are shown in appendices 2, 3 & 4.

Major constraints affecting efficient and effective

delivery of extension services to farmers include the following;

- Lack of highly trained and skilled manpower (officers and farmers)
- Poor resources inventory and farm level data
- Poor and costly market access and infrastructure
- Lack of money.

In line with the IHD policy, the Division of Natural Resource has identified human capital development and institutional strengthening as the major long term strategies to address these constraints affecting the delivery of extension services.

## HUMAN CAPITAL DEVELOPMENT

Since 1989 the Division has consolidated and strengthened the programme of building the knowledge, skills and attitude of the farmers, fishermen and forest owners and staff. In so doing there has been a move from passive and extensive education and training into an active and intensive education and training system in which relevant courses, study tours, field days are organized for farmers, fishermen and forest owners and staff throughout the Province.

Major emphasis on extension staff training has been geared to developing and improving their technical skills and knowledge in primary production.

Future strategy will seek to identify potential officers and provide them with specialized training with emphasis in working with people or community field work training and secondary and tertiary production and farm management training. The same strategy will be applied to the farmers.

The active and intensive training programme for farmers is focused on a small target group of farmers selected from each Community Government area who received training in aspects of crop production, animal husbandry and processing. These we hope will give birth to lead farmers who we will then concentrate on to become catalysts for natural resources development in their respective community government areas.

The Department currently has on strength seven District Rural Development Officers under the Division of Community Government. They make up the extension services delivery team in Manus. Our long term aim is to have 16 Rural Development Officers, in the 16 Community Government areas to deliver our extension services. At the Provincial Level we will recruit and develop specialist capacities in food technology, marketing, economics, environmental management, human resource management and information as well as subject specialists.

The Division of Natural Resources has no direct decision making role over the activities of the extension officers except playing an advisory role in policy and planning, technical, legal and regulatory functions, support services and technical and professional training of the officers.

## POOR FARM LEVEL AND SOCIO ECONOMIC DATA

Lack of accurate and timely farm level and other relevant socio economic data has been and continues to be a major constraint and we have attempted to address this since 1989 through the compilation of Natural Resources Profiles for each of the 16 Community Governments in the Province. The profile identifies and categorizes farm level and socio economic data into households, clans, villages and community governments basis. As at 1993 only three Community Government profiles had been completed. The rest now have become the responsibility of the Division of Community Government and should be well complimented and supported by the villages profile project under the National Government Village Services Scheme Programme.

## NATURAL RESOURCES INFORMATION CENTRE

The Division of Natural Resources has established and operated since 1992 along with its Provincial Information Centre. The Centre (library) is stocked with information in the form of books, publications, report, etc., and provides access for staff to enhance their knowledge and skills ensuring that they are kept abreast of developments taking place in the Natural Resources Sector. The Resource Centre is our humble beginning of what will become our Integrated Natural Resources Informa-

tion System that would also include the Commerce, Land and Minerals and Energy Sectors.

Capacity building for the information centre is on going. Two officers have so far received practical training in Library Management with a third officer scheduled for practical attachment with DAL Library this month.

From the Provincial Natural Resources Information Centre we will then move to actively help Community Governments to establish their own Resource Information Centres.

## NATURAL RESOURCES FORUMS

As a means of getting the farmers and the community to become more involved and actively participate in the process of delivering agricultural extension services we commenced last year the staging of the first Provincial Natural Resources Forum. This is attended by District Rural Development Officers, District Managers, Community Government Leaders responsible for natural resources and a farmer representative from each of the sixteen Community Governments. Our second forum will be held this year from the 2 - 6 May 1994. Community Government and the village levels as well, establish their Village and Community Government farmer associations.

## RADIO EXTENSION SERVICES

We have begun on a trial basis the delivery of extension services through the radio to educate and train target farmers. This trial programme will be based on a similar concept of high school education being used by our Manus School of the Air. We believe the radio extension system has the potential to make our extension delivery system more efficient in that it will be able to reach and cover more farmers with very little cost.

## FINANCIAL RESOURCES

The delivery of extension services requires the outlay of money as an enabling means and Manus like all other provinces is no exception in that very little money is allocated to fund the delivery of extension services. Money for other services and credit is also in short supply. Given these situations of scarcity our strategy has been to concentrate our financial resources on the human capital development programme of farmers and officers.

## PLANNING FOR NATURAL RESOURCES DEVELOPMENT

Manus Province's first five year plan 1985-1989 was prepared by a team of foreign consultants with very little involvement and participation by the provincial leaders, officers and people.

The second five year plan 1990-1994 was prepared by the Department of Manus with the participation of provincial leaders, community government leaders, national agencies and non government organisations (Illagi 1990). The third five year plan 1995-1999 will be prepared by the 16 Community Governments with the full participation of community and village leaders and people base on their basic minimum needs.

Associations and extension officers using their natural resources profiles will play an important role in planning for an improved extension services system as part of the province's third year plan.

Finally, I want to conclude by emphazing that given the past socio - economic trends and experiences, current situation and future forecast of socio - economic conditions, agricultural extension services in Manus will continue to concentrate on building the knowledge skills and attitude of the target farmers through active and intensive education and training to enable them become the implementors of their own policy based on their basic minimum needs.

We believe that agricultural production can be improved and increased through direct inputs to develop the human capital of our smallholder farmers.

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*Appendix 1*

## THE NEEDS AND NEED ELEMENTS IN ORDER OF PRIORITY ON A PROVINCIAL BASIS.

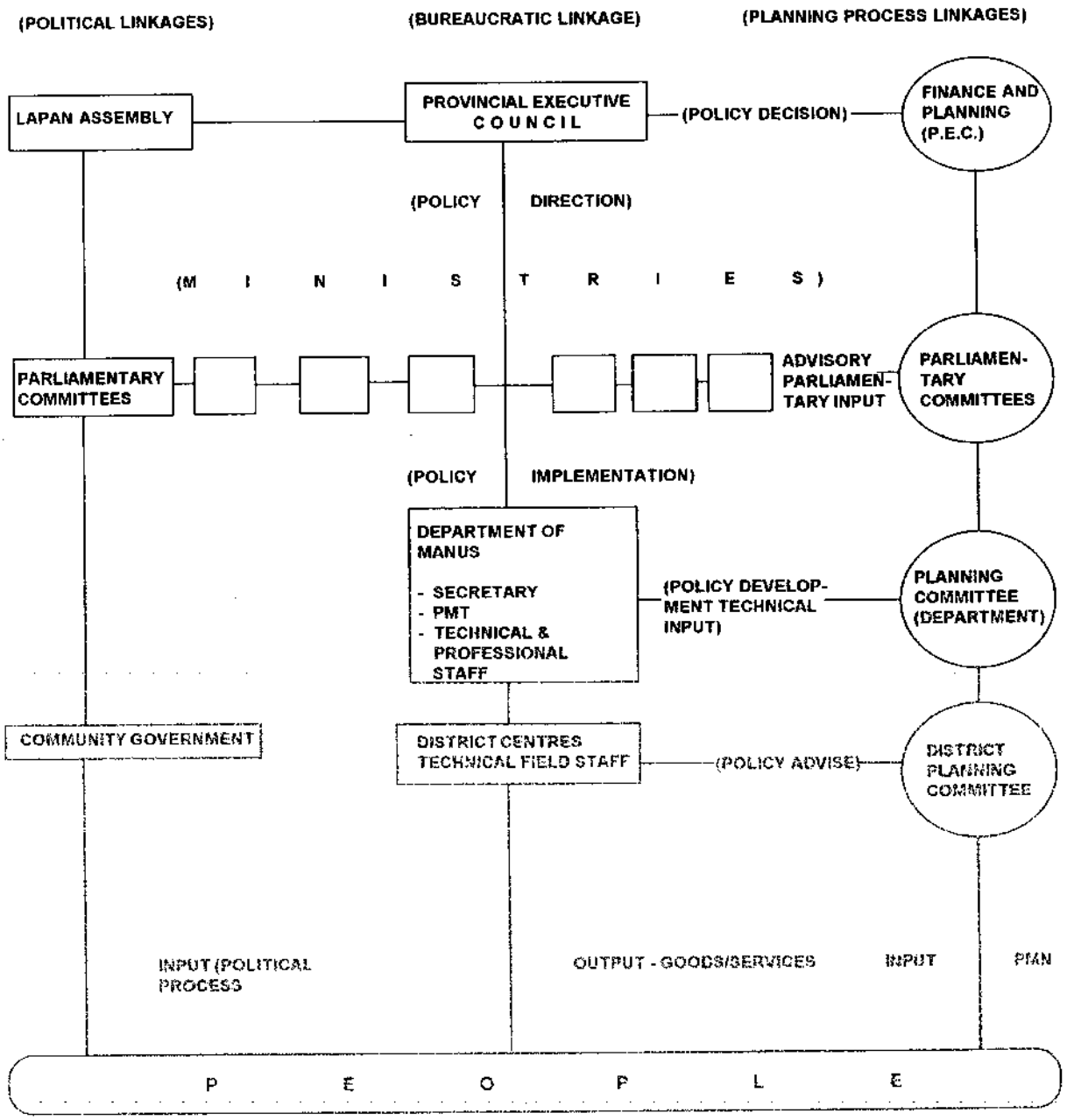
| | BASIC MINIMUM NEED | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Province/ Electorate: | : Shelter | S/Dev | Med/Dev | Family Life | Peace& Harmony | Family Plan. | Water | Food | Comm. | Money | Educ. | Land |
| Province : | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N/Western | 3 | 10 | 2 | 4 | 9 | 5 | 1 | 8 | 7 | 6 | 11 | 1 |
| Kali Bipi | 1 | 2 | 5 | 11 | 3 | 12 | 6 | 4 | 8 | 9 | 7 | 10 |
| Soparibeu | 2 | 9 | 7 | 5 | 1 | 4 | 6 | 3 | 8 | 12 | 11 | 10 |
| Tulu Ponam | 1 | 2 | 9 | 4 | 6 | 3 | 12 | 11 | 10 | 8 | 5 | 7 |
| Kurti Andra | 1 | 3 | 4 | 5 | 2 | 12 | 9 | 7 | 11 | 10 | 8 | 6 |
| Bupi Chupeu | 1 | 5 | 9 | 11 | 8 | 4 | 3 | 10 | 6 | 2 | 7 | 12 |
| Lelemasih | 2 | 6 | 3 | 5 | 11 | 8 | 7 | 1 | 9 | 4 | 10 | 12 |
| Los Negros | 1 | 7 | 2 | 3 | 8 | 6 | 5 | 4 | 10 | 9 | 11 | 12 |
| Nali | 3 | 5 | 1 | 2 | 10 | 7 | 4 | 9 | 8 | 6 | 11 | 12 |
| Pere MBunai | 1 | 3 | 8 | 2 | 4 | 6 | 12 | 9 | 10 | 7 | 5 | 11 |
| Ere Kele | 4 | 1 | 10 | 7 | 3 | 2 | 8 | 9 | 5 | 6 | 12 | 11 |
| S/Malai Bay | 3 | 4 | 6 | 7 | 2 | 5 | 1 | 8 | 9 | 10 | 11 | 12 |
| Balopa | 1 | 3 | 5 | 2 | 4 | 9 | 10 | 6 | 7 | 8 | 11 | 12 |
| Rapatona | 2 | 3 | 10 | 4 | 7 | 9 | 6 | 8 | 5 | 1 | 12 | 11 |
| S/Western | 3 | 11 | 2 | 7 | 4 | 1 | 6 | 10 | 8 | 5 | 9 | 12 |
| Lorengau | 10 | 2 | 9 | 3 | 6 | 5 | 4 | 8 | 11 | 1 | 7 | 12 |
| Lombrum | 6 | 1 | 7 | 2 | 8 | 4 | 9 | 10 | 12 | 3 | 5 | 11 |

NOTES:

1. Lorengau and Lombrum are urban areas.
2. Provincial priority ranking of the BMNs for the Province starts with shelter and ends with land.
3. Electorates priority ranking of the BMNs are as numbered accordingly.

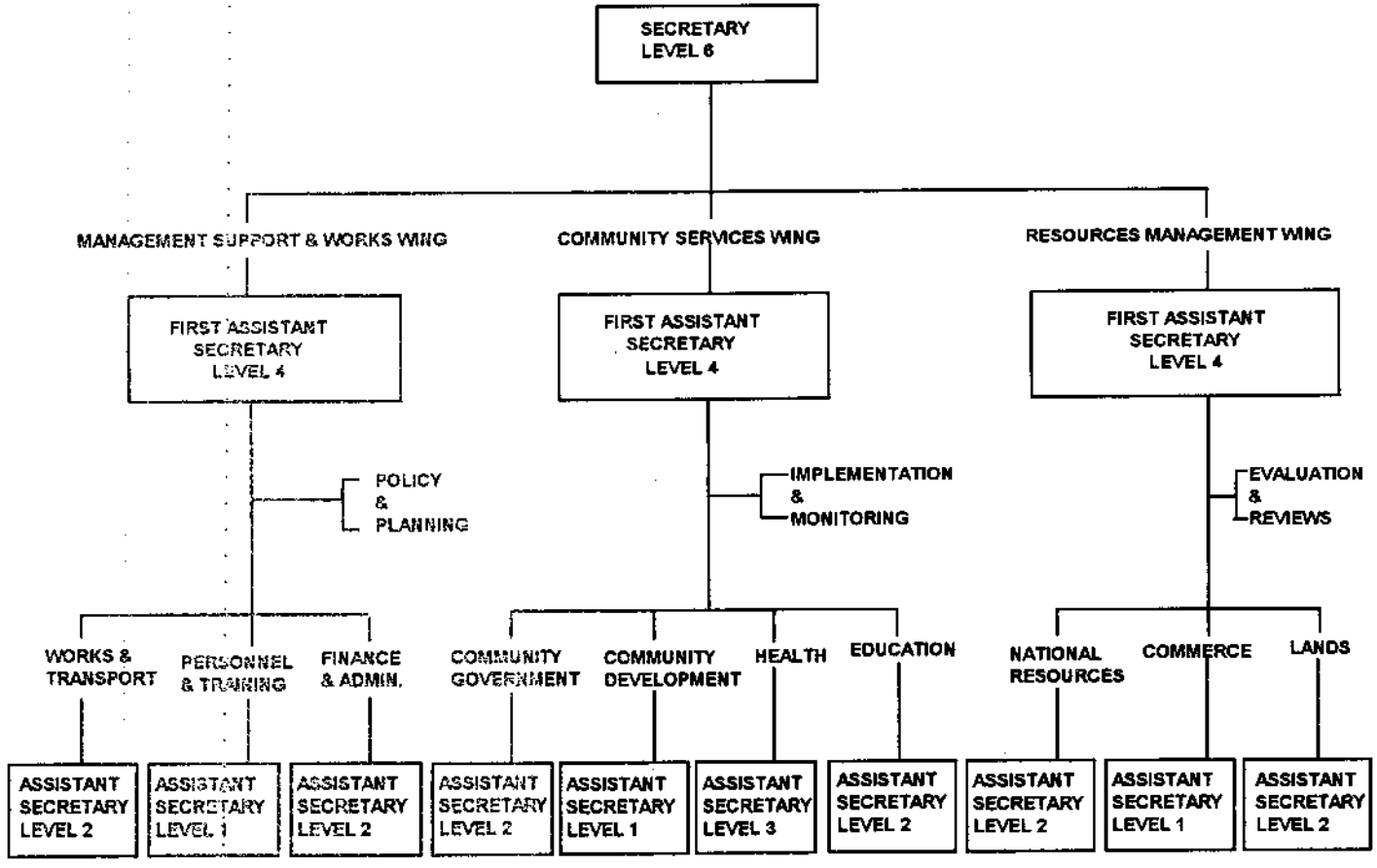
*Appendix 2.* **MANUS PROVINCIAL GOVERNMENT**

**POLITICAL/BUREAUCRATIC LINKAGES**



*Appendix 3.* **APPROVED ORGANISATION AND MANAGEMENT STRUCTURE**

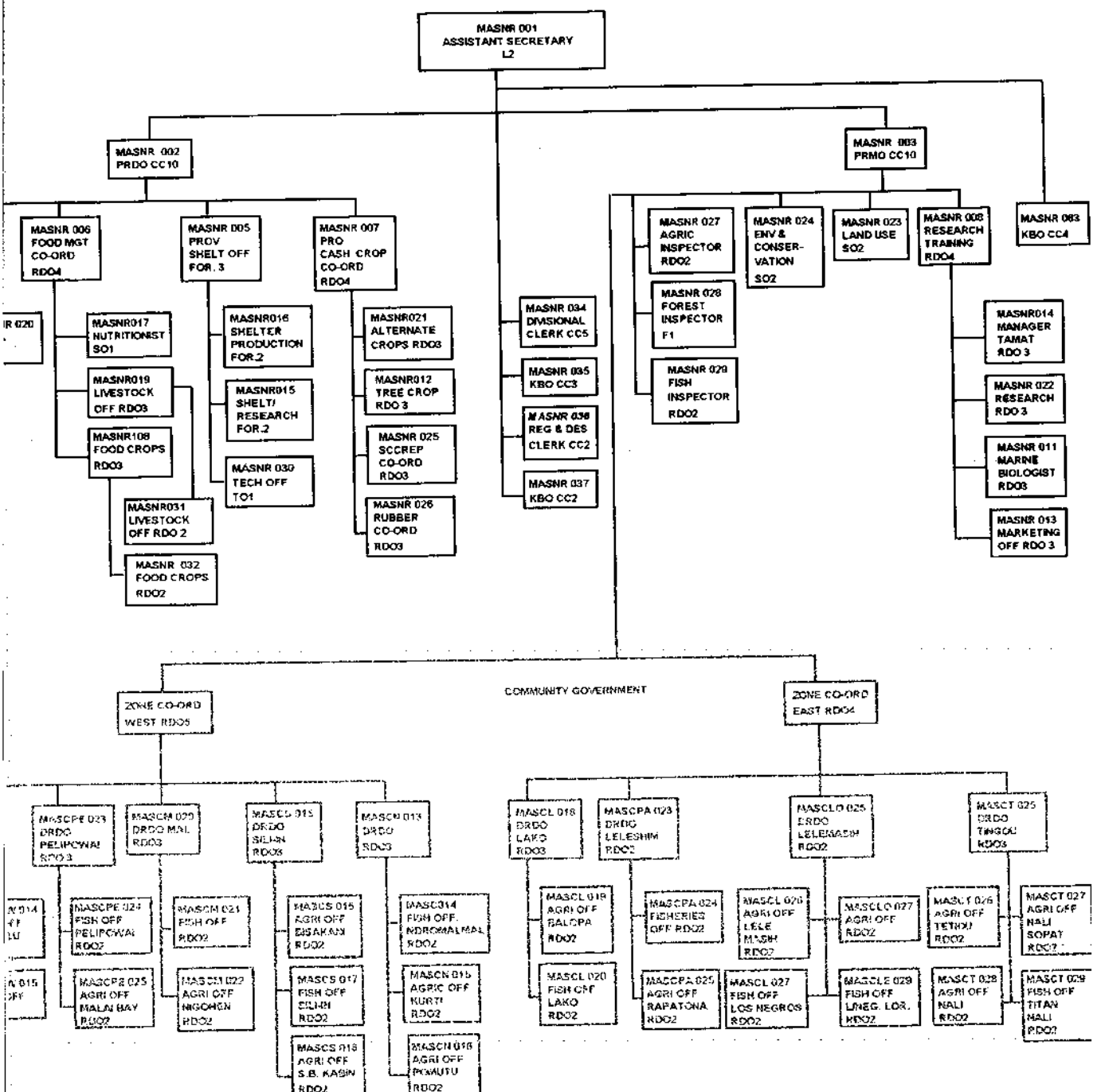
**DEPARTMENT OF MANUS**



## *Appendix 4.* DEPARTMENT OF MANUS

EFFECTIVE 20 TH MAY 1992

## DIVISION OF NATURAL RESOURCES



# THE ROLE OF PRICE SUBSIDIES IN AGRICULTURE IN PAPUA NEW GUINEA

Modowa Gumoi[1]


## ABSTRACT

*In PNG ,subsidies in the agriculture sector are related to major export tree crops such as coffee, cocoa, copra and oil palm and are aimed at helping the local producers. The role, function and welfare implications of price subsidies of the agriculture sector in PNG are addressed in the paper. The focus has been on subsidy schemes that are concerned with producer protection. In that respect deficiency payments, direct production subsidies, specific export subsidies and interest rate subsidies are discussed in detail. The recently established Agriculture Price Guarantee Scheme (APGS) is analysed.*


***Key words**: Subsidies, local producers, functions/roles, implications.*

## INTRODUCTION

In most countries in the world (both developed and developing alike), subsidies are instituted to help both producers and consumers. In Papua New Guinea (PNG) subsidies are and have been part of the successive government's Fiscal Policy regime for decades. They have been applied on factors of production (inputs) and outputs for various sectors and come in a variety of forms.

Subsidies are direct opposite of taxes. While taxes raise revenue to boost the government treasury, subsidies are a cost to the government and society as a whole. In a developing country context, most often taxpayers bear the burden of subsidy schemes. While they may benefit (both directly and indirectly), in some cases they do not benefit. The incidence of the subsidy burden on taxpayers and the potential benefits will depend on the elasticity of supply and demand and the nature of the markets (both domestic and international).

In the Agriculture sector in PNG, subsidy payments are on factors of production and on output of major export tree crops such as coffee, cocoa, copra and oil palm. In recent times the apparent failure of the Price Stabilisation Schemes for coffee, cocoa, copra and oil palm in stabilizing producer prices and incomes has led to the establishment (in 1993) of the Agriculture Price Guarantee Scheme (APGS). Most subsidy schemes in the agriculture sector are aimed at helping the PNG producers. Consumer-based subsidy schemes are rare, if not almost non-existent in the agriculture sector in PNG.

The objective of this paper is to look at the role of price subsidy schemes in the Agriculture sector in PNG. In that respect the mechanics and operation of the different types of subsidies will be looked at. The welfare implication of such subsidy schemes will be analysed. The recently installed APGS will be analysed in detail. As much as possible, simplicity of analysis and avoidance of theory and abstract will be maintained throughout the paper. This is cognizant of the fact that since this is a consultative and "brainstorming" seminar, a clear, consistent and simple message needs to be relayed to the Department of Agriculture and Livestock (DAL) to help refine its policies and strategies.

## MARKET INTERVENTION

Subsidies, in essence, are interventionist in nature. They may also be reactionary. They are established by governments because of the apparent failure of the market mechanism to efficiently allocate resources and determine the 'optimal' level of prices and outputs.

The intervention in the free working of the market mechanism goes against the principles of neo-classical economics which advocates free interac-

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tion of supply and demand to determine optimal price and output levels. However, action by the government to institute subsidy schemes with the hope of correcting *market failure* may actually lead to *market distortion*. Moreover, there may be mismanagement of subsidies, misallocation of resources and loss in both producer and consumer surpluses.

In a competitive market environment the demand curve represents willingness of individuals to pay for additional units of goods and services. Likewise, the supply curve represents the willingness of producers to produce additional units of goods and services. The demand curve therefore can be defined as the marginal social benefit curve while the supply curve can be defined as the marginal social cost curve. However, the market mechanism only incorporates goods and services which are exchanged in the market, and hence acquire a monetary value. These costs and benefits are termed private costs and benefits. There are, however, costs and benefits associated with the production of goods and services which are not valued through the market process. For example, costs and benefits associated with the environment and natural resources. Market failure reflects the inability of the market mechanism to incorporate these unpriced costs and benefits into the assessment of Net Social Benefit (the summation of consumer and producer surpluses). The existence of externalities and inadequate definition of property rights also contribute to market failure.

Because market failure implies distorted and suboptimal price and output levels, government intervention by way of subsidy schemes may lead to further distortion in price and output levels. The magnitude of such distortions will depend on the elasticity of supply and demand.

This aspect of subsidy schemes in the agriculture sector in PNG is important given uncertainty over the supply responsiveness of PNG producers to such schemes and the uncertainty over the causal relationship between price and income stability. The very few studies done (eg. Gerritsen 1985) show that PNG copra producers may be unresponsive to price changes. If prices increase or are guaranteed at a higher level, production may not necessarily increase. The perennial nature of agricultural commodities may compound this problem.

Despite further distortions introduced by subsidy schemes and given the open nature of the PNG economy and the easy transmission of international price instability into the domestic economy for major agricultural exports, subsidy schemes guaranteeing producer prices and outputs at least offer some form of protection to PNG producers from external price fluctuations. The extent of the protection against fluctuating prices may be problematic because price stability may not automatically translate into income stability. See for example Houck (1973), and Nguyen (1979). Certainly, given the competitive nature of commodity markets, the transmission of the full guaranteed price levels along the domestic marketing chain to the producer levels may not be achieved. Manipulation by middlemen may put downward pressure on guaranteed prices and, hence, output. See for example, Gumoi (1993).

## ROLE AND EFFECTS OF SUBSIDIES

The primary role of price subsidies is to act as a buffer against external disturbances by guaranteeing prices to producers at some level. The aim is to stabilise production and producer incomes. Subsidy schemes are usually undertaken in situations of prolonged depressed state of commodity prices. Sometimes, however, subsidy payments on inputs and output may be an essential element of the governments policy of import substitution and/or export promotion. They may also be effected through the Interest Rate Policy.

A subsidy payment made by the government forms a wedge between the price consumers pay and costs incurred by producers such that price is less than marginal cost. Such payments may have a number of possible objectives: (1) a transfer from taxpayers to producers or consumers of a particular commodity in order to raise producer incomes, (2) to influence the behaviour of suppliers or demanders via the mechanism of the elasticity of supply or demand, (3) to keep prices of certain commodities low or stable as part of an anti-inflation policy. Multi-product firms engaging in cross-subsidization may also use subsidies.

There are many types of subsidy schemes which are designed to protect both producers and consumers from the vagaries of market forces. They may be designed to either encourage exports or discourage imports. Some subsidy schemes are designed to directly affect producers (eg. quotas). In this paper, the direct subsidy schemes aimed at

protecting agricultural producers in PNG will be looked at in detail. Direct and indirect consumer subsidy schemes will be briefly mentioned.

The beneficial incidence of subsidies is important to determine the desirability or otherwise of subsidies. It is often observed that the benefits of subsidies may not necessarily be the direct recipients. For example, consumers of a subsidized commodity may benefit by way of lower prices and suppliers of factors of production such as fertilizers may also benefit.

However, subsidy schemes are often criticized on several fronts. Prices of subsidized factors of production are rarely reduced by the whole amount of subsidies. Subsidies on output and inputs used by farmers may be inequitable in the sense that larger producer incomes may be boosted at the expense of smaller producers. Even when subsidy schemes raise per unit returns on production, they may be ineffective welfare measures in improving the most depressed incomes. A dependency mentality may be created among farmers who may be content with 'free financial handouts'. This may be more so in cases where farmers may be risk averse. The transmission of false market signals may lead to resource misallocation. The desired results of a subsidy scheme may not be attained in terms of increased production without a full knowledge of the nature of supply responsiveness of PNG farmers.

Let us now look at some of the direct subsidy schemes that are aimed at protecting producers in the agriculture sector.

**Deficiency Payments**

Some form of agricultural price guarantees for many products are an integral part of agricultural price and income policies of many countries. Such price guarantee schemes guarantee producer prices that are in most cases higher than the prevailing market prices.

Various measures can be employed to protect internal price guarantees. The traditional trade policy mechanisms are tariffs and quotas. Although they may be considered indirect subsidy measures, they have operational drawbacks. Fixed or ad valorem tariffs involve transmission of world price fluctuations into the domestic economy. Input quotas may insulate the domestic economy from the vagaries of international market forces, but they may widen domestic price fluctuations caused by internal supply and demand fluctuations.

As part of a protective trade policy, variable levies may be employed to protect domestic price guarantees from being defeated by trade flows. Variable levies effectively disconnect domestic price of imports from world prices. Domestic demand and supply instability is transferred to the world market through the change in imports. As with fixed or ad valorem tariffs revenue is generated.

The price stability in internal markets introduced by variables levies may, however, lead to producer income instability as domestic agricultural production fluctuates from season to season. With the failure of the present price stabilisation schemes to siphon off price fluctuations, producer incomes in a large importing country like PNG may swing more widely than if producer prices were flexible and connected to the international markets. Despite this apparent drawback, price guarantees through a variable levy system tends to discourage imports in the short-term. Over time, this may induce domestic supply to increase faster than otherwise.

Protection afforded to producers by way of import tariffs, quotas and variable levies requires domestic consumers to pay higher prices for protected goods than otherwise. There is loss in consumer surplus which may be a gain by producers and the national government. However, consumer losses can be avoided by a production subsidy that involves deficiency payments.

The workings of a deficiency payment system and its desirability are elaborated on in section 4 where the Agricultural price Guarantee scheme introduced by the national government in the 1993 budget is discussed. In this section we will develop a simple analytical framework to assess the welfare effects of a deficiency payment system.

Figure 1 sets out a simple partial equilibrium analytical framework. *P1* is the international price in the absence of any protection (i.e, in a free trade situation) where quantity *ac* (figure 1b) would be imported. This is equivalent to *be* in figure 1a. If the government sets the guaranteed producer price at *Ps* and instead of intervening directly in the market to ensure that the producers get *Ps* it resorts to a deficiency payment scheme, how would this scheme operate?

The difference between *P1* and *Ps* is the deficiency payment in the form of direct payments to producers. Domestic output expands by *fg* units above free market production. The higher *Ps* relative to *P1*, the larger the deficiency payment. Buyers in the domestic market still face *P1*. Hence, no negative consumption occurs. If *Ps* and consumption will fall by *hj* units. But with deficiency payments consumption stays at *Oj*. But because domestic production expands by *fg* units, imports must decline by an equal amount.

In figure 1b deficiency payments alter the original demand curve. The new demand curve with a deficiency payment scheme is ED*. It measures the amount of imports demanded at various market prices when *Ps* is guaranteed. Note that the supply curve in given *Ob* is perfectly elastic while the demand curve is inelastic. This is because the PNG economyis small and open and therefore has no influence on world prices. It is essentially a price-taker.

Deficiency payments aimed at protecting producers do not affect consumers. But the taxpayers and the government have to bear the burden of such schemes because deficiency payments are a cost. They raise no additional revenue unlike tariffs and quotas.

### Direct Production Subsidies

Deficiency payments and variable levies ensure producers a guaranteed price for their output. It can be argued that each of these schemes have an income goal. Direct production subsidies, however, are aimed at expanding domestic output, usually in a program of deliberate import substitution. Production subsidies can take two forms. First, it can be a specific per unit payment from the government to the producers. The second type is on inputs like fertilizer. The aim of these types of subsidy payments is to reduce direct production costs in the hope that domestic agricultural output will increase at the expense of imports. A large portion of the domestic markets for commodities may be captured by the local industries but at a cost to the taxpayers and the government.

Figure 2 lays out the analytical framework for a direct production subsidy. The analysis is similar to those outlined for deficiency payments (Section 3.1). The only difference is that the subsidy in this case is a per-unit amount and not an output price guarantee.

The per unit subsidy is *S*. Producers supply curve shifts to S* because marginal costs fall. Demand curves shifts to ED* and imports fall from *ab* as domestic output increases and replaces imports. The per unit return to producers increase from *P1* to *P2*. This decline in imports has no direct effect on buyers of the subsidized products since the fall in imports is balanced by an increase in domestic production. Prices of buyers of the product do not change. In all, producers benefit and taxpayers meet the cost of the subsidy program. There are also opportunity costs involved as there is resource movement into the subsidized sector. As long as imports do not influence international prices, consumers are unaffected by the production subsidies.

### Export Subsidies

Export subsidies are a direct-unit payment by the government to exporters on volume of goods cleared for export. Exporters may purchase products at a higher price in the domestic market and sell them for a lower price in the world market.

Export subsidies come in different forms. They may be fixed, ad valorem, open-ended or variable. For purposes of simplicity, a fixed or specific export subsidy is discussed here. Interested readers are referred to Houck (1986) for elaboration on the other types of export subsidies.

Figure 3 lays out the analytical framework of a specific export subsidy. The specific subsidy is *S* It shifts supply curve of exports to the right to ES* expanding export volume by *ab*. International price remains at *P1* but domestic prices increase as exporters expand exports to earn subsidy payments, thereby increasing prices paid for export goods. This increase in domestic market price curtails domestic consumption but expands production.

As a caution, it should be noted that when an exporting country raises domestic market prices of exports above the world market level, it must curtail imports of that product and its close substitutes so that there is no inflow of imports into the domestic economy.

### Subsidized Interest Rates

Sometimes governments can assist agricultural producers by providing the means to purchase factors of production. Subsidized interest rates

may provide 'cheap' credit to producers through the banking system. However, the experience in PNG with the Rural Development Bank and the commercial banks is that the 'cheap' credit becomes expensive for the poor farmers and benefits the already wealthy.

If one takes into account the administrative cost of loan disbursement, cost of funds and the risk premiums, then subsidized interest rates may in fact be higher.

## THE AGRICULTURAL PRICE GUARANTEE SCHEME

### Introduction

PNG's major agricultural export commodities are Coffee, Cocoa, Copra and Oil Palm. These crops together account for about 30 percent of total export earnings and about 70 percent of export earnings from agricultural production. However, the supply of these commodities is highly elastic while the demand is inelastic in nature. This implies that PNG is just a price-taker and not a price-maker.

Since 1985 the world prices for these commodities have declined by about 60 percent in real terms. World Bank price forecasts (table 3) show very little improvement in the future. Hence, the future of these export industries looks bleak, although in recent times prices for cocoa and copra have been on the improve.

Given the relatively small and open nature of the PNG economy, the degree of susceptibility of the economy to the vagaries of international market forces is great. The transmission of external price fluctuations will therefore have an impact on the domestic economy.

The apparent failure of the present commodity price stabilisation schemes in stabilising producer prices and incomes as a result of prolonged depressed state of commodity prices prompted the government to institute the Agricultural Price Guarantee Scheme (APGS) as part of its 1993 budget reform. Although the economics and rationale of the scheme are not immediately obvious, the presumed objective of the scheme is to support producer prices at some specified level (see table 1). The APGS scheme was deemed necessary because the survival of the four major export industries were dependent upon government price support.

*Table 1:* **Govt. Guaranteed Prices under the APGS (K/tonne)**

| | |
|---|---|
| Cocoa | 1 300 (dis) |
| Coffee | 2 300 (fob) |
| Copra | 250 (depot) |
| Oil Palm | 26 (ffb) |

*Source:* Dept. of Finance and Planning

### Mechanics and Operation of the APGS

Apart from the APGS being interventionist and reactionary in nature, it is a system of Deficiency Payments. The intention of such a payments system (together with variable import levies) is to protect domestic producer price guarantees from being undermined by fluctuations in producer prices and incomes as a result of the vagaries of international market forces.

The Deficiency Payments System works in the following manner. Basically a price is guaranteed by the government to the producers. If the world price falls below the guaranteed price, a deficiency payment is paid to the producers. The amount of the deficiency payment will be equivalent to the difference between the guaranteed and world prices.

The present Commodity Price Stabilisation mechanism is used to effect the APGS in terms of making bounty payments. The bounty payment is actually the deficiency payment. The respective commodity boards (with the exception of Oil Palm) have to make formal submissions to the government (Department of Finance and Planning) on likely production and corresponding prices before funds are released to support producer prices.

### Cost of the Scheme

The cost of the price support package under the APGS was estimated by the government to cost about K84 million in 1993 (Budget Paper 1993, Vol.1). Table 2 gives the amount disbursed as of September 1993 and the estimated cost by the end of that year. Between Janauary and September 1993 the amount disbursed for the 4 major export tree crops amounted to about K85 million. By the end of the year producer price support to the major

export tree crops amounted to K104 million. For 1994, the government has estimated the APGS to cost about K71 million.

*Table 2:* **Level of Expenditure under the APGS (Jan-Sept 1993)**

| Export Crop | Total Support (K million) | Total Estimated 1993 (K million) |
|---|---|---|
| Cocoa | 19.0 | 22.6 |
| Coffee | 56.0 | 72.5 |
| Copra | 9.1 | 12.1 |
| Oil Palm | 1.2 | 1.5 |

*Source:* Dept. of Finance and Planning

The cost of the APGS should be critically analysed in terms of opportunity costs. In particular, it should be viewed in comparison to the Commodity Price Stabilisation Schemes. The major difference between the APGS and Commodity Price Stabilisation Schemes is that the latter is partly financed by grower contributions in the form of levies while the former is being totally financed by the government through its price support programme. Hence, the level of opportunity costs in terms of alternative productive investment of funds elsewhere will generally be high in the former than the latter.

In the short term (1993-1996) the level of price support (and opportunity costs) is likely to increase considerably, especially in the Oil Palm and Copra industries where there is rivalry and close substitutes available in the world market. This is because price projections by the World Bank either show very little improvement or fall well below the domestic guaranteed price levels (see table 3). The long term price forecasts (2000-2005) show an improvement in prices but should not be trusted because they are in any case very speculative. Whether world commodity prices improve will be determined by interaction of the world supply and demand conditions. PNG has no influence on world supply and demand conditions.

### Merits of the Scheme

The APGS has been complemented by the removal of export duties on exports of Coffee, Cocoa, Copra and Oil Palm as part of the 1993 budget reform process. There is some economic justification for the institution of the APGS. The conventional trade policy mechanisms to protect internal price guarantees such as tariffs, variable levies and quotas have operational problems. Such mechanisms require that domestic consumers pay prices for protected goods that are higher than otherwise. Loss in consumer surplus is usually the consequence, although such a loss may be a gain to producers in terms of increased revenue.

However, the system of deficiency payments (which also is a form of production subsidy) aimed at protecting producers can also protect consumers. The deficiency payment system involves direct payments by taxpayers rather than transfers from consumers. Such an incidence of burden on taxpayers rather than on consumers occurs because consumers still purchase both imports and domestic output at competitive market prices. Because price guarantees in the form of deficiency payments is by way of direct payments, no conventional trade policy mechanisms such as tariffs, variable levies, and quotas (which can be considered as indirect price guarantee measures) are required. Hence there is no direct restriction of trade.

*Table 3:* **World Bank Commodity Price Projections**

| | Short Term | | Long Term | |
|---|---|---|---|---|
| | 1993 | 1996 | 2000 | 2005 |
| Coffee (c/kg) | 137 | 130 | 298 | 231 |
| Cocoa (c/kg) | 104 | 112 | 170 | 215 |
| Palm Oil ($/MT) | 410 | 430 | 460 | 413 |
| Copra ($/MT) | 290 | 210 | 313 | 492 |

**Note:** Appropriate conversions to Kina/tonne terms need to be made before interpreted against table 1. Conversions from c/kg to Kina/tonne would involve multiplication by 1000 and division by 100. Conversions from $/MT to Kina/tonne would involve multiplication by 100 and division by 1000.

*Source:* World Bank, May 7 1993

### Demerits of the Scheme

The institution of the APGS has serious implications for the future operations of the present commodity price stabilisation schemes are not self-financing, unbalancing and unpredictable over time, the AGPS could be an ideal alternative producer income stabilisation mechanism. However, as already argued the opportunity costs of the APGS are likely to be high. Moverover, the APGS may have created a dependency mentality among

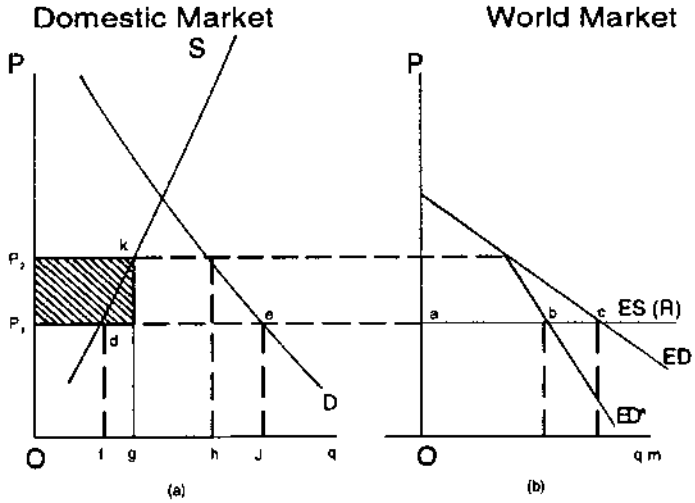


*Figure 1.* Deficiency payment and imports

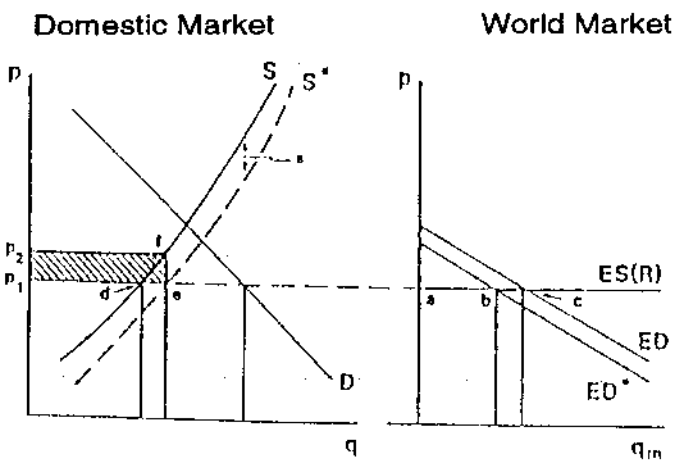


*Figure 2.* Direct Production Subsidy

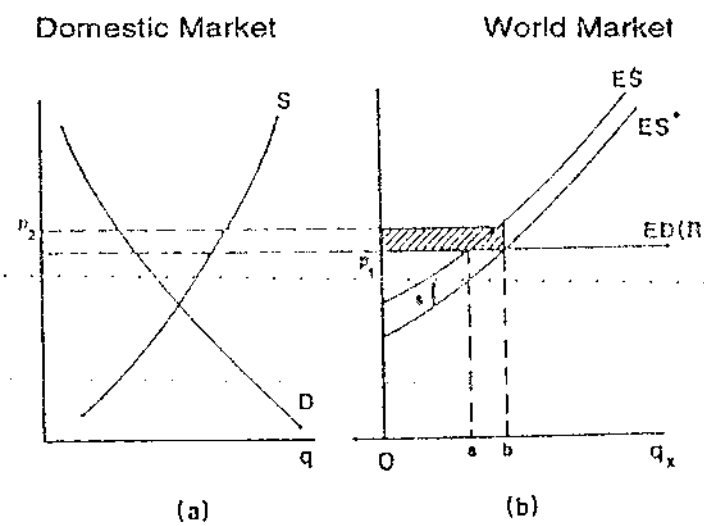


*Figure 3.* Fixed Export Subsidy

Source: HOUK (1986)

farmers. This may have negative implications for expansion of production in the industries.

Because of free exit and entry into the industries, the government price support may actually be an incentive mechanism to induce entry by other producers. Those already in the industries may also not leave because of 'free financial handouts'. Hence costs (including opportunity costs) of the price support programme may actually increase.

In summary the APGS is really a system of Deficiency Payments and should technically be referred to as such. Its relevance and desirability should be based on costs (especially opportunity costs) and benefits. If the present prolonged depressed state of commodity prices is any indication, costs of the APGS are likely to increase in the long-run.

In that respect, a decision needs to be made on the future of Commodity Price Stabilisation Schemes. If the Price Stabilisation Schemes are abandoned, the APGS should probably be effected through another mechanism other than the Price Stabilisation mechanism. This should rid the Commodity Boards of this additional responsibility so that scarce resources are employed to concentrate on the production, marketing and research/ extension aspects of their mandate.

## CONCLUSION

Subsidies are interventionist in nature and a cost to taxpayers and the government. They come in different forms and their effects can be both direct and indirect. Usually governments institute subsidy schemes to protect both producers and consumers from the vagaries of international market forces. In the PNG agriculture sector, producer-based subsidy schemes are more prevalent.

Government intervention in the free working of the market mechanism with a view to correct market failure may lead to market distortion. Sub-optimal price and output levels may be achieved. Transmission of such distorted levels can further distort prices and output. Hence, subsidies may be self-defeating in the sense that the desired results of increased and/or stabilised price and output levels are not achieved.

This paper has attempted to address the role, functions and welfare implications of price subsidies in the agriculture in PNG. The focus has been on subsidy schemes that are concerned with producer protection. In that respect deficiency payments, direct production subsidies, specific export subsidies, and interest rate subsidies have been discussed in some detail. The recently established Agriculture Price Guarantee Scheme (a form of deficiency payment system) is also analysed in depth.

It is felt that the desirability or otherwise of subsidy schemes will hinge on the government policy direction. Such a direction, however, needs to take into account the costs (especially opportunity costs) and benefits of subsidies on a case by case basis. The precedence of producer protection over the opportunity costs of such protection implies considerable burden on society.

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# IMPROVING RURAL INSTITUTIONAL FINANCE: SOME LESSONS

Nimal Fernando[1,2]


## ABSTRACT

*A summary of the major criticisms of the conventional approach to rural credit is presented. Some lessons and experiences in developing rural finance are discussed. The need for a broader view and a holostic approach, importance of building financial infracture, importance of rural infrastracture and non-financial policies, importance of institutional building is emphasized. Subsides in building institutional capacity essential in rural saving mobilizations, roles of private commercial banks, and the need for directed finance progrommes are briefly outlined.*


***Key words:*** *Rural finance, financial infrastructure, institutional building, studies, savings.*

## INTRODUCTION

In many developing countries government policy agenda stresses rural development for a variety of reasons: rural areas are largely underdeveloped in comparison to urban areas; most of the population and the poor live in rural areas; rural areas offer considerable development potential; rural areas are politically important. Thus the concern for rural development reflects equity, growth and political considerations. To achieve the objective of rural development, governments have offered a multitude of support measures, incentives and assistance. Measures aimed at increasing the flow of credit to the rural sector, particularly to small farmers constitute a major element of such support in many developing countries. More specifically such support includes, inter alia, interest rate subsidies on loans to rural economic activities; establishment and operation of special credit schemes and institutions; budgetary support for rural credit activities; refinance facilities for rural lending operations of financial institutions. Perhaps, there is no developing country government in Asia, Africa, or Latin America which has not extended some specific support for rural credit operations.

International aid agencies, multilateral lending institutions, regional development banks and donor countries have supported in varying degrees developing country initiatives to improve credit flows to the rural sector. In many cases governments have initiated special programs or projects with financial assistance from such external sources. The nature and scale of the programs have differed across countries. But most of the programs have focused on supply of credit.

## CRITICISMS OF THE CONVENTIONAL APPROACH

Criticisms of the conventional approach to rural credit are well known and have been widely discussed in literature as well as international and many national fora (von Pischke *et al.* 1983; Braveman and Guasch 1993). Hence the paper does not attempt to detail these approaches. But to put the subject of the paper in proper perspectives a summary of the major criticisms is presented.

These criticisms include: the approach has been too narrow, being confined largely to agricultural credit; rural savings have constituted the "forgotten half" of rural finance; interest rate subsidies and various other subsidies have undermined development of viable rural financial systems by promoting misallocation of credit and encouraging defaults; subsidized credits have benefitted largely the rich and very little had reached the small farmers and the poor; the approach had led to a greater dependency of financial institutions on external sources of funds including government budgetary support and hence undermined the institutional viability and sustainability; the approach has offered strong incentives for political interference in rural credit activities with consequent adverse effects on effi-

[1] The views expressed in this paper are entirely those of the author and do not in any manner reflect the views or policies of the Asia Development Bank.

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ciency of credit institutions and recovery of credit; the number of farmers reached remained small and many farmers served are those who could even have had access to credit from commercial sources[3].

## SHIFT TOWARD A MARKET-BASED FINANCIAL SYSTEM

A major response to the weaknesses in the traditional approach to agricultural credit has been a gradual movement towards providing financial services at market-based or market-approximating prices. This approach is widely known as Rural Financial Market (RFM) approach. The RFM approach emphasizes the need to develop rural financial markets rather than increase credit supply and to rely on market interest rates; recognizes savings mobilization as an integral part of rural finance; highlights the importance of building viable and sustainable rural financial institutions (RFIs) through market incentives and allowing private financial institutions to expand rural sector portfolio on market basis; and advocates elimination of subsidies for rural finance activities.

There were some changes in the old supply-led approach to agricultural credit in the 1980s. However, the changes have not been wide enough to replace the old approach. In many countries conventional support measures aimed at increasing supply of rural credit seem to continue side by side with the new initiatives though the relative importance of the former is gradually decreasing.

Although the RFM approach had gained considerable popularity during the last decade, still there seems to be no consensus of opinion on how best the rural financial system could be improved to support rural development. Disagreements, for example, exist on most appropriate interest rate policy on rural finance[4]; subsidization of rural finance, the need for specialized financial institutions to cater to rural sector and the need for targeted credit schemes. The arena of rural finance policy and practice has come to a critical and controversial stage where many national and international institutions involved in achieving the objective of improving the rural financial system have begun to take a fresh look at their own policies and strategies.

In the meantime several experimental projects aimed at improving rural finance have matured and scaled-up their operations, the notable examples being the Grameen Bank (GB) of Bangladesh and Badan Kredit Kecamatan (BKK) and Kupedes Scheme in Indonesia[5]. The Grameen experience is being replicated in a large number of countries with financial and technical assistance from donors and multilateral financial institutions. Besides these widely-known programs and projects, a large number of small-scale rural finance projects are being operated in many countries[6].

The old approach to rural credit, RFM approach as well as the other new approaches being tried in a number of countries offer many useful lessons for those who are interested in improving rural financial systems. A major purpose of this paper is to highlight *some* of those lessons of relevance to developing countries. The lessons chosen for the discussion in general relate to: the approach; financial and rural infrastructure; financial and non-financial policies; institutions; prices of financial products and services; savings mobilization; involvement of private commercial banks; and directed finance programs.

## LESSONS

### Need for a Broader View and a Holistic Approach

Experience in a large number of countries shows that our view has to be broadened from agricultural credit to rural finance and the approach from credit supply to development of financial markets. This change has occurred to some extent over the years, but that is not yet complete. There are several dimensions to this broadening.

[3] For more recent empirical evidence from Bangladesh and Nepal supporting most of these assertions, see Chowdhury and Garcia (1993)

[4] For example, Desai and Mellor (1993) argue in a recent publication that market interest rates on rural loans in certain situations can have considerable adverse effects on mobilization of rural savings and hence the overal profitability of RFLs. They point out that if an increase in interest rates decreases the volume of business, it cuts back on the savings the institutions can accrue from economies of scale, negatively affecting their profitability.

[5] See for an excellent account of these, Yaron (1992); On Grameen Bank, see also, Hossain (1988).

[6] See The Foundation for Development Cooperation (1992); and Hilhorst and Oppenoorth (1992).

First on the "concept broadening". Clearly agricultural credit is only a segment of rural finance. But evidence suggests that rural non-farm sector is also of vital importance for broad-based development[7] and that sector's financial requirements cannot be ignored. Also, the "forgotten half" of rural finance, which is savings, must be made an integral part of intervention measures in rural financial markets. The other type of broadening required is vertical: given the high degree of socioeconomic heterogeneity in the rural society it appears that rural finance should not be conceptualized as banking for the "poor", "marginalized", or "small" farmers. The concept of "finance" is broader, cuts across activities and socioeconomic groups; and compels to direct the focus on financial markets and relationships between different types of participants in the markets. Thus, if the approach is to be broadened from one of segmented to holistic, the broadening of concept to "rural finance" becomes a prerequisite.

Second, on the broadening of the approach. The financial system is an important mechanism by which an economy mobilizes and allocates resources. For the financial system to do this function efficiently there must be efficient institutions, suitable financial instruments and supportive financial and non-financial policies (see Appendix 1). Rural financial markets consist of relationships between buyers and sellers of financial services and assets of different types in rural communities. The narrow supply-led approach to credit cannot cover these important dimensions and hence is unlikely to lead to financial market development through which resources may be efficiently mobilized and allocated.

Financial institutions must also diversify their risks to minimize their overall average risk level. Potential for such diversification is greater when their clientele is not confined to the poor or small farmers. Also, institutions that deal exclusively with small loans and deposits are often unable to meet costs and produce a profit. Therefore, they cannot resort to cross-subsidization of activities to any significant scale, at least until the initial information and other constraints to expansion of their activities are removed and their outreach is broadened to serve an increasing number of small sector clients. This tends to make such institutions heavily subsidy-dependent. Further the apparently popular presumption that those who do not belong to the categories of poor, marginalized or small farmers do not have problems in having access to formal sector financial services, does not appear to be realistic.[8]

Financial intermediation is the most important role of financial markets in development. Financial intermediaries perform this role by pooling and reallocating savings. There is considerable potential for savings mobilization in rural sectors, in part because everybody in the rural sector is not poor. Even poor people save and these savings can be mobilized, pooled and transformed into financial assets (Von Pischke 1978; Fernando 1991a). Also, savings mobilization provides multiple benefits to lenders by enhancing their information base on existing and potential clients which in turn would enable them to improve their lending decisions (Vogel and Burkett 1986).

## IMPORTANCE OF BUILDING FINANCIAL INFRASTRUCTURE

In the past many developing countries have attempted to improve agricultural or rural credit flows through creating institutions or special schemes that deliver funds. Very little or no attention had been paid until recently on building financial infrastructure to support, strengthen and ensure sustainability of such initiatives. As a result, many schemes and institutions lacked solid foundations and have become fragile and unsustainable. A large number simply ended up as failures. For example, in Papua New Guinea, the Savings and Loans Societies (SLSs) were developed in the 1970s without a suitable and adequate financial infrastructure. This contributed to the failure of most SLSs. Many small depositors simply "lost" their savings with the demise of the SLSs in which they deposited their funds and did not have any legal protection. It was only recently that the policymakers of Papua New Guinea attempted to address the financial infrastructure issues relating to the SLSs.

Poorly functioning and underdeveloped financial infrastructure impedes efficient financial intermediation by adding to the risk and cost of transactions while development of such infrastructure facilitates market based development by reducing costs and risk and allowing participants in financial

[7] See the significance of rural non-farm activities, Anderson and Leiserson (1980); and Binswanger (1983).

[8] In many developing countries, potential investors in medium and large scale agroprocessing industries and large holder farmers in perennial crops experience difficulties in obtaining loans from formal commercial financial institutions.

markets to transact business easily (Khanna *et al.* 1992). The infrastructure includes: accounting policies, practices and financial disclosure requirements; prudential regulation and supervision of financial institutions; legal framework governing financial transactions and legal procedures for enforcement of contracts; and dissemination of financial and legal information (Khanna *et al.* 1992; World Bank 1989). If rural financial systems are to be efficient and robust and to expand their coverage over time, they must be developed in the context of a suitable financial infrastructure (see Appendix 2). It is essential therefore to pay adequate attention on this aspect which underpins the process of financial development.

## IMPORTANCE OF RURAL INFRASTRUCTURE AND NON-FINANCIAL POLICIES

Another underrated and neglected aspect of rural financial development is the significance and relevance of rural infrastructure. Such infrastructure facilities which directly influence economic development potential, returns on investments and level of social development also influence rural financial development, although their bearing has not been adequately recognized by many policy-makers in developing countries. This include, among others: farm to market roads; bridges; primary health care and primary education facilities; and marketing facilities[9]. Condition of rural roads and bridges often will determine whether a loan will be repaid or not while status of primary health care and education facilities may influence utilization of loan funds for the stated purpose.

Rural financial development is also intimately linked with a wide array of non-financial policies. These include chiefly exchange rate and agricultural pricing and taxation policies. In many developing countries, overvalued exchange rates and administered farm output prices make farming less profitable, farm investments unattractive and farmers less creditworthy. The macro as well as sectoral policies contributing to better financial returns on rural investments will have a far-reaching and significant effect on sound rural financial market development. The bottom line significance of sound non-financial policies is the same as that of rural and financial infrastructure: they contribute towards reduction of costs and risk of financial transactions.

The effect of better infrastructure and sound policies is felt on both sides of the financial services equation: on the demand side they enhance debt and saving capacity of potential clients and effective demand for services; on the supply side they result in reduction of costs and risk of financial transactions ,enhance incentives to provide services on a profitable basis, leads to an expansion of supply of finance and contribute toward sustainability of institutions.

Potential viability of rural economic activities is a key factor in development of viable financial institutions. If economic activities are unremunerative, it is unrealistic to expect that there will be bankable demand for loanable funds, nor will there be considerable potential for mobilizing savings in such a situation. Financial institutions that are compelled or required to serve rural sectors that suffer from severe inadequacies of physical infrastructure or that are subject to unfavorable price structures are likely to limit their services to the barest minimum number of clients or experience large losses and become fragile. They are unlikely to be able to build confidence among the rural community as a permanent element of the financial system and therefore may not be able to contribute towards the process of financial development. Unhealthy institutions are unlikely to provide services of good quality.

## INSTITUTIONAL BUILDING IS IMPORTANT

For a long time the significance of institutional capacity for rural financial market development was overlooked. Emphasis was placed on making funds available for lending. This is partly why state departments and project management offices were often granted responsibility of delivering credit to rural sector and specific target groups in that sector. Building suitable institutions and their capacity was not a high priority item in many credit programs or projects. This is true even when new institutions were set up for the purpose.

In general, most RFIs were created within and nurtured by a distorted policy environment. Many of the institutions were not market-driven. Hence the signals and directions transmitted to these institutions were simply not conducive for orderly and sound institutional development. Also, such

[9] High default rates are cited as a common characteristic of rural credit. It may be interesting to find out the extent to which poor rural infrastructure is responsible for the default problem.

new institutions were conceived and used as mere conduits for delivering credit rather than essential components of the long term process of rural financial market development. Often they were under-funded, under-staffed; their staff was not given suitable and adequate training; their capacity to appraise projects and manage delinquent accounts was not developed systematically as a part of long term human resource and skill development process in rural finance. Accounting practices of the institutions were not developed in a systematic manner. Management information systems remained poor. Incentives for innovations were conspicuously absent in many institutions. In short, institutional building was considered as an exercise in creating new institutions, physical construction of buildings and appointment of new staff and giving them some training and budgetary support.

Experience during the last three to four decades shows that institutional capacity is of vital importance in the process of rural financial market development. Many credit programs and projects have failed, in part, due to the neglect of this aspect. Rural financial development is a tedious, complex and long term task. To accomplish this, a country must have strong financial institutions with trained staff[10]. Recognition of the significance of this factor is illustrated by the fact that GB which is frequently cited and widely claimed as a rare success story in rural finance, spent as much as 10.5 per cent and 28.1 per cent of its administrative costs for training purposes, respectively in 1987 and 1989 (Yaron 1992, p. 39). Functionally also training of staff is considered as one of the most important tasks in GB. Incentives for efficient operation will have to be combined with capacity to respond. In the absence of sufficient capacity, incentives are unlikely to produce desired results.

RFIs must have sufficient ability to promote financial services, efficient system of credit delivery and recovery, suitable eligibility criteria for lending, staff with adequate skills in cash flow analysis, project appraisal and management of delinquent accounts, efficient systems for deposit mobilization and staff trained in deposit mobilization, and a management information system which can produce timely and user friendly information. It is equally important that these institutions enjoy a sufficient degree of autonomy in decision making relating to their day to day activities.

## INTEREST RATES DO MATTER

Many developing countries neglected for long the fact that distortions in interest rates can have significant adverse effects on the speed, level and nature of financial development. This was partly a result of the wrong assumption that agricultural sector cannot bear market interest rates. While this assumption has proved to be unrealistic, experience shows that the level and structure of interest rates have to be such that they provide sufficient incentives for the participants in the markets to operate efficiently. This is particularly true in the case of lending rates in the rural sector.

Interest earnings are the principal source of revenue for RFIs. When on-lending rates are kept at artificially low levels with inadequate spreads through administrative decisions, RFIs are forced to use various rationing devices of funds leading to political interventions in decision making, distortions, poor outreach, and significant financial losses. Such systems of pricing of loanable funds also reduce incentives for financial technological innovations which play a major role in rural financial market development. These problems, to a large extent, can be addressed by shifting to a market-based pricing system.

Competition in the financial sector can be ensured only if the interest rates are market-determined. Non-price competition among suppliers of financial products and services also depends to a large extent on the market-determined interest rates. When interest rates are simple administrative prices with no bearing on market movements, for example, the quality of financial services ceases to matter because such administered prices do not lead to a competitive behavior among suppliers.

The issues relating to deposit rates appear to be more controversial than those relating to onlending rates. Yet, empirical evidence seems to suggest that positive real deposit rates can have significant

[10]. According to Hilhorst and Oppenoorth (1992, p. 53) "it is not uncommon to find people with no training in financial matters, such as doctors, social workers, priests and agricultural technicians running the programmes and running them badly. In these circumstances it is not surprising that the rate of failure is so high".

[11]. Desai and Mellor (1993) refute this contention and argue that "farmers prefer to keep their assets in physical form anyhow in seed, equipment, livestock, and so fort-so a change in the rate paid on deposits". However, there is little empirical evidence to support their argument.

favorable effects on rural deposit mobilization[11].

The lesson is that market-based interest rates are important and they do affect significantly the development of rural financial markets. However, this does not mean that interest rates alone can provide a solution to the complex problem of rural financial market development and they should abruptly be allowed to be determined by market forces. The best strategy and the speed with which to shift from a distorted structure to a market-based system will have to be worked out depending on the country situation. The shift needs to be, in general, gradual.

## SUBSIDIES CAN BE USED PRUDENTLY TO BUILD CAPACITY

The RFM approach to rural financial development highlights the negative role of subsidies and strongly argues against subsidies, particularly interest rate subsidies. Subsidies made available by donors and governments through budgets and central banks have in general undermined the financial viability and self-sustainability of many RFIs. Yet, in the author's personal view, the lesson from experience in the developing world is not that subsidies are bad and unnecessary: the lesson is quite different.

Subsidies, in some form, appear to be essential in the development of rural financial systems in most developing countries, if one of the objectives is to expand the outreach to cover bulk of the rural population, particularly low income groups and various disadvantaged groups such as women and those who live in remote areas. Mobilizing small deposits and delivering and recovering small loans involve high administrative costs. A considerable proportion of these costs relate to social intermediation[12] rather than financial intermediation and arises from the low level of social and human development of rural population. Hence, a justification exits for subsidization of operational costs of rural financial intermediaries[13]. Justification of subsidies also depends on the type and the number of clients served by an institution. Obviously subsidies are difficult to justify for those institutions which serve primarily the rich or large farm holders.

Again to illustrate the point it may be pointed out that GB's subsidy dependence was as high as 180 per cent in 1987 and 130 per cent in 1989, according to Yaron's (1992) estimation[14]. GB received a substantial amount of funds from donors and international lending agencies at concessional rates for on-lending and held much of those funds in private banks as long-term high yield term deposits. Hossain (1988) estimated that if the low-cost funds from the International Fund for Agricultural Development had not been available, the average cost of funds of GB would have risen from 3.6 per cent to 8.5 per cent and the cost of operation from 21.7 per cent to 26.6 per cent in 1986.

The author believes that GB would not have been able to serve the clientele it has been serving and have an extensive outreach without such a high level of subsidization. Yet this does not mean that subsidies must be an integral and permanent part of the rural finance structure. This does not also mean that lending rates must be subsidized. In the case of GB the subsidies were used prudently to serve an increasing number of low income group clients, mainly women, while maintaining high recovery rates of loans[15].

In the past subsidies produced widely discussed negative effects because: their purpose was not clearly spelled-out ; they were given largely to maintain concessional interest rates on loans; they were not transparent; RFIs receiving the subsidies were mostly state-owned and subject to a great deal of political interventions which created a vicious circle of subsidies; they were not time-bound; they were not given to right type of institutions and activities.

[12] Bennett (1993) defines social intermediation as "a process of linking those beyond the frontier of formal finance with formal financial institutions and other services that will improve their welfare and make them productive."

[13] Subsidies provided to RFIs to cover costs of educating borrowers and providing technical assistance to borrowers may be considered similar to public expenditure on agricultural extension.

[14] The subsidy dependence is measured as the ratio between total subsidies (both implicit and explicit) received by a financial institution and its total estimated annual interest income on the average loan portfolio. The ratio measures the percentage increase in the average onlending interest rate required to compensate a financial institution for the elimination of subsidies in a given year while keeping its return on equity equal to the approximate nonconcessional borrowing cost (see for details, Yaron 1992).

[15] As of end of June 1990, GB had 660,000 loans outstanding with a total loan volume of $30 million. Its loan collection rate had been over 95 percent (Yaron 1992; Hossain 1988).

If subsidies are to be applied in relation to rural financial development, it is essential to clearly spell-out the subsidy policy. The policy should, among other factors, deal with the activities deserving subsidization, time-frame of subsidies, transparency, financing method of subsidies and how and when effectiveness of utilization of the subsidies may be assessed. In general available evidence tends to suggest that the subsidies be confined to finance start-up costs and institutional development activities (training, development of efficient delivery and recovery systems, improvement of information systems etc.,) and must not be used to make interest rates cheaper to the final borrowers partly because for most rural sector potential clients, availability rather than cost of credit is more important. This seems to be true particularly in respect of short term loans irrespective of the clientele category.

**Greater Emphasis on Rural Savings Mobilization is Essential**

Mobilization of rural savings is an important part of many successful rural financial institutions. Voluntary savings mobilization generates multiple benefits to financial institutions. Vogel and Burkett (1986, p. 426) note that:

> "...lenders that mobilize deposits automatically obtain information about their depositors as potential borrowers that can lower transaction costs and default risks on loans, while borrowers from FIs (financial intermediaries) that mobilize deposits locally feel an increased obligation to repay loans. Furthermore, deposit mobilization can free FIs from the feast-or-famine cycle of external funding from governments and international donors and thereby strengthen confidence among both depositors and borrowers. Deposit mobilization may, therefore, increase, and loan delinquency and default may fall, as borrower incentives to repay promptly are based in part on future access to credit from an FI".

They conclude that the performance of lenders that accept deposits appears to be significantly better than those that do not in terms of transactions costs for both lenders and borrowers and also in terms of loan delinquency and default.

Despite the potential benefits, the significance of voluntary savings mobilization by rural financial institutions has not been fully recognized and appreciated by policy-makers in many developing countries. As a result many countries have not yet made much progress in establishing savings as an essential dimension of their rural financial development activities. When attempts to promote savings are made they often constitute attempts to graft a saving component onto an existing institution or a scheme rather than attempts to make savings an integral part of the rural finance system.

Savings mobilization efforts, however, should not lead to hasty attempts to graft savings schemes into poorly functioning lending institutions. It is unrealistic to assume that a lending institution that cannot efficiently allocate its existing resources would function more efficiently in mobilizing deposits from a large number of people, synchronizing such resource inflows with credit transactions and managing their funds profitably. As Von Pischke (1991, p. 311) points out:

> "the damage done by failed deposit takers can be large and politically awkward, with disastrous social consequences. It would be specially unfortunate for small savers to find that their savings had disappeared as a result of bad bookkeeping, fraud, or poor lending decisions leading to bad loans and ultimately to the failure of the institution accepting deposits"

While deposit insurance can protect depositors' interests, as shown more recently by the US experience on Savings and Loans Societies, such insurance can lead to moral hazard problems and finally may be costly to the society. Thus Von Pischke (1991, p. 312 ) concludes:

> "The conclusion to be drawn from recent experience with failed deposit-takers is that institutional sustainability requires a high quality of lending and capital adequate to bear the risks of intermediation. Thus deposit-taking is not a panacea for poorly-performing lenders. The first order of business in improving their performance should be reform of their lending operations, not the addition of deposit-taking. Before deposit taking is introduced, capital should be sufficient to protect the interests of depositors".

An important aspect relating to rural savings is that they are influenced by a variety of factors, not just the deposit interest rate. The most critical determinants of rural savings will have to be identified carefully and savings promotion strategies be designed accordingly to address those critical factors and constraints. The standard prescription of positive real deposit rates is important, but may not

be sufficient to generate an adequate response in certain situations where savings are less elastic to interest rate and more elastic with respect to other factors such as level of confidence in deposit-taking institutions, appropriateness of savings instruments and the degree to which access to loans is enhanced through savings.

While the significance of savings for rural financial development cannot be denied, it must be recognized that for a variety of reasons it is difficult for RFIs to use rural savings to finance term loans, if they are to be involved in term lending. This is particularly true when RFIs are to finance perennial crop development where gestation period of investments typically ranges from 3 to 6 years and negative cash flows are experienced for even a longer period by final borrowers and to a lesser extent in regard to financing medium to large-scale agro-processing industries.

The lesson to policy-makers is that if term loans are to be expanded, additional funds may have to be provided to RFIs until such time they develop capacity and generate adequate savings with suitable maturity structures for transformation of relatively shorter term liabilities into longer term assets.

## PRIVATE COMMERCIAL BANKS WILL PLAY A LIMITED ROLE

Historically, government interventions in rural credit supply began as a response to market failure. Since private banks were not willing to play an active role, state-owned or controlled institutions were put in place to fill the gap between demand and supply of credit. More recently with measures towards financial liberalization, efforts have been made in several countries (e.g., Sri Lanka, Pakistan) to involve private commercial banks in rural finance, particularly in lending to an increasing number of small farmers and low income people. However, the response has so far been generally poor despite additional incentives provided in some cases in terms of credit guarantees and concessional funds for on-lending.

The reasons for this poor response is not surprising. Cost of lending to small farmers and low income clients still remain high. The administrative costs of small loans even under best circumstances may not be lower than 5 to 6 per cent of the average annual loan portfolio of a RFI (Yaron 1992, p. 40). The risk levels of rural lending have also not come down substantially. Financial liberalization in many countries has also generated relatively more profitable lending areas for private banks than rural lending and hence they are more keen to exploit those opportunities.[16]

Private banks also require marketable collateral to cover perceived risks of lending to agriculture and new clients in rural areas. Many rural potential investors find it difficult to offer such collateral. Thus they continue to lack access to credit from those banks.

The issue of collateral is important even in a liberalized framework within which commercial banks are free to charge market interest rates on loans. In theory, interest rate should reflect risk levels and hence be different when risk levels are different, assuming all other costs entering the interest rate calculation remain the same across borrowers. The banks, however, do not practice interest rate discrimination among most of its clients, though the risk levels across borrowers may be quite different, and, in general, charge a standardized interest rate for a majority of their loans. Thus collateral is essential in cases where the market interest rates are insufficient to compensate for the risks associated with a loan to a particular borrower (Fernando 1991b). The implication of this is clear: most of the potential rural borrowers who lack bankable collateral may find themselves excluded even when lenders enjoy freedom to charge market-determined lending rates[17].

[16] Those who argue for a greater role in rural finance by private commercial banks and criticize private commercial banks for not being active often seem to ignore that what matters in decisions relating to allocation of limited resources is risk-adjusted *relative* profitability rather than profits per se of alternative activities.

[17] It has been argued that this is the case in Papua New Guinea where private commercial banks are free to set their lending rates (Fernando 1991 b). In a case study of the Thai rural credit system, Siamwala *et al.* (1993), p. 164) also reported that the sphere of operations of commercial banks has been almost exclusively in villages where land titles have been issued to the tillers.

[18] Indonesia's Kupedes (kupedes means general rural credit) scheme demonstrates the significance of collateral in expanding the outreach of RFIs. At the end of 1989, one rural household in every twelve had a kupedes loan outstanding and over 60 percent of the borrowers were able to meet the collateral requirement by pledging homes and/or house lots to gain access to credit from Kupedes (See Fernando 1991 b) ; Fernando 1991 b)

Since collateral continues to be a key factor in improving access to credit for bulk of the rural people and inducing private commercial banks to play a dynamic role in rural finance[18], measures to address issues relating to collateral must be accorded high priority in rural financial market development. The approach in many countries has so far been largely limited to improving debt recovery laws and very little emphasis had been placed on land title improvements and making land a readily marketable collateral.

'Group liability' has been an important and tested innovation which addresses the issue of rural people's lack of ability to offer marketable collateral to gain access to credit from RFIs.[19] GB had effectively used this "social collateral" to deliver and recover credit. However, 'group liability' is not a universally applicable innovation across countries and it has limited application across different economic activities even within a given country. This method cannot be efficiently used in term lending as it is in short term lending (Fernando 1991 b, p. 17). In such cases, there appears to be no substitute for marketable collateral.

## DIRECTED FINANCE PROGRAMS ARE STILL NEEDED

In many developing countries, programs have been designed and implemented to provide credit to specific target groups for specific activities by selected institutions. Such programs are commonly known as directed credit programs. Disappointing results of most of the directed credit programs in the past several decades seem to have contributed to an apparently general view that such programs are an impediment to the development of rural financial markets. Although most directed credit programs in developing countries have had adverse effects on financial market development and failed, it is not logical to conclude that directed finance programs cannot play an important role in the process of rural financial market development.[20] Most such programs failed due to poor design, poor implementation capacity of the responsible institutions and due to the distorted policy and economic environment within which they were created and operated.

The rural sector is highly heterogenous in terms of economic status and social development of people. The access to information, awareness of opportunities available, familiarity with formal sector procedures and instruments and ability to make use of economic opportunities differ considerably among various socioeconomic categories. There are some categories of people, such as women, small farmers, micro-enterprise operators, who are distinctly at a disadvantage in responding to market opportunities. If the development is to be broad-based and people-centered, such groups cannot be left on their own. They need specific assistance. Similarly, the suppliers of financial services due to lack of information and costs and risk considerations may not respond to the financial requirements of such groups. Hence, such groups may find it difficult to be active participants in an exclusively market-based financial development process.

Directed rural financial programs can play an important role in laying the foundation for integration of such categories of people into the formal financial system over time. These programs can, not only be catalysts but also important extension mechanisms and human capital development efforts within such groups. However, learning from the past failures, such finance programs, to be effective, need to be carefully designed, well administered and targeted and must be subject to regular evaluations.

## CONCLUSION

The conventional supply-led approach to rural credit had its limitations and weaknesses and was inadequate to address the fundamental issues concerning rural financial development. The current poor status of rural financial markets in most developing countries which followed this approach for over four decades itself is ample evidence to support that hypothesis. However, many years of experience relating to the supply-led approach in a large number of countries seems to indicate the needed redirection in rural finance. The RFM approach and a variety of other new approaches ranging from widely-known GB, BKK and Kupedes to many other smaller scale rural finance projects further enrich our understanding on how to address the complex issue of improving rural finance in developing countries.

[19]. See advantages and shortcomings of group lending - Braverman and Guasch (1993).

[20]. In most developing countries directed credits have burdened financial institutions with nonperforming loans, hindered the growth of financial savings, promoted financial indiscipline within financial institutions and among borrowers and interfered with the financial system's efficient operation, (see World Bank 1989; 1993).

Many lessons can be drawn from the past experiences with rural credit and finance. These lessons may be fitted into a coherent framework consisting of financial and rural infrastructure; financial and non-financial policies; institutions; market-based prices and market-responsive practices. Development of rural financial systems requires suitable infrastructure and sound financial and non-financial policies. These are necessary but not sufficient. Suitable institutions that adopt market-based prices and that respond to market signals are also essential. It is however becoming increasingly clear that the shift towards a market-based system has to be gradual rather than abrupt. This shift must involve a transitional period during which subsidies and directed finance programs will continue to play an important role. Yet, subsidies need to be used prudently to improve institutional capacity rather than to provide financial services at concessional prices. Similarly, directed finance programs must be carefully designed and well-implemented to address constraints which impede incorporation of specific target groups into the mainstream of formal rural finance. There are however no blue-prints for individual countries. Each country will have to design its own strategy depending on country-specific factors bearing on its rural financial market development.

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*Appendix 1.* **AN INTEGRATED RURAL FINANCIAL SYSTEM: FRAMEWORK**

| System Components | Elements/Characteristics | Effects/Impact |
|---|---|---|
| Sound Macroeconomic and Fiscal Policies | exchange rate; wages; prices; trade; taxation. | improves resource allocation;provide incentives for efficient resource use by all parties in the markets; |
| Financial Infrastructure | prudential regulation;legal framework; accounting policies, practices and financial disclosure requirements information disclosure and dissemination; central bank's capacity to supervise and regulate the financial system. | risks and cost of intermediation are reduced and returns raised; confidential enhanced (see, Appendix 2 for details) |
| Rural Infrastructure and Support Services | farm to market roads; bridges; market places; market information; extension services; health care; primary education facilities; rural electricity. | returns on rural investments are raised; risks to users and suppliers of finance reduced; incentives to suppliers enhanced; debt capacity (ability to borrow and repay) and savings capacity of clients raised. |
| Sound Financial Policies | Market-based interest rates; absence of undue portfolio restrictions. outreach and supply; greater ability to diversify risks. | potential returns to financial institutions raised; greater incentives to expand |
| Institutions and Their Capacity | private involvement in ownership; adequate, trained and motivated staff; sufficient resources and decision making autonomy; appropriate operational systems and simple procedures; reponsive to markets; multiple services and products; efficient accounting systems; reliable and efficient management information systems; market-based prices. | room and incentives for political interventions reduced; business-like behaviour encouraged; returns on services and products are improved; risks lowered; greater incentives for financial innovations to expand markets and returns. |

## *Appendix 2.* FINANCIAL INFRASTRUCTURE AND ITS SIGNIFICANCE

| | | |
|---|---|---|
| 1. Prudential Regulation and Supervision of Financial Institutions (FIs) | Why?: | Confidence is a key factor in finance. Lack of adequate prudential regulation will contribute to inefficiencies within FIs and erosion of confidence among clients. Prudential regulation helps ensure solvency of FIs. Uniformity in practices across FIs can be maintained. Through supervision, Governments can obtain information to assess financial health of FIs and effects of Government policies on FIs.Problems may be identified before they develop into crisis proportions. |
| | Tasks: | Criteria for entry of firms into the industry; Capital adequacy; Exposure limits to prevent undue concentration of risks; Guidelines for classification of assets by quality; Definition of non-performing assess by quality; Definition of liquidity standards. |
| | Institutions: | Central Bank capacity to supervise FIs must be developed. |
| 2. Legal Framework Concerning Financial System | Why?: | Participants in financial markets must have a legal framework within which they can transact business. Absence of suitable legal framework raises costs and risks. Inability to offer bank able collaterls Impede financial Intermediation. Mortgages over land and real estates are the best form of collaterals from FIs' point of view. Security of tenure, clear land titles and the case with which can be transferred facilitate lending and recovery. |
| | Tasks: | Enforcement of contracts is major aspect. FIs should be able to recover debts through foreclo sures on collaterals. Legal recognition of property rights is necessary. In the absence of such rights, it may be impossible for potential borrowers to offer security in the form of mortgages |
| | Institutions: | Laws and legal system need to be improved. Financial system is based largely on confidence. |
| 3. Accounting Policies, Practices and Financial Disclosure | Why?: | Hence regular monitoring is essential. For this purpose, accurate and timely information is required. FIs also need such information to assess and manage their risks which is basic to success of FIs. In many developing countries, accounting and auditing |
| | Tasks: | Uniformity in accounting practices across FIs; Conformity with accounting practices recom mended by the International Accounting Standards Committee; Loan write-off policy; valuation of assess; classification of assets to facilitate meaningful analysis; Presentation of income statements and balance sheets. |
| 4. Information Disclosure and Dissemination | Why?: | Finance is an information intensive industry. A small error can lead to large losses. Information is essential to distinguish good from bad clients. FIs must make available accurate and timely information. Central banks and Credit Information Bureau can make use of and disseminate the information. |
| | Tasks: | Mechanisms to collect, process and disseminate information in a suitable format and regular manner without adversely affecting participants in the markets must be developed. |

# SUSTAINABLE RURAL CREDIT FOR AGRICULTURAL DEVELOPMENT IN PNG

C.Kannapiran[1]

***ABSTRACT***

*The sustainable rural credit refers to maintain the rural financial services in a viable state in perpetuity to ensure that credit is accessible at affordable rate. The sustainability is affected by market failures, agricultural sector failures, structural weakness of farming, inappropriate and high cost delivery system and non-availability of infrastructure and support services. Market approach in smallholders credit can be a long term goal. In the short to medium term smallholders credit shall continue to be a non-market approach. The viability of financial services is adversely affected by the viability of credit delivery as well as receiving systems. The possilbe policy options to address these problems include regualtion and subsidisation of credit operation in the short to medium term, credit delivered as a package along with support services, low cost institutional credit, rural savings mobilization, insurance and credit guarantee scheme to cover risks, land reforms and improved infrastructure and support services.*

***Key words:*** *Sustainable rural finance, market failures, market approach, viability of delivery and recieving system, market intervention and policy options.*

## INTRODUCTION

*"Whenever you are in doubt or when the self becomes too much with you apply the following test: Recall the face of the poorest and the weakest man whom you may have seen and ask yourself if the step you contemplate is going to be of any use to him. Will he gain anything by it ? Will it restore him to a control over his own life and destiny ?*

*.....Then you will find your doubts and self melting away."*

*-Gandhi-*

The purpose of this seminar can be deemed to have been achieved if we could find the right answers to the above questions. The above theme may be more relevant for most of the discussions during this seminar and for restructuring the agricultural services delivery system in PNG. We are discussing the best ways to ensure delivery of agricultural services to the farmers to improve their income and the economic welfare. We recognise that the delivery of rural services should adopt "Farmers First Approach".

Agriculture continues to be the most important economic sector in the country, primarily because it provides income and employment to about 85 % of the population, contributes to about one third of the GDP and to about 30 % of the export income. Being the renewable resource sector, agriculture shall be the source for broad- based growth. During the process of economic development agriculture sector will be the principal source of capital for investments elsewhere in the economy. Sustainable agricultural development is the prerequisite for economic progress.

As one of the key factors for development, rural credit and rural savings have to play an important role to achieve the sectoral goals and objectives of the National Government plans for agricultural development. Rural credit will support the commercialization process and the subsequent privatization under agricultural sector.

Financial services mobilise the savings for productive investments which raises the income of the savers, lending institutions and the borrowers alike. As PNG rural sector moves away from the land and labour intensive subsistence farming to capital intensive commercialised agriculture, they need more finance to make additional capital investments. The biggest difference between subsistence and commercialised agriculture is the efficiency with which the resources, more so the

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financial resource, are used. The contribution of rural finance lies precisely in its ability to increase efficiency.

The discussions in this paper mainly consider the sustainability of rural credit with special reference to sustainability of smallholders credit. The rural finance is considered as a means to the end - that is development on sustainable basis and in terms of availability, accessibility, affordability of rural financial services and viability for the savers, lenders and borrowers.

## SUSTAINABLE RURAL CREDIT

Sustainable rural credit implies that the financial services must be maintained in productive and viable state in perpetuity. The credit and savings are accessible and available for investors at affordable rate. The financial market should reward the savers and lenders in order to mobilise the savings and make available credit at affordable rate to ensure productive investment. Savings is mobilised to make investments and to promote growth in the economy.

The sustainability of rural financial services depends on the viability and sustainability of the credit delivery system and credit receiving system. The necessary policy interventions to sustain the delivery and receiving system should be in place to ensure sustainability of rural finance. The credit delivery system involves the financial intermediaries i.e. the banks, and the receiving system involves the borrowers, mostly the smallholders.

Sustainable rural credit improves the intensive cultivation and commercialisation and thereby increases the productivity and profitability. Non-availability of credit and high interest rate beyond the reach of smallholders and subsistence farmers may lead to extensive or shifting cultivation which may ultimately lead to deforestation. Similarly the credit institutions, who are responsible to deliver the credit, should be viable and profitable. In a way sustainable rural finance shall also contribute to sustainable development.

## THE KEYNESIAN APPROACH

The familiar Keynesian approach for growth focuses on keeping interest rates low to stimulate investment which in turn produces greater output. Tobin extended the basic Harrod-Domar growth model to incorporate money and showed that the higher the return to money in a household's portfolio of assets, the smaller is the proportion of capital available for investment thus decelerating growth. These prescriptions were the theoretical foundation for controlled low interest rate policies.

It is true that low interest rates promote investments. It is, however, unfair to argue that these economists prescribed supply of credit in advance of effective demand and thereby for the supply-led strategy of financial development. There are evidences to indicate that many developing countries adopted this strategy and have not only failed to effectively stimulate growth but also introduced counterproductive distortions in the financial markets. It is the case of mere coincidence and without the supply-led approach also the result would have been negative as there were other serious constraints.

It is universally recognised that the first and foremost precondition for successful agriculture lending is of course, successful agriculture. Any downturn or failures in agriculture shall have adverse impact on the agriculture credit irrespective of whether we followed supply-led or market driven approach unless the credit risk is adequately covered. When the economic policies, which includes delivery of all services at an affordable cost, succeed to make agriculture profitable then only the agriculture lending shall be viable and profitable.

Government has to pursue a number of goals besides economic efficiency. Subsidised credit is viewed as one way of transfer and distribution of economic benefits. In developing countries like PNG where there are no social security measures and the viability of farming system is adversely affected due to the economic policies, the government intervention in the short term is to subsidise the delivery of services including credit. In the long term when the market imperfections and distortions are minimised everything should be left to be decided by the market forces.

Sustainable financial services depends on a dynamic approach to the credit and savings programs. The approaches and strategies may have to change and adopt according to the changes in the economic situation. Different approaches are needed for different time period.

## FINANCIAL LIBERALIZATION

According to the financial liberalization policy advocated by economist such as Shaw-MacKinnon interest rate deregulation may lead to positive real rate of interest which shall be closer to the market rate. Liberalization, by allowing the nominal interest rates to raise to market-clearing levels, would cause real interest rates to rise to positive levels and remove explicit interest rate subsidy. Higher real interest rate may lead to more domestic savings and investment.

The World Bank cites evidence from a number of countries such as Thailand, Turkey and Kenya where the liberalization of interest rates generated more savings and investment(The World Bank 1989). Countries like Japan, Korea, Taiwan and Singapore adopted this policy and achieved remarkable success, whereas the liberalization programs ended in near-collapse in latin American countries of Argentina, Chile and Uruguay.

The financial liberalization is not the panacea and developing countries have to examine the appropriateness of the policy.

The policy may be appropriate when there are no market failures, rural sector is fully commercialised and when there are not many distortions or imperfections. The rural sector is currently adversely affected due to high transport costs and marketing system, exchange rate, poor technology transfer system, poor capital formation and low private sector investment etc. All these factors ultimately lead to low productivity and profitability. By year 2000 the financial sector, including the rural financial sector, can be possibly liberalised and until then the development process may need some sort of government intervention and financial regulations to ensure sustainability.

## SMALLHOLDERS CREDIT

According to Keynes, technology and accumulation of capital were the engines of growth. Development of smallholders farming system heavily depends on transfer of technology and capital and access to other infrastructure and support services. While the transfer of technology and provision of necessary infrastructure facilities are the responsibility of the development departments, transfer of capital to smallholders sector can be effected either from tax payers money through the budgetary allocation or from the public savings deposited with the banking system through the bank credit. All these services should be made available to the smallholders on a sustainable basis.

Development planners have to make appropriate policy interventions, after careful analysis of the socio-economic and financial returns or benefits and the cost recovery factors, to ensure adequate flow of capital to smallholders sector either through the budget or bank credit according to the government priorities.

In the process of development the financial intermediaries, the Development Bank and other banks, make decisions to invest or lend the accumulated capital to producers who have higher returns with low risk in preference over the enterprises with low and risky returns. In a fair and free economy the scarce capital resources normally get allocated to most efficient and productive enterprises.

Generally the largeholders sector which is highly organised and commercialised, is capable of availing the maximum credit facilities from the Banks whereas the smallholders sector is trailing much behind and is not normally able to get adequate access to credit.

"Too much credit for largeholders and very little for smallholders" is the general observation and it can at best be classified as the symptom and not the problem. Inadequate access to credit, if identified as the very problem, then the solution is to ensure adequate supply of credit and this may lead to supply distortion without studying the bankability and viability of banking operation. Very little credit for smallholders is not the problem by itself but rather the symptom of something ailing our smallholders farming system and our rural financial market.

It is, therefore essential to identify and define the problem. Basically the problems could be defined as under :

- Poor viability and credit absorption and debt servicing capacity of smallholders farming system and
- Doubtful financial viability of smallholders credit operation and limited delivery capacity of credit delivery system.

These are the main problems and the exhibited symptom is less credit to smallholders sector in any developing country and more so in PNG. As a matter of fact it is an investment gap rather than credit gap in the sense any credit facilities may complicate the problem further resulting in accumulation of bad and doubtful debts under the smallholders credit portfolio.

It is,therefore, essential to examine whether it is advisable to address the above problem by ensuring forced credit delivery or to ensure availability of a package of services to make the smallholder farming commercially viable and to convert the investment gap under the smallholders sector as a bankable credit gap.

Smallholders credit will be a myth and never be a reality unless we approach the problem in an integrated and systematic manner. We have to clearly study and define the problem, rather than going by the symptom. Credit should be an integral part of the packages to be delivered and not to be delivered in isolation, so as to make the credit more productive and useful. Credit delivery will be a solution in cases where credit is the only limiting factor and not in cases where credit is one among the limiting factors.

The most relevant factors to be analysed are :

- Financially sustainable smallholders farming system
- Delivery of a package of inputs to ensure better productivity
- Risk sharing through appropriate policy interventions
- Creditabsorption and servicing capacity of the smallholders

Once these factors are favourably available at optimal level then smallholders credit will never be a myth but a reality. A detailed review of the credit delivery and receiving systems and the rural savings is to be made to make systematic approach to the problem of sustainability of smallholder credit.

## SUSTAINABLE CREDIT RECEIVING SYSTEM

The sustainability of credit receiving system is to a greater extent decided by viability and credit absorption and servicing capacity of the credit receiving system i.e. smallholder farming system.

The smallholder farming systems (Fig. 1) are characterised by:

**Un-economic holding**: The smallholders farm size and investment activities are below the economic holding size. The income to be generated may be just sufficient to meet the family consumption claims and in general there may not be any surplus to save, invest or to service any credit facilities with interest.

**Low productivity**: The productivity of factors of production are low due to lack of support services and infrastructure facilities.

**Lack of economy of scale**: Small scale production is not able to enjoy the benefit of economy of scale and therefore the productivity and profitability continues to suffer.

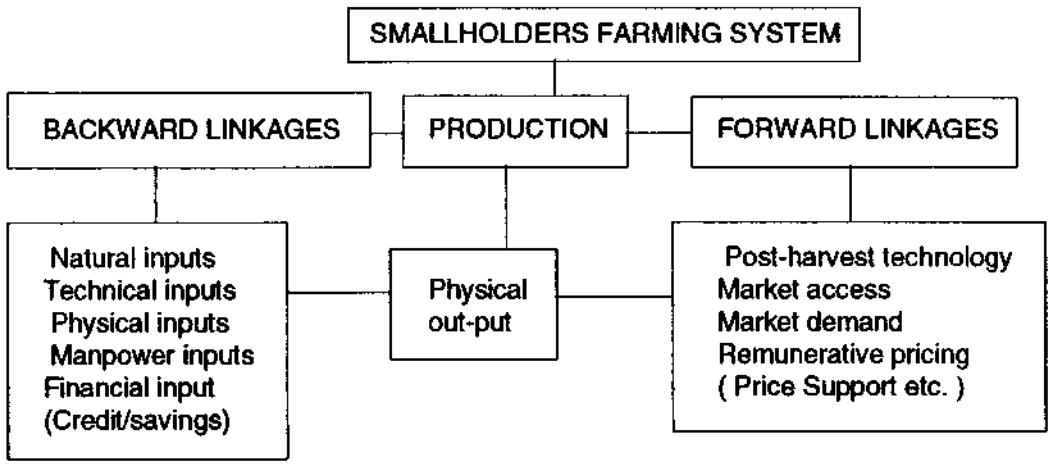
**Lack of optimum utilisation of factors of production**: Smallholders farming normally may not be able to utilise all the factors of production as efficiently as possible and normally it is less capital and technological intensive.

These factors influence the viability and debt-servicing capacity of the smallholders and therefore they are not able to have easy access to credit. Many a time there is an argument that credit is not the limiting factor whereas the development planners argue that credit is also a limiting factor. Both of them are right in their own perception but then the right argument would be " credit is not the only limiting factor but it is one of the limiting factors" under the smallholders farming.

Development will take place on a small scale evolutionary basis as sporadic events without development planning and credit because of the efforts of the " innovators " as happened in tree crop smallholders sector in PNG. Wide spread and faster development on a revolutionary basis is the ultimate goal of the development planning and for that level of capital and technological intensive development credit along with other infrastructure has to play a key role. Thorough examination of the smallholders farm production system may indicate the weakest links in the system.

An integrated and systematic approach to solve the problems that are ailing our smallholders farming in PNG should possibly be identified. The natural inputs, agro-climatic condition and lands and soils, are more favorable than all other link-

*Figure 1.* **A SMALLHOLDERS FARM PRODUCTION MODEL.**




ages. The technical input which is normally expected to be delivered through the extension agencies is not up to the expectation. The physical inputs like agro- chemicals, farm machineries etc. and the skilled manpower are not adequate enough to undertake modern farming.

The above four factors in conjunction with the other forward linkages contribute heavily to poor accessibility to financial inputs like credit etc. and the poor credit absorption capacity.

The physical output i.e. production, productivity etc., is very low due to low productivity of smallholders farming. The post harvest technology is not adequate enough to ensure timely processing, storage and conversion into marketable goods. The access to the market is very poor due to poor transport facilities and partly due to lack of post harvest technology.

The domestic market demand for many of the commodities produced by the smallholders is negligible and the overseas market is also highly unpredictable. There is demand for commodities like food grains, fruits, meat etc. but the smallholders are not producing enough of these commodities to meet the demand. The commodity price fluctuations and the unfavourable cost of inputs adversely affect the viability of the smallholder farming.

The producers' share in the consumer price is very low and the market access and the marketing intermediaries take away the major portion of the consumers' price i.e. the difference between the farm gate price and the retail market price. This pattern of price spread indicates that the benefit generated by agricultural production is taken away by marketing costs which includes transport, wages, processing and packaging, duties and taxes etc. Ultimately, the farmers' share in the consumers' price can increase only when all other forward linkages indicated above are favourably available.

It is therefore essential to ensure delivery of all services for proper integration of all backward and forward linkages with the production process and an integrated approach to the problem is more appropriate rather than delivery of one input while the other services continue to be critical constraining or limiting factors.

Unless and otherwise all these services are favourably available at optimum level the smallholders farming system may not be productive and viable. With the result the credit receiving system, i.e. the smallholders farming system, may not be able to absorb the credit and service the debt. Delivery of credit is not the panacea for this ailment as there is only an investment gap and not a credit gap.

By ensuring an integrated approach to deliver all the services, the investment gap can be transformed into credit gap/demand. Delivery of credit alone, without other services, may ultimately increase the liability of the smallholders and make them bad debtors.

Further the smallholders need to be organised into farmers associations or cooperatives or farming companies, to avail the benefit of economy of scale. This will also make the transfer of technol-

ogy much easier by reducing the number of contact farmers and by minimizing the possible distortion in communication.

The extension agencies are expected to contact these institutions rather than thousands of smallholders. Adoption rate will also increase considerably and this will result in increased production, productivity and viability of smallholders sector and bankability of smallholders credit.

While planning for future projects it should be ensured that the minimum smallholders block should be at least 10 hectares so as to ensure economic holding and keeping in view the possible farm family size increase. Fragmentation and further sub-division of holdings should not be encouraged.

It can therefore be concluded that the smallholders need a package of services to be delivered which includes technical, physical and financial services. Delivery of these services coupled with a favourable natural input and other forward linkages will make the smallholder farming productive and viable. A financially viable smallholder farming system may be in a position to generate adequate surplus to meet the reasonable investment demand and debt-service obligations. Any incremental demand for investment can be supplemented through bank credit. This will enable the creation of a sustainable smallholders farming and rural financial services.

## 7. SUSTAINABLE CREDIT DELIVERY SYSTEM

The formal credit delivery system consists of the Commercial and Development Banks. The business of banking, either Commercial or Development Banking, mainly depends on the viability of the operations, to recover the cost, to recover the funds invested and then to generate surplus for recycling and further lending. In other words the banking operations should ensure " return of capital" and" return on capital" employed. But then the question is whether to ensure " financial return or economic return".

Generally the Commercial banking and to some extent the Development banking has to ensure financial return to their operation. However the development banker may have, at times, to lend based on economic returns provided the economic return generated is transferred to the development bank in the form of adequate subsidy and grants by the Government. The Development Banker has to play a more catalytic role and socio-economic development of the nation should be their goals and their operation should be at least cost effective.

Basically the viability of credit operation depends on "return of capital" and " return on capital". The return of capital refers to the recovery of the credit without any bad and doubtful debts where as return on capital refers to recovery of variable cost as well as fixed cost and a reasonable return or profit. The cost of fund is the variable cost where as all other administrative costs, including the transaction cost, are called fixed cost. Profit is a payment for entrepreneurship and business risk taking and therefore a reasonable return as profit is also expected.

The variable cost i.e. the cost of fund , remains the same for the largeholder or the smallholders credit operation; but the fixed cost or the overhead cost fluctuate widely due to the size of the loan amount and normally it will be low per unit amount lend in the case of largeholders whereas it will be comparatively higher per unit amount lent in the case of smallholders.

The institutional credit operation further increases the operating cost due to the high cost administrative structure of the institution. It may not be possible for smallholders to meet these expenditures. Now it is to be examined whether the increased fixed cost is to be transferred to the smallholders or to the bankers or to be subsidised by the government. Necessary policy interventions are essential to cover this additional cost associated with the credit.

Apparently the risk in the form of bad and doubtful debts is also relatively high with the smallholders credit operations because of the comparatively poor capacity to meet the various risks associated with the smallholders farming. The risk is to be shared and cannot be passed on entirely to the bankers or to the smallholders. Policy interventions by the government is needed here also to cover various risks associated with smallholder farming by way of various insurance and guarantee schemes.

One more pertinent point is the capacity of the banking system to meet the entire credit demand of the smallholders farming sector. Smallholders credit is normally highly supervised and the man power required per account is comparatively higher and the demand for the manpower is also seasonal

mainly because of the topographical and agro-climatic conditions of PNG. This again limits the capacity of the banks to lend liberally to smallholders and the bankers have to make use of all resources including manpower resources most optimally.

The lendable funds available with the banking system are also considerably limited and therefore it may not be possible to meet the entire credit needs of the smallholders sector without further mobilization of funds.

The viability of smallholders farming as discussed earlier is further compounding the problem of risk associated with smallholders credit because of the poor productivity and viability of smallholders farm due to various reasons discussed. Even if there is a potential demand for credit the capacity of the banking system to meet the entire demand is very limited because of limited capital, manpower and other resources.

Precisely it can be concluded that the smallholders credit operation is not that much profitable or at least cost effective when compared to largeholders credit operations. Furthermore the risk associated with the smallholders credit operation is comparatively high which may result in high rate of loan delinquency. The present institutional system may not be cost effective and cannot operate without subsidy. Liberalization may not rectify the structural weakness of the delivery system and may not ensure sustainability.

The possible options to ensure viable delivery system includes identification of a low cost institutional arrangement, credit tied with input-output marketing agencies, subsidisation of credit operations, coverage of loan default risk and farmers education. Ensuring proper end-use of credit and timely follow-up shall minimise the credit default risk.

There will be arguments against subsidisation of credit operations as it may be against the structural adjustment policies. Jackelen and Rhyne(1990) in their paper, "Toward a more market-oriented approach in credit and savings", justified the commercial approach after detailed evaluation of the credit programs of Bangladesh, Indonesia and Bolivia. However a careful evaluation of almost all the smallholders credit programs across the world may indicate some form of hidden subsidy. Market-oriented approach may be appropriate as long as the market is free, fair and with minimum imperfections.

## 8. RURAL SAVINGS MOBILIZATION

Policies and institutions that increase the accumulation of capital, such as providing savings deposit facilities in rural areas would increase technology adoption through capital formation. Savings is a means; the end is future consumption. If savings are not invested to ensure production and supply of goods and services in the future, the reserved purchasing power may lead to inflation. Alternatively, productive investments may lead to economies of scale and more competition in the market and ultimately result in reasonable prices and savings.

The advanced countries have all passed the stage to take-off into self sustaining growth. The developing countries that are still in either a traditional society or the pre-conditions stage, have only to follow certain sets of rules of development to take off in their turn into self-sustaining economic growth. One of the principal requirements necessary for any take-off is mobilization of domestic and foreign savings in order to generate sufficient investment to accelerate economic growth.

The Harrod-Domar growth model views limited savings as the major constraint on aggregate economic growth. High savings rates in Japan, particularly in the postwar period, resulted in rapid capital accumulation. Thus, high saving rates are usually considered to be a major factor contributing to Japanese economic growth (Mundlak 1979).

Faster growth, more investment and greater financial assets accumulation all partly comes from savings. Liquidity, easy access and high return on financial instruments promote savings. Higher real interest rates are likely to lead to increase in financial assets. Empirical findings indicate conflicting evidences regarding the effect of real interest rate on real saving, but financial savings seem to respond strongly to higher interest rate (Lee 1991).

Table. 1. Investment, Savings and Financial Requirement in PNG,1965 to 1987 (Percentage of GNP)

| | 1965-73 | 1973-80 | 1980-87 |
|---|---|---|---|
| Gross domestic investment | 27.8 | 22.0 | 27.6 |
| Gross national savings | .. | 11.1 | 3.5 |
| Balance of payments; total to be financed | .. | -10.9 | -24.1 |

*Source:* The World Bank, World Development Report 1989.

As may be seen from table 1, PNG has a large gap (24.1 per cent of GNP) between domestic investment and national savings. Most developing countries have an average of about 7 per cent as the difference between domestic investments and savings.

Development finance is normally for long-term or medium- term investment and therefore the rate of interest cannot exceed 12 to 15 per cent based on the opportunity cost of capital in the rural sector. The average lending rate of RDBPNG is about 10 percent and of Commercial Banks about 15 per cent (BPNG 1991). Assuming that 12 to 15 per cent is the average lending rate for development finance, the cost of funds should be less than 8 to 10 per cent to ensure the viability of credit operations, provided the spread is sufficient to cover fixed costs and a reasonable profit (Kannapiran 1991).

In PNG, the cost of deposit funds accounts for 10 per cent (BPNG 1991). The ABPNG average lending rate of interest is about 10 per cent. There will therefore be no interest spread and profit margin. Moreover, deposit mobilization for the purpose of agricultural lending may not be able to address to the problem of resource and profitability constraints. Mobilization of rural savings may be attempted but it can be one of the options for long-term results. A cost-effective system needs to be designated to mobilize savings.

## 9. INTEREST RATE

Subject to monetary policy regulations, interest rate is normally decided by the following factors:

- Cost of lendable funds available to the bank
- Transaction and credit operation costs
- Risk premium for loan default
- Inflation and real value of money

The average cost of fund for Rural Development Bank of PNG (RDBPNG) and Commercial Banks is about 3 % and 10 % respectively. The cost of fund for RDBPNG is low due to the subsidised funds made available by the Government. The loan administration cost for RDBPNG is around 17.6 % (Kannapiran 1991).

There is no estimate of risk premium associated with rural credit in PNG. Considering the level of bad-debts written-off by the banks, it can be safely assumed that the risk premium should be of about 7 %. After taking into account all these costs the market rate of interest in the free market should be in the range of 27-34 %.

The average return on investment under smallholders' sector in PNG is in the range of 10-12 %. Any credit program with interest rate higher than 12 % may not be suitable for smallholders. Any financial liberalization may lead to a interest rate of about 25 % for rural sector and this may be a clear case of denying the credit or inaccessible credit. The smallholders may not be willing to borrow at that rate of interest and even if they borrow they may not be able to repay the loan.

Rural sector in PNG is facing the serious problem of uncovered risks and low profitability. The lack of credit worthiness reflects the poor income and meager savings of the smallholders. Growth of real income and improved repayment of loan should reduce the probability of default and the risk premium which will in turn reduce the interest rate on credit.

Low interest rate led to excess demand for loans and non-price rationing which reduced the viability of the lending bank. On the other hand deregulation of interest rates and removal of specialised source of concessional credit could result in the rural sector paying higher average interest rates

on funds. A competitive market system with a minimum regulation was the most efficient way to organise economic activity. However the Government has to pursue a number of goals besides economic efficiency and to intervene in those sectors where there are market failures.

Agricultural technical change does influence the supply of loans and the interest rate. This may lead to improved productivity and profitability, increased real income of the smallholders and thereby increase the repayment capacity and credit worthiness. Interest rate can be lowered indirectly through the provision of technical change and investment opportunities which will reduce the risk and improve the credit worthiness.

## 10. BANGLADESH GRAMEEN BANK

The Bangladesh Grameen Bank is perhaps the most admired effort in institutional credit for smallholders and rural poor. An evaluation of the most successful Bangladesh Grameen Bank operations may indicate that major source of their income (50 %) is from investment of a substantial part of available funds in fixed and short- term deposits with other banks (Hossain 1988). These funds are mostly received from International Fund for Agricultural Development(IFAD) at an interest rate of 3 % and deposited at 14 % interest with commercial banks. This ultimately indicates that they preferred to keep the lendable funds borrowed from IFAD in deposits which is more profitable than lending to their clients.

This highly profitable line of business clearly indicates that there is a hidden subsidy as these incomes relate to non-operating income. Once the IFAD funds are repaid the bank may loose almost 50 % of its income and incur losses to the extent of Taka (Tk) 43 million. Further if the IFAD fund is not available the cost of fund would have gone to 8.5 % from the present level of 3 %. This ultimately might have resulted in increased cost of loan operation to 26 % as against the average lending rate of 16 %. The bank therefore is lending at subsidised interest rates. In the year 1986 the cost of loan operation was Tk 72 million whereas the income from loans and advances was Tk 44 million, implying a subsidy rate of around 40 %.

The sustainability in terms of economic efficiency of the financial services provided by the Grameen Bank is doubtful. The program, however, is the most sustainable in terms of social benefits. There is a strong case to support the Grameen Bank institutional credit arrangement on socio-economic ground as this program supports the livelihood of the poverty families especially women and landless.

The approach to credit to rural poor by the Grameen Bank is highly commendable. Some elements of the Grameen Bank approach to delivery of credit, such as formation of small homogeneous groups for group guarantee of loans and supervision and recovery of loans, recovery of loans in smaller regular installments and development of institutions of collective savings for mutual benefits of members, may also work in other environment and therefore can be replicated.

## 11. EFFICIENT FINANCIAL SYSTEM

Experiences have indicated that evolutionary process of development is more sustainable than the revolutionary process. The East European revolutionary approach is the best lesson for development economists. When there are imperfections and market failures in the economy which adversely affect various sectors, it may not be realistic to remove distortions under one sector alone in isolation.

There should be a systems approach in the economy than meddling with some sub-systems. As long as the overall system is not having economic efficiency, it may not be possible to ensure economic efficiency under one sub-system, that is financial system.

The rural financial market approach in rural finance focus on the financial viability of financial institution (Fernando 1991) without much discussion on viability and affordability of smallholders farming system. The supply-led approach as well as the rural financial market approach is built upon the assumption of viability of creditors or debtors respectively. The first approach emphasis is on the end whereas the second approach emphasis is on the means. Both the approaches have their own strengths and weaknesses.

The rural financial market approach is built upon the ideal assumptions of perfect market and that smallholders can borrow at market rate; the smallholders farming is having highest rate of return like largeholders; the transaction cost of

credit can be kept at the minimum; low cost operational credit delivery system is possible and so on. Experiences have indicated that nowhere in the world the above assumptions are realities under smallholders credit operations.

The financial institutions including the Bangladesh Grameen Bank experiment are working under heavy subsidy. If we really want to ensure that financial market approach should be strictly implemented, without rectifying the market failures and the structural weakness of the smallholders farming system, all the smallholders credit programs shall be a myth and never be a reality and not at all workable. We should adopt a pragmatic approach with due weightage for socio-economic desirability.

Further the financial viability and return on credit is one aspect to be ensured whereas the Government is keen on the economic viability and economic rate of return for the credit investment. A proper economic analysis may indicate that the smallholders credit shall have a higher economic rate of return but may have lower financial rate of return. Even when there is low financial viability to the lending institutions, as being experienced elsewhere, the government may wish to subsidise and continue the credit operations on socio-economic justifications.

It is ideal to establish an efficient rural financial system in the long-term if this is possible. The elements of efficient rural financial system include:

1. Achievement and maintenance of stable macro-economic conditions without any sectoral imbalances and market failures.

2. Policies and strategies to make agriculture profitable and competitive which will improve the credit absorption capacity.

3. Market-determined interest rates and lending. This will ensure sustainability of the system in the long-run.

4. Savings mobilization to improve capital formation and more private sector investment under primary sector.

5. Improving the capacity to audit and monitor the banks.

6. Restructuring and strengthening of credit delivery system.

7. Alternative source of credit delivery agencies including NGOs, Church Groups, cooperatives etc.

The first three aspects are core elements for establishing an efficient credit system and other aspects shall have supplementary role to be played. Sustainable financial system can be achieved only when all the three core elements discussed above are favourable. Without ensuring the favourable core elements, the efficient financial system and financial liberalization shall remain as a distant dream.

## 12. AGRICULTURAL SERVICE COOPERATIVES

Slow rates of technology adoption may be attributed to a high level of risk, poor infrastructure for distribution of modern inputs and insufficient capital. Isolated low-cost credit programs, without proper linkages with other services in developing countries have generally failed to achieve agricultural technology adoption goals. The failure is due to the non-availability of other rural services and the inability of the poor farmers to bear the combined business and financial risks posed by adopting new technologies.

There are suggestions to establish alternative financial institutions to deliver rural credit, especially to smallholders. Considering the cost and benefit of the rural credit operations in PNG no further formal institutional arrangements may be worth trying and therefore either in the short term or in the long term there is no need for another financial institution to deliver rural credit. However people should be organised into self-help groups which may eventually be transformed into cooperatives or other informal institutions.

Currently, in PNG, there is no village level institutional arrangement or farmers association to ensure delivery of services to the villages. The Government policy is to improve the delivery of services to rural sector. There are plans to make the District as the focal point for delivery of services. There is an urgent need to develop village level people oriented institutional arrangement to ensure effective participation of villagers under our development programs.

Earlier experiences indicate the failure of coopera-

tive institutions in PNG. In the recent past there are discussions about the possibility of reintroduction of village cooperatives or some form of farmers organization outside the public service in order to ensure joint efforts by farmers and development departments, including development banks. This approach may ensure greater people's participation and the cost effective way of improving the efficiency in the delivery of agricultural services.

The delivery of services including extension, credit, input supply, marketing etc. may be through the proposed Agricultural Service Cooperative. The cooperatives should be managed by the people and government role shall be restricted to facilitating the operations of the cooperatives by providing technical assistance.

Until the rural financial system is well established it is advisable to ensure delivery of credit on project basis. All development projects should have an in-built credit component which will be transferred as refinance to lending institutions or to the proposed Cooperatives to on-lend to smallholders.

The proposed Agricultural Services Cooperatives should be provided with refinancing facility to on-lend to the smallholders. Refinancing on project basis according to the Agricultural Sector Public Investment Projects (PIP) may be most appropriate in the short term to ensure credit delivery in line with sectoral development.

An ideal village level agricultural services institution appropriate for rural PNG may have the following attributes:

1. The institution must accept its role in assisting the smallholders and readily accessible at village level.

2. It must view delivery of services like extension, inputs, marketing, credit etc. as part of package, to be delivered to smallholders to improve farm productivity and profitability.

3. The institutions should provide credit in kind for purchased inputs to ensure end-use and to reduce procurement costs.

4. The institution must ensure timely delivery of credit and seasonality in lending and recovery of credit.

5. The credit should be tied with marketing to ensure better price and to ensure prompt recovery out of the sale proceeds.

6. Loan amount, down payments, interest rate, repayment program etc. should be flexible to the needs of the smallholders.

7. Credit worthiness and viability of the investment activity should be the basis for lending without much insistence on collateral security.

8. Clans or peer group responsibility may be ensured to recover the bank loan.

9. The cooperative should be managed by elected members of the cooperatives and government shall provide the necessary technical assistance and regulatory support.

Considering all these aspects the proposed restructuring of delivery of services may consider establishing an alternative low cost institution called "Agricultural Services Cooperative" at village level for development of rural sector in PNG.

## 13. POLICY PERSPECTIVES

13.1 **Market approach (Rural Financial Market)** in smallholders credit is a good ideology but the reality is that it could not be implemented in the developing world. Throughout the developing world, including the most successful Bangladesh Grameen Bank approach, the smallholders credit is heavily subsidised and continues to be a non-market approach.

13.2 **The long-term objective**, for year 2000, should be to establish an efficient rural financial system. The prerequisite for efficient rural financial system includes a stable macro-economy, a profitable and competitive agriculture sector and minimum distortion in the market. Then the market-forces shall determine the allocation of credit and interest rates.

13.3 **The government intervention** is necessary where there are market failures and imperfections. The intervention is in the form of regulation of interest rate and subsidisation of credit operation based on economic and social justifications.

13.4 **Smallholders credit** should be delivered as a package along with extension, input supply, processing and marketing. This will ensure productivity and profitability of credit investment which will ultimately improve the credit delivery and loan recovery. The proposed restructuring of services delivery system may facilitate the implementation of this approach.

13.5 **Credit and Technology adoption**: Technical change in rural sector can be enhanced if a package of services along with credit is delivered to farmers to maximise productivity and profitability and to minimise the risks.

13.6 The **possible options** to ensure viable delivery system includes identification of a low cost institutional arrangement, credit tied with input-output marketing agencies, subsidisation of credit operations in the short-term, coverage of loan default risk and farmers education. Ensuring proper end-use of credit and timely follow-up shall minimise the credit default risk.

13.7 All agricultural projects should include **credit as one of the components** which should be transferred to banks or other lending institutions as refinance for lending to smallholders. This refinancing project shall be managed by the proposed Marketing and Credit Division of DAL and implemented through the proposed Village Cooperatives.

13.8 The present system of high cost institutional arrangements to deliver credit to smallholders directly through the bank may not be sustainable and appropriate. A low cost alternative village level farmers association or Agricultural Service Cooperatives may be organised. The **proposed Agricultural Service Cooperatives** shall be managed by the smallholders themselves with technical assistance from the Government.

13.9 **All agricultural services** including extension, input supply, marketing, credit etc. may be delivered through the proposed village level cooperative. Banks and Government can provide refinance to these cooperatives for on lending to their members. They will be responsible for delivery and recovery of credit.

13.10 **Rural Savings Mobilisation**: Savings mobilization needs to be encouraged in the long term and this can be achieved by designing an alternate cost effective and easy accessible system so as to mobilize rural savings in PNG. Promoting savings habits, by offering attractive savings scheme, may improve the financial assets of the rural farmers which may ultimately improve the private sector investments under primary sector.

13.11 **Interest Rate Policy**: The interest rate for smallholders credit may be less than 12 % and for other agricultural credit interest may be charged at market rate. In the short term interest subsidy may have to continue as long as the market imperfections could not be minimized. Probably by year 2000 the rural financial system can be liberalised

13.12 **Farming System Structural Adjustment:** In the long term there needs to be structural adjustments in the farming systems of the smallholder sector in PNG. The optimum size of the economically viable smallholding or appropriate productivity level which can sustain the farm family minimum needs is to be decided. Wherever possible the smallholdings should be consolidated to ensure economies of scale and better technical change. Further sub- division and fragmentation of holdings should not be encouraged.

13.13 **Risk sharing**: At present there is no crop and livestock insurance scheme in PNG. Any unforeseen loss is to be met by the farmers. This also increases the lending risks and the banks cannot take this risk. A comprehensive risk sharing policy needs to be introduced.

The **credit guarantee schemes**, as experienced in other developed countries, normally leads to poor credit discipline and management as the bankers are sure of recovery by invoking the guarantee rather than by follow-up of the loans for recovery. Without proper monitoring, the guarantee scheme shall also result in payment for inefficiency.

13.14 **Collateral security & Land reforms**: The land tenure system in PNG, where there is no transferable legal title for lands, makes the lending further difficult as banks often feel insecure as there is no asset to fall upon in case of default of bank loan. It is therefore essential to introduce proper legal reforms to enable the

land owners to mortgage their properties as collateral security for bank loans.

13.15 **Infrastructure and support services**: In the short term project approach is the best option for development of infrastructure and support services. However institutional arrangements to provide support services, including financial services like credit and savings, should carefully be evaluated to ensure delivery at minimum cost without much institutional administrative overhead costs. Government budgetary support, in the form of subsidy or grants, should be based on productivity and there should not be any payment for systems inefficiency of support services institutions.

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Marketing Systems for Agriculture:

# DIAGNOSING PROBLEMS AND PRICE AND MARKET ANALYSIS FOR PAPUA NEW GUINEA

Jim Longmire[1]


## ABSTRACT

*Approaches to analysing marketing systems for PNG agriculture are presented in this paper. Smallholder farmer and village markets can be analysed with marketing methods similar to those employed for large-scale commercialised farming. An approach called marketing systems research is reviewed. Some marketing studies of this nature have been undertaken already in PNG. Marketing systems research has its parallel with farming systems research. Methods of demand and price analysis are then reviewed. In most cases, the small-country assumption is likely to be appropriate for PNG's export crops, although this should be tested for the main ones under different world market conditions. For domestic crops, prices are likely to be very responsive to shifts in local demand and supply. PNG's markets for domestic crops will become better linked and more stable as infrastructure and agricultural development occurs and as more products enter markets. Some aspects of government involvement in markets are reviewed.*


***Key words:*** *Marketing systems, smallholder agriculture, village markets, diagnosing problems, government intervention, price analysis.*

## INTRODUCTION

Marketing plays a central role in any agricultural sector. Traditional smallholder farmers are as attuned to markets, as are modern capital-intensive farmers. Numerous cultures have paid special devotion to the merchant class and others involved in marketing, since they play an important role in bringing together individuals and communities who benefit from exchanging goods and services. The concept of "organised complexity" can be borrowed from more fundamental science to typify village and local markets (Davies 1993). The challenge for the researcher is to find order out of a rather complex process.

Marketing systems for agriculture are often perceived to be the source of problems for farmers. The perceived power in the market of a relatively small number of traders and marketing agents, as compared to the relatively weak bargaining power of the individual farmer, is at the heart of this concern. Most markets are typified by a small number of entrepreneurial traders capturing most of the trade, and there is the opportunity at times for these to capture some abnormal profits. The extent to which such profits exist, however, is rarely documented and the concerns about it have often led to policies and change in marketing systems which have been to the detriment of farmers and the wider community.

Prices play a central role in markets. They give the producers and storers incentives to produce and deliver goods. They give consumers, exporters and traders the signals on opportune times to buy. Prices are important in driving longer term decisions on investment, infrastructure and development as well. Prices play these roles in traditional smallholder communities as much as they do in more commercialised agricultural systems. No smallholder farmer is so isolated from markets that they are unaware of prices of key crops, livestock products and inputs. In my experience, smallholders have a very keen knowledge of prices, even if illiterate.

The central role of prices and markets in developing country agriculture is the underlying theme of

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this paper. Arguments for the application of practical price and marketing analysis are developed, with special orientation towards PNG's agricultural and livestock sectors. Methods are developed which have a parallel in farming systems research (Zandstra *et al.* 1981, Remenyi 1985, Sukmana, Amir and Mulyadi 1989). It also contains a review of market and price analysis that can be applied to the special conditions of PNG. Some key policy issues concerning markets and policies are discussed.

## OVERVIEW OF PNG AGRICULTURE

PNG is a nation of just over 4 million, and had an average per capita income of US $830 in 1991 (World Bank 1993). This level of income places PNG in the lower-middle income bracket of developing countries around the world. The nation is heavily dependent upon primary commodities, with agriculture providing more than a quarter of national income directly, plus a sizeable amount additionally through the food and fibre marketing and processing sectors. Some 97% of export income is from primary commodities, with minerals forming two thirds of this, and agriculture most of the rest.

The population is heavily rural, with only 16% living in urban areas. Over 700 local languages prevail in PNG, with important implications for marketing. A large proportion of the population has not received formal school education, although in recent years enrolment rates for primary schooling have been around 70% (of eligible age group) and 12% for secondary. Differences in culture and native language and limited education of the people create a major constraint to developing marketing systems.

The geography and infrastructure of PNG also poses major challenges for the development of marketing systems. Many parts of PNG contain dense tropical lowlands broken by higher mountainous areas (to more than 4000 m in the Central Highlands). The transport and communications infrastructure system is costly to develop and freight rates are correspondingly high. The mountain barriers often mean that local economies can be very isolated, with few main transport and marketing links to large urban centres, ports and international markets. Islands of PNG have the opportunity for market links by sea, although reefs and limited port facilities on many islands restrict this to smaller and more flexible boat transport.

PNG's agricultural production has three main elements: a food crop sector, an export crop sector and a livestock sector (primarily import-competing). The main food crops grown include: sweet potatoes, yams, cassava and taro, as well as various tropical fruits (Figures 1 and 2). The export crop sector includes: cocoa, coconuts, coffee, palm oil, rubber and tea. Traditional livestock production with pigs and poultry is now being supplemented with larger commercial livestock production, although considerable scope for development of the livestock industry exists.

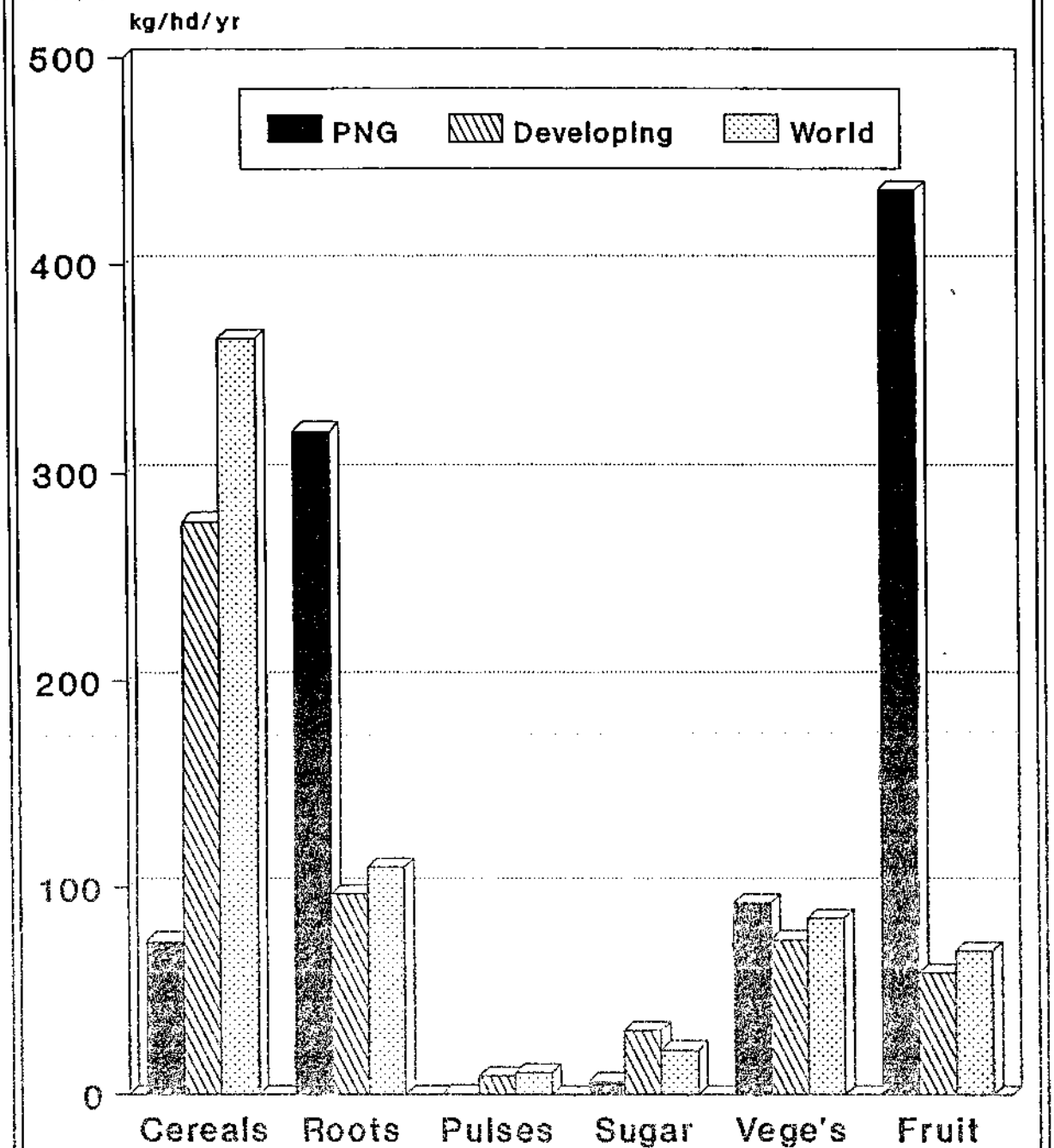
There are two very important considerations relating to agriculture of PNG. Firstly, the rural sector remains the dominant form of employment in the nation. The sector employs about 80-85% of the total workforce, and yet only receives 25% of the national income. Thus there is a large group of comparatively lowly-paid people in agriculture. Improved agricultural marketing offers the potential to lift the incomes of these people and thus to assist in redistributing income towards the agricultural sector.

Secondly, PNG's agriculture suffers from the syndrome termed "The Dutch Disease". This is the situation where a boom in one traded goods sector places considerable competitive pressure on another sector. It was first coined to depict the situation in Holland when large reserves of natural gas and oil were found in the North Sea and Holland's agricultural and secondary goods sectors came under considerable pressure with the appreciation of the currency. In PNG's case, the growth of the minerals sector has placed considerable competitive pressure on the export crop and import-competing sectors of agriculture. By boosting the real value of the Kina, the growth of the minerals sector in PNG has lowered export crop prices and prices of imported foods, thus placing considerable competitive pressure on these sectors of agriculture (Gregory 1976).

Any good analysis of marketing systems for PNG farmers will take account of the following:

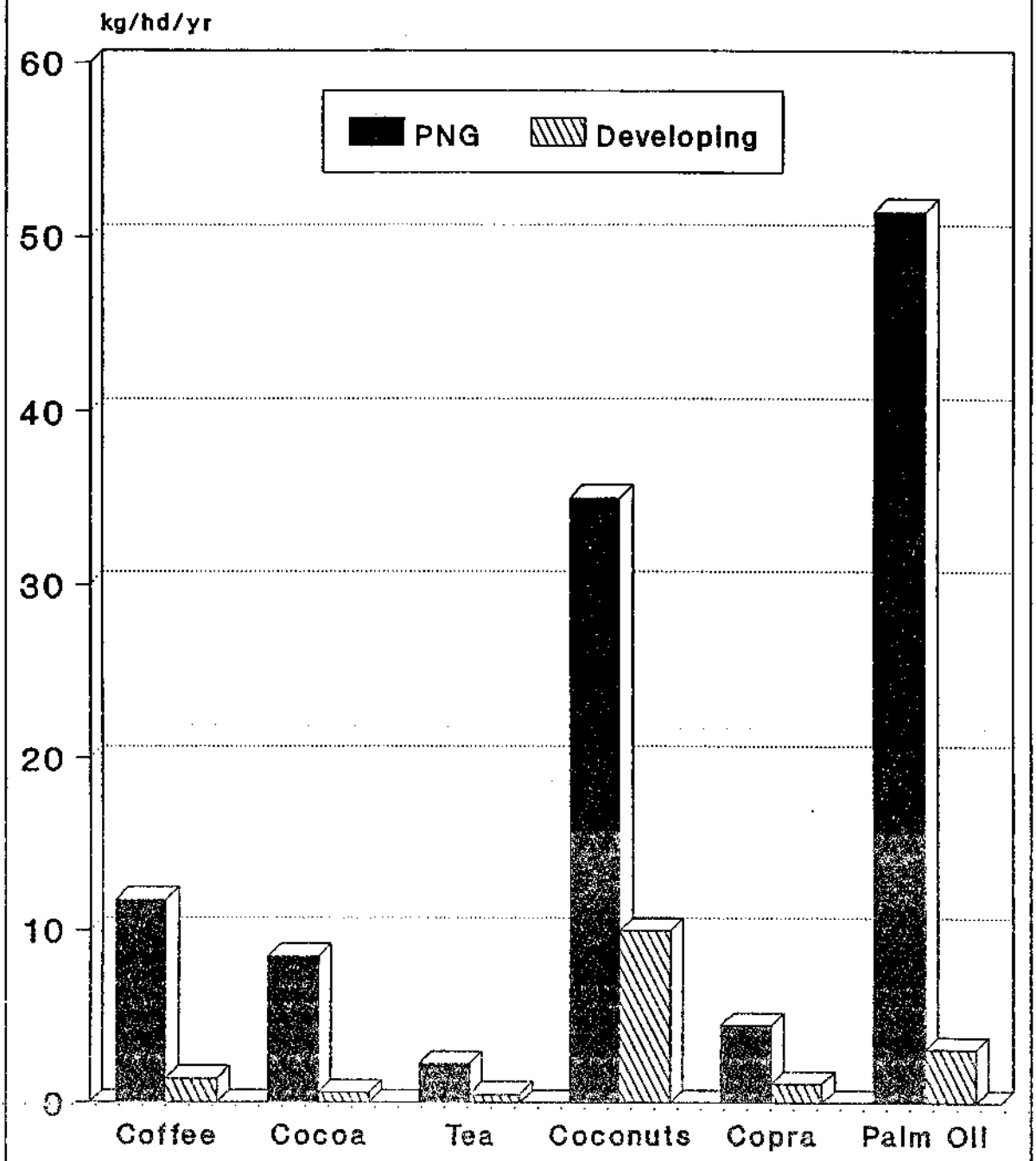
- the complexity of smallholder systems, including interactions between staple and export crops, and crops and livestock, and social and cultural factors influencing behaviour (especially the importance of women in agricultural decision making)

*Figure 1.* **Consumption Per Person, Crop Products of PNG, All Developing Nations and World**




Source: FAO, 1991 ests., ignore stocks.

*Figure 2.* **Production Per Person of Export Crops, for PNG and All Developing Nations, 1991**




Source: FAO Production Yearbook

*Figure 3.* **Simplified Example of Price Linkages in World Wheat Market**

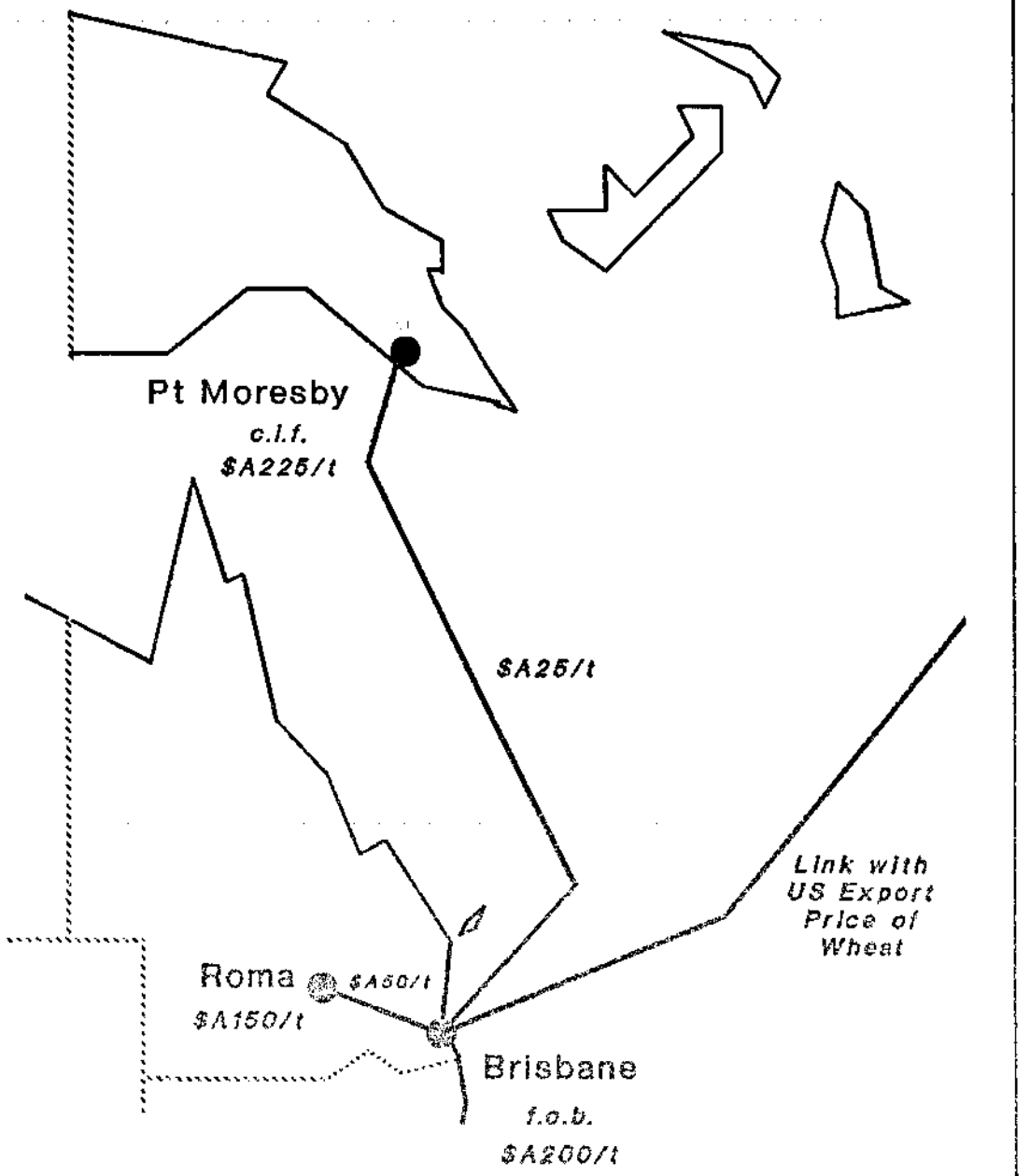
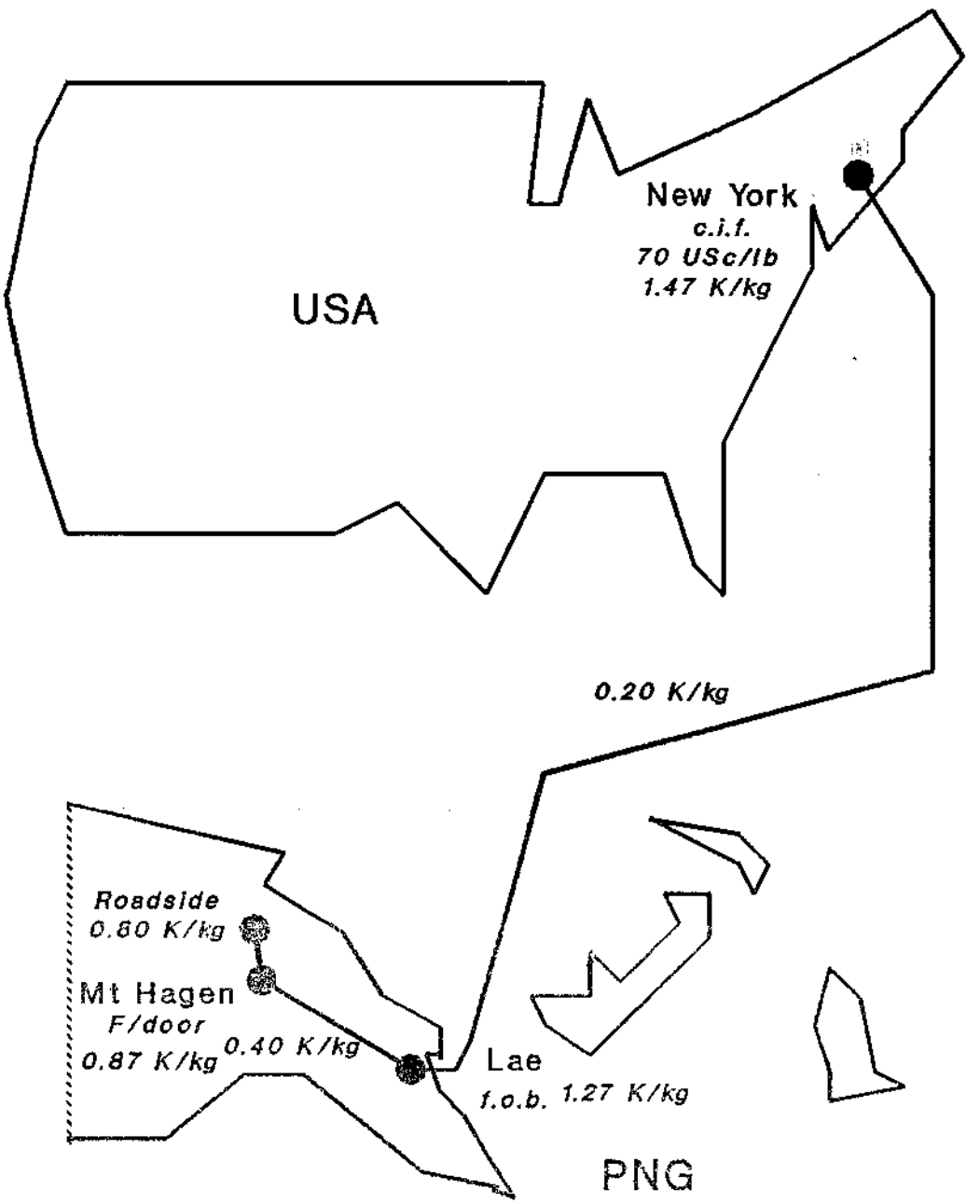


*Figure 4.* **Simplified Example of Prices in World Arabica Coffee Market**



- the limited transport infrastructure of PNG, implying that local markets can be well-isolated from other domestic markets and international markets

- the limited information base on prices and market behaviour

- government policies affecting markets.

## SOME MARKETING PRINCIPLES

Marketing is the process whereby effective demand of consumers is linked with the supply of goods and services by producers (Hunt 1983, Stanton 1984, McColl Kennedy, Kiel *et al.* 1992). Generally, spatial aspects of markets are important and we can learn a lot about spatial patterns from economic geographers (Lloyd and Dicken 1972). Marketing usually involves specialised activities, which include:

- price discovery
- assembly of goods
- storage
- relocating product
- transformation of product
- promotion
- facilitating exchange.

Marketing systems develop because rewards exist for the provision of particular services, which are embodied in final products. Marketing systems typically add value to product as it flows from producer (origin) to consumer (final destination). The rewards for those providing marketing services are reflected in the value added at different stages of the markets. The key components of marketing costs include labour, finance for goods in storage and transit, freight, (tele)communications, storage operations, and so on.

The marketing system provides important signals to all in the markets of any major shifts in demand or supply, especially through changing prices. A marketing system is equally as successful when prices are declining as when prices are rising - the market is not the cause of these changes, it is simply the referee in the process. Markets are the best objective judges of one's entrepreneurship. Markets are the best test of any idea or technology. Markets also impose discipline on governments, and may often render policy change ineffective, despite the intentions of government.

In developing countries, principles of marketing can be applied to local or village markets, providing the local circumstances are properly taken into account. For example, the lack of resources limits liquidity in these markets, so that buyers or sellers may be at a particular disadvantage in the process of price discovery (often involving lengthy bargaining). A lack of volume can also prevail in these markets, so that rather small changes in demand or supply can lead to quite sharp fluctuations in price. Generally, less commercialisation is observed in smallholder farmer areas, because they have little surplus beyond home consumption to sell into markets. Nevertheless, all smallholder farmers participate in some markets, albeit not many.

In smallholder agriculture, marketing activities are much more labour intensive than for larger-scale farming and marketing systems. More labour is used to assemble, store, transport and distribute product, and less capital. These methods often appear rudimentary and involve more wastage and losses than for the large capital-intensive methods. Difficulties in establishing grades and standardised pricing also exist with small-scale marketing. Nevertheless the labour-intensive methods are the most effective use of the local resources available, and they do offer jobs locally. Introducing capital-intensive marketing systems is often a less-efficient strategy for the market overall and for the local economy. As the economy develops, infrastructure and size of markets will expand, and opportunities for introducing more capital-intensive marketing activities will increase.

Governments often intervene in marketing systems for agriculture. It is important to distinguish between intervention in markets which delivers industry assistance (or negative assistance) while permitting a private marketing system to function freely, from intervention which involves the establishment of state-owned marketing bodies. Although massive subsidies are delivered to farmers in Western Europe and in the USA, there is limited participation by governments in these countries in the provision of marketing services.

In contrast, many developing countries, and Australia, Canada and New Zealand, have had a number of state-marketing bodies, or cooperatives, involved in provision of marketing services. Without fail, most state-owned bodies end up being hidebound by policies and restrictions which prevent them from offering the full range of market-

ing services a market often desires. This lack of flexibility, which too often is combined with a serious lack of efficiency, leads to serious losses for governments, consumers and/or producers. In the end, state-trading bodies which were set up to provide more bargaining power to producers, price certainty and price support, often end up doing the opposite through increasing the rigidity and uncertainty in markets. This is especially the case for governments lacking funds to finance marketing agencies well.

## SOME COMMON PROBLEMS IN AGRICULTURAL MARKETING

Generally, governments and others in the community want an agricultural marketing system that is fair and efficient. However, agricultural markets rarely stand up well to the tests of their efficiency and equity. This is especially the case where official markets are established and fail to deliver the goods and services efficiently and equitably. Often, a good indication of a problem in the operation of an official market is when an active shadow or parallel market in the same good or service exists. When a large differential exists between the official and the shadow price, serious deficiencies in the official marketing system exist.

The presence of informal markets has been widespread historically, although as many countries have deregulated marketing of agricultural products the parallel markets have diminished considerably recently. Informal markets reflect an inability of the official markets to serve all in the market. This may be caused by official prices being artificially too high in the official market, so buyers seek to circumvent the official marketing channels. Alternatively, when official prices are too low, suppliers circumvent official channels or simply do not have the incentive to produce what the market really wants.

### Inefficienies in Provision of Marketing Services

Many agricultural markets suffer from inefficiencies in the provision of marketing services. Too few agents involved in the provision of marketing, implying excessive concentration, can lead to serious lack of efficiency in marketing. Without good healthy competition between the various parties involved, they will tend to charge too much for their services and cut back on quality of service. Some indication of excessive concentration in marketing can be obtained just by counting the number of active participants in markets. When this reduces to just a few individuals or enterprises, the chances of inefficiencies existing rise sharply.

More importantly than the number of participants is the way that they participate. Baumol (1982) has shown that markets can behave quite efficiently even with few participants providing there is always the opportunity for others to enter at low cost. Thus ease of entry by marketing participants is one of the key means of determining whether markets are likely to behave efficiently. The persistence of abnormally high profits by traders, or others involved in providing marketing systems would also indicate lack of efficiency in marketing. Lack of efficiency can be especially serious for state-marketing agencies, because they lack a system of rewards related to performance in marketing and because they are hidebound by many regulations and obligations not found in private marketing enterprises.

### Pricing Inefficiencies

Pricing inefficiencies usually arise when the marketing system has insufficient information, is poorly linked or has inflexible prices. Efficient prices will fluctuate regionally, seasonally, between product qualities and according to different stages of value added to product. They will also fluctuate to indicate to consumers and producers when shifts have occurred in demand, supply, marketing costs and so on. When the marketing mechanisms are not in place to prices to play this key role, pricing inefficiencies will be observed in markets.

Normally, traders in markets buy and sell whenever they see the opportunity to make some money from the transaction. The resulting effects of many traders being active in markets is to eliminate pricing inefficiencies. However, if there are restrictions on trading or the market is dominated by government, the pricing inefficiencies may be quite serious. Government pricing which leads to pan-territorial prices and prices which do not fluctuate over time can lead to serious ineffiency in the operation of the market. By sending inappropriate price signals to farmers and to those providing marketing services, these inefficiencies can be very costly to the nation, even if the state marketing agency is making a profit. More often than not, however, state marketing agencies have been very inefficient and costly to maintain by government.

Symptons of pricing inefficiencies that are common include:

- insufficient price differentials within the marketing season to reward private storage of commodities. This leads to insufficient investment in storage facilities, and leads to heavy use of the marketing infrastructure immediately after harvest, followed by slack use at other times.

- insufficient price differentials for quality. This leads to producers tending to deliver poorer quality product than the market wants. This problem is especially acute if there is a single price paid to farmers irrespective of quality of product.

- insufficient price differentials between regions. This usually implies that governments are subsidising those regions where production is more inefficient, at the cost of production in regions where the product can be produced more efficiently. Thus a guaranteed support price at all depots, irrespective of location, will tend to favour producers in the more isolated areas. Often this form of pricing is undertaken for reasons of equity, to develop isolated areas or to discourage migration from these areas.

- prices of tradable commodities that differ widely from international price levels, after allowance is made for international freight and other marketing costs.

### Poor Market Information

Reliable and objective market information is essential for the effective functioning of agricultural markets. Because market information contains elements of a public good, there is a case for governments supporting the provision of such information. This is especially the case where markets are isolated and information often has to be conveyed via electronic media. One indicator of an ineffective marketing system is the lack of availability of market information. Commonly, traders know the various types and qualities of products entering markets well. However, markets can work more effectively when widely accepted trade descriptions come into common use. In the case of PNG, a common trade language can be especially useful in encouraging communication between different groups in the country whose native languages differ, thus facilitating local marketing. Regular price reports by marketing agencies coupled with other types of market information (reviews of developments in key overseas markets and in the domestic economy, forecasts of key prices, crop and livestock production forecasts, an annual agricultural outlook conference) can be especially useful in facilitating improved marketing.

### Government Intervention in Markets

Governments often want to intervene in markets to influence the rewards going to individuals and to encourage greater agricultural production. Thus governments often are prepared to fund sizable intervention in markets, either directly through state marketing agencies or indirectly through other forms of subsidies. No one can question the motivation of governments in aiming for fairer and higher rewards for farmers. However, the unintended consequences of government intervention are often very large. For example, governments usually want farmers to be paying low prices for inputs. An artificially low price for certain key inputs, including, seed, fertiliser and finance, might then be set. For those farmers who can obtain the subsidised product, the benefits of the cheap inputs are real. However, low prices for inputs discourage wise use of the inputs by farmers. As well, the input marketing system often experiences serious shortfalls, because of lack of incentives to supply the inputs. A lack of funds from government to ensure the smooth flow of subsidised input can often be more disruptive than the situation where governments withdraw all direct subsidies on inputs. Governments can unintentionally introduce considerable uncertainty by intervening in markets.

Similarly, guaranteed prices are often not a sure bet for farmers. With guarantees coming through state trading agencies, considerable delays are often experienced in rewarding farmers for product sold. These delays might come from the stricter accountability requirements that prevail for state trading enterprises. They also come from a failure of such enterprises to be self-financing. When such enterprises cannot pay their way and have to rely on the main budgetary process of governments for income, considerable uncertainty can prevail over the size and timing of funding.

## ANALYSIS OF AGRICULTURAL MARKETING SYSTEMS

Marketing systems for agriculture can be analysed in different ways. Two main types of analysis will be very briefly reviewed here: marketing systems research (which is paralleled by farming systems research) and economic analysis of prices, marketing and supply and demand (more basic economic analysis).

In any traditional form of agriculture, very subtle methods are employed by farmers to cope with the various interactions between crops, livestock, climate, topography, soils and the many social and cultural considerations which influence smallholders. These subtleties are often the essence of the farming system, and yet can be readily overlooked in the development of alternative technologies, new crops and so on. Similar subtleties exist in marketing of traditional crops in these systems. In order to provide a basis for implementing research and change which is better suited to farmers conditions, the process of farming systems research was developed. Its parallel in marketing can be termed "marketing systems research".

## MARKETING SYSTEMS RESEARCH

The process of farming systems research was developed to place research in the context of smallholder agriculture. This method is based heavily on obtaining a good knowledge and understanding of farmer circumstances and of their key production problems, with which to plan research in farmers' fields. A key aspect of an integrated farming systems research program is diagnosing problems and planning research. Much has been written on diagnosis in farming systems research (Remenyi 1985, Byerlee, Collinson, *et al.* 1988). Obtaining information on farmer circumstances involves three steps:

- assembling background information
- exploratory surveys
- formal surveys.

A similar series of steps can be proposed for marketing systems research in smallholder agriculture. This implies considerable effort on behalf of the researcher in gathering data from the markets on the issues of concern.

### Background Information on Smallholder Marketing Systems

Assembling background information on smallholder marketing systems relies upon gathering of secondary information and data on the study area and its resources. Such information would include:

- crops and livestock products and farm inputs of importance, especially broad product flows in local markets
- major population centres and markets in the study area
- major transport linkages to other markets and regions, including roads, traditional transport methods, ports and export market outlets
- resources of the study area, especially the topography, climate and environment.

Considerable background information exists on most potential study areas, although there is the possibility of large information gaps or conflicts as the data are assembled. A good method of obtaining this background information is to search for previous studies of systems and to obtain material from maps and other sources. Often official statistical bulletins can assist, and a preliminary trip to the study area is essential. Throughout the process of information gathering, researchers are encouraged to keep good field notes, sources of information and addresses of contacts.

### Exploratory Survey on Marketing Systems

An exploratory survey would be conducted when satisified that all major sources of background information have been exhausted. A specific research problem on marketing systems would have to be identified before embarking on an exploratory survey. The exploratory survey would then proceed with the aim of finding out considerably more about the problem in the study area. Often this exploratory research is best conducted by a multi-disciplinary research team. Different aspects of the problems will be generated by informally surveying farmers, local marketing agents, village shopkeepers, providers of tranport services, local government representatives and so on. Every attempt should be made to avoid just hearing the village leaders' perspectives, which might not truly reveal the marketing problems. The coverage should be across social structures, es-

pecially including women in the exploratory survey. This informal surveying should proceed until considerable discarding of side issues and narrowing of the main marketing problems has occurred. The exploratory survey is a way of helping provide focus for any formal survey which will follow. It also helps elicit considerable local information about prices, flows of product, seasonal patterns and freight and local storage and processing (if any). Depending upon the perceived seriousness of the marketing problem, the exploratory survey may take from a few days upwards of two weeks for a team in the study area(s) of interest.

**Formal Survey of Marketing Systems**

If sufficient information on particular markets is not available from elsewhere, a formal survey can be conducted to elicit information needed to address particular marketing problems. This is best conducted on a short sharp basis, with a structured questionnaire that is brief, requires limited time for completion and can be answered directly by the interviewed person. Standard practices are documented in the literature for surveying and should include:

- randomly sampling villages in a study area, to avoid simply surveying those in the more favored areas or closer to main roads

- surveying a minimal number of farmers or marketing people in a village or location so that costs of travel during the conduct of the survey are reduced

- using a standard rule for selecting farmers or marketing people in villages that will lead to an approximately random choice of them, without having to prepare a list and then randomly select (for an example of such rules, see Harrison and Tamaschke 1994)

- cross-checking and completion of survey questionnaires on the spot, so that the information is as precise as possible before leaving the study area.

Survey analysis can then proceed efficiently, especially now with the use of micro-computers. For marketing issues, formal surveys may be repeated over time in particular locations, to obtain information about prices and marketing margins and so on through time. The same principles apply as above, although more time would be required in surveying if returning to the original sample for repetitive collection of information.

The specific questions that might be asked in a formal survey include:

- simple questions about production, sales, purchases and participation in markets for local products

- questions about storage, marketing and local processing by the farmer of different products

- opinion-type questions

- more specific questions about prices and costs or inputs, storage methods, transportation and so on

- socio-economic characteristics of the farmer, perhaps including income and other more confidential questions if required near the finish of the questionnaire.

Ultimately, this research will lead on to well-focused research on markets which will provides an information base for improved decision making and improved marketing for villages and agriculture. The key questions likely to be answered in such research are:

- how responsive to price and income are local consumers of products, including staple foods and other heavily consumed items?

- how responsive to price are local farmers in the supply of product?

- what are the economic determinants of storage of goods?

- how efficiently are local markets behaving?

- how are prices linked across markets?

- what are possibilities for cost reductions in marketing, especially as new infrastructure is developed and new processes and technologies are employed in marketing?

- what are the impacts of government policies on local markets?

It should be noted that studies which basically followed the method described above have al-

ready been undertaken in PNG, as typified by Livingstone (1989), Beil (1990) and Temon (1991). We now turn to some elements of applied market analysis which are essential for addressing these questions.

## ELEMENTS OF APPLIED MARKET ANALYSIS

Much of the material of this part of the paper is drawn from the best books available on agricultural marketing (Campbell and Fisher 1982, Timmer *et al*.1983, and Tomek and Robinson 1990). As well I draw heavily on previous experience in marketing and commodity analysis with ABARE (Australian Bureau of Agricultural and Resource Economics) and CIMMYT (International Maize and Wheat Improvement Centre) without implicating these research organisations.

### Correct Pricing in Markets

The essentials of pricing in agricultural markets are well described in Tomek and Robinson (1990). Any price must be clear with respect to the following information:

- description of item (whose price is being reported)
- units in which price is reported
- time period the price represents
- quality of product
- location
- level of market.

Generally, after-harvest prices are seasonally low because of abundant supplies of goods, with the seasonal peak a month or two before the main harvest period. The after-harvest price is the best indicator of the price signals to farmers, since many need to sell then to obtain essential cash to repay short term loans. Where products have no definite harvest season, the pattern of prices seasonally will be less marked. Average prices for the marketing season overall might then be employed as the best estimate of prices that actually influence farmer decisions. Economic analysis of farmer incentives might also involve what is termed the "field price", which is the calculated price of a crop before harvest (CIMMYT 1988). When harvesting costs differ strongly between crops, the field price should be employed in considering farmer decisions on supply of crops and choice of technology.

If prices are to be compiled into averages for a season, year or other period, then weighted average prices should always be employed. This becomes obvious when considering a market in which most sales occur during the after-harvest period, and many fewer later in the marketing season. Taking a simple average of prices across all weeks or months of the marketing season will tend to overstate the true price. When most of the product is sold in the low price period, the weighted average will be below the simple average. This is why the weighted average is the correct one to use.

### Deriving Prices in Markets

When deriving a price from other levels of markets, the law of one price can be invoked. This tells us that prices tend to equilibrate across markets through the process of exchange. Differences between prices can be explained by level of market, quality of product, degree to which it has been transformed (or had value added), location and time of year. Prices can be validly derived when proper account is taken for marketing costs and flows of product in markets.

For domestic goods, finding a reference price for a particular item is often very challenging. Because of isolation, poor infrastructure and high cost of transport between markets, bulky staple items often fluctuate considerably in price within a season and between locations. Reference prices for these items can easily be considerably in error if no consistent and widespread price reporting system exists. In this case, considerable effort using marketing systems research should be devoted to better documenting prices in local markets, especially for those goods not entering large urban or international markets.

Examples of correct pricing for internationally traded goods are provided in Figures 3 and 4. The essence of pricing is to ensure that the various marketing costs are added or subtracted correctly, depending upon product flows in markets. Articles which emphasize strongly the importance of correct pricing include Westlake (1987) and Byerlee and Morris (1993). Reference prices of many internationally traded items are now regularly reported. Sources which I find most helpful on this are IMF, *International Financial Statistics*, FAO, *Monthly Bulletin of Statistics* and *Production Yearbook* and ABARE, *Agricultural and Resource Quarterly*. For commodity and trade data, the FAO's *Production Yearbook* and *Trade Yearbook* offer

considerable information, although some doubt always exists about the reliability of the less important data contained in the reports.

The system of reporting commodity data used by the US Department of Agriculture is the most sophisticated globally. Many aspects of their commodity reporting system can be adapted usefully to other countries and I would actively encourage PNG to review the USDA system and to adapt aspects of it. Their system now in place for extracting commodity data and presenting it graphically or in tabular form is most impressive.

**Marketing Margin Analysis**

Studies tell us that the difference between prices at different levels in markets (the marketing margins) follow certain regular patterns (Tomek and Robinson 1990). Generally marketing margins reveal some combination of a constant absolute margin and a constant percentage margin. Levelling and averaging of margins also is often observed. Levelling is where the marketing system does not reflect fully the week to week variation in farm or village prices at the retail level. Those providing the marketing service thus level out the fluctuations in price and absorb the fluctuation, with the intent of having more stable prices at the retail level. Averaging is where marketing margins are averaged across commodities or goods in the market, so that the full change in the farm or village price of one item will not be reflected at the retail level. As those offering marketing services usually retail many different items simultaneously, they sometimes absorb price shocks across items. For price analysis, it is important to know the marketing margin behaviour, as this allows us to properly link demand and supply.

Applied Demand Analysis

Well-established models exist for estimation of price and income elasticities of demand (Phlips 1974, Deaton 1975, George and King 1971, Tomek and Robinson 1990). These parameters provide the basis for analysing how responsive the consumption of different commodities is to changing incomes and prices. These demand models account for all prices affecting the consumer's decisions and for real changes in income too. There is insufficient space to review these demand studies in detail, other than to encourage PNG to conduct a study similar to that done by George and King , where the focus should be on major food items consumed in PNG households. Two matrices of food demand elasticities might be prepared: for typical local village consumers and for typical urban consumers in large towns. We would expect the price and income responsiveness of demand to differ considerably between the two types of consumers.

Many countries have only spasmodic estimates of the responsiveness of consumption of items to changing prices or incomes. Nevertheless, it is possible to derive quite a good set of demand elasticities using standard methods. Firstly, whatever, demand elasticities that do exist should be compiled into the form of a matrix of food demand elasticities. There will probably be many gaps. As well, reasonable estimates of demand elasticities might be drawn from studies in other countries with similar income and consumption patterns. IFPRI's work has drawn together considerable information on demand from a number of different countries. Then, using methods well described in Tomek and Robinson (1990), a more complete matrix of price and income elasticities of demand can be compiled.

IFPRI and IRRI have both conducted a series of studies which help us better understand demand in developing countries. More of this analysis should be conducted and I would actively encourage PNG to undertake it, perhaps in collaboration with IFPRI. I would expect elasticity of retail demand for major food staples to be very price inelastic. Traditional food staples will also probably have a negative income elasticity of demand too. As incomes grow, we would expect well-fed consumers to switch their consumption towards more income-responsive products, including dairy products, more high-protein foods and towards more convenience foods. Bread consumption commonly displaces consumption of mealy and other traditional staple foods, especially amongst urban consumers of developing countries (CIMMYT 1983).

Applied Export Demand Analysis

Elasticities of export demand, and export supply, can be derived only after the full array of demand and supply elasticities is known for all major producing and consuming countries of a particular commodity, and when price linkages between markets can be suitably summarised. The basic method for deriving an elasticity of export demand is preesented in Cronin (1979) and more discussion can be found in Carter and Gardiner (1988).

Critical determinants of export demand and export supply are the share of the particular country's exports in total trade. If this share is very small, then we can be sure that the elasticities will be very large (sufficiently large to presume that the exports of that country will have no impact on international prices). This is the small country assumption, which can be applied for most of PNG's export crops. Whether or not the small country assumption is always valid should be continuously tested using the method proposed by Cronin (1979). By accounting rather neatly for pricing policy and intervention in global markets, Cronin's method is more realistic than some others employed.

### Supply Response Analysis

Analysis of the reponsiveness of supply of agricultural products is essential to undertake market, price and policy analysis. This article will not contain a review of such studies, the reader is referred to Campbell and Fisher (1982), Timmer, Falcon and Pearson (1983) and Tomek and Robinson (1990).

### Applied Price and Market Analysis

The studies of demand, supply, price and marketing margin behaviour have no relevance until applied to particular policy, research or marketing problems. This is where the economic analysis becomes particularly important to policy makers and various decision makers. Timmer, Falcon and Pearson (1983) and Mellor and Ahmed (1988) offer many examples of the types of policy analysis that can be conducted for developing countries. Carter and Gardiner (1988) and Tyers and Anderson (1992) offer many examples of the types of analysis that can be conducted at the international level.

The degree of sophistication of applied market and price analysis is increasing over time. As our capacity to quantify, analyse and summarise grows, so will our need for the basic parameters and market information to do such analysis. There are new demands being placed on economic analysis of policies over time. These include the need to assess the worth of major projects (in order to satisfy governments and international lenders of their worth beforehand, as well as to review impact of investments later). As well, policy interventions by governments often require economic analysis beforehand.

## GOVERNMENT AND SMALLHOLDER MARKETS

Governments have various roles to play to facilitate the efficient and equitable behaviour of markets. A key role is providing the legal and administrative support for the establishment of property rights and rights of individuals to enter contracts and adhere to them. Governments also have a clear role to play in providing law and order, so that business can be conducted without undue disruption and uncertainty. Most infrastructure developments require participation by government, since infrastructure is partly a public good. Of course, there are some infrastructure projects that can legitimately be developed by the private sector, although governments obviously want to play a strong role in the development effort.

An economic justification clearly exists for government to provide price monitoring and market reporting services, since information on prices is a public good. In parallel with this is the strong need for regular and reliable crop reporting and commodity analysis. The provision of a grading system also can be justified on the same grounds, although governments should take special care to ensure that the grades established have a sound commercial or market basis.

Whether governments should go further in intervening in markets is debatable from an economic perspective. While governments may legitimately want to redistribute income between sectors, intervention in markets to do this has been shown to be an inefficient policy instrument (Campbell and Fisher 1982). The inefficiencies arise because the marketing structures set up often become inflexible and unable to fully undertake all the subtle tasks required in a sophisticated marketing system. This argument applies especially for local village markets where smallholder farmers and poor villagers participate. In aiming to assist smallholders, the consequence of most government intervention in developing country markets has been to seriously distort prices to the disadvantage of farmers (Schiff and Valdes 1992).

In summary, agriculture in Papua New Guinea has many challenges. Some of these no doubt are production and technology oriented, some market-oriented and some more broadly-based. The further progress of PNG agriculture hinges critically on the development of good marketing systems. These need strong support from govern-

tems. These need strong support from government in the provision of infrastructure and those services for which a legitimate role for public involvement exists. However, this does not imply that governments should "crowd out" entrepreneurs from the marketing system. The entrepreneurs are the ones who will encourage markets to flourish which will be to the ultimate benefit of smallholder farmers, village and urban consumers and the nation more generally.

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# PROPOSED MARKET RESEARCH AND INTELLIGENCE SERVICE BRANCH

Francis Mangila[1]

***ABSTRACT***

*A Market Research and Intellegence Service Branch ( MRISB) should be established with the ultimate objective to research and provide appropraite market information to the clients in order to improve their production and distribution potential in food, livestock and alternative crops. The assessement and evaluation of marketing and pricing of agricultural products and other inputs and providing marketing information to the smallholder producers, non-government organizations, government agencies and individuals would be an important objective of the proposed branch. MRISB would formulate the criteria and guidelines for export and domestic market, provide practical support to clients, review agriculture market policy and strategy, and furnish other relevant market intelligence.*

***Key words***: *Marketing, pricing, market policy, market intelligence.*

## 1. INTRODUCTION

The purpose of this paper is to discuss ways of improving the Market Research Intelligence Service delivery by DAL to the smallholders. This is in line with the overall DAL's strategy of regionalisation and district level delivery of agricultural and livestock services. This report will not explicitly cover the following areas:

(i) Agriculture Marketing systems
(ii) Private sector involvement in agricultural marketing
(iii) physical marketing infrastructures and
(iv) Corporate Industry Involvement in market.

## 2. BACKGROUND

The broad policy objective of the department is to assist the rural producers to achieve higher productivity and incomes, to become better oriented towards the market place, and produce for own consumption. The government is in a process to direct its delivery services at the regional and district levels, closer to the majority of the population. DAL in line with this move is preparing to reorganise structurally to deliver its services.

However, PNG does not have a clear agriculture marketing policy despite the recognition of major deficiencies in agricultural development and marketing system. A number of studies including the recent paper by DAL Working Committee on Delivery of Agriculture Services, the 1989 Strategy and White Paper, ANZDEC (1990) Study on Agriculture Extension Delivery, and the 1988 World Bank PNG Agriculture Assessment Review, just to name a few, have identified inadequate marketing facilities, weak infrastructural support system, the fragmented and small size of domestic market, high transport costs, weak institutional capacity, declining world market prices for export crops, limited credit facilities and generally low sector productivity as some of the major factors hindering agricultural productivity in PNG. Thus, there is a need to improve market research and intelligence information by DAL for public consumption. These reasons have promoted the need to improve the current marketing situation.

### 2.1 Policy Support for Smallholder Sector

The government supports the smallholder sector because it produces much of the agricultural production in PNG. It has advantages in spreading benefits of development, minimal foreign exchange leakages and resistance to natural disasters and adversity. Agriculture sector holds the strategic position in the country's development in terms of

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GDP, employment and export earnings.

The disadvantages are generally low efficiency of Farm Management, lack of economies of scale, irregularity of supply, especially for high income freight produce and lack of agro-processing opportunities.

### 2.2 Current Policies Related to Market

#### 2.2.1 International Trade (from 1989, DAL White Paper)

a) Support a cautious reduction of food imports by strengthening the food production capacity of the sub-sector

b) Continue to encourage and support the private sector in agriculture produce marketing

c) Continue to maintain close links with international trade organisations through closer collaboration with industry and government agencies

d) Encourage the diversification of international markets for exports crops to include non-traditional markets for export crops to include non-traditional partners such as countries of Eastern Europe and Middle East.

#### 2.2.2 Domestic Marketing (from 1989 DAL White Paper)

a) Continue to encourage the private sector to participate more in marketing of agricultural products

b) Continue to provide marketing services in isolated areas as a buyer of last resort

c) Continue to monitor the pricing systems offered by various marketing agencies and companies on all agricultural products

d) Improve the capacity to provide market information and further develop an effective support service to provinces

e) Encourage the improvement of basic marketing infrastructure, such as roads, bridges, and ports for market access, and

f) Encourage improvements in presentation and packaging marketed goods.

### 2.3 Other Policies

#### a) The Commodity Price Support

The Commodity Price Support is a direct support given to the tree crop sub-sector to maintain production, meet PNG exports requirements and maintain grower interest. In 1994 the Commodity Price Support is allocated K75 million which has declined from K102 Million in 1993. In a long run the government wishes to do away with continuous price support to the tree crop sub-sector.

#### b) The Freight Subsidies

The Freight Subsidies Scheme was initiated in 1992 but has not been implemented due to logistics problems in 1993. In 1994, there are no funds allocated to the scheme. The idea was to assist the smallholder to maintain production and income earning.

## 3.0 THE NEW DAL POLICY/STRATEGY

The past agricultural development policies and strategies were not matched by commensurate efforts in strengthening and improving the marketing system, especially, for the smallholders. The policy strategy on re-organisation of DAL will enable closer delivery of services to the smallholders (DAL 1993). It will assist the smallholder producers to achieve higher productivity and incomes, and to achieve self-sufficiency by the following strategies:

a) Improving Current Problems and Institute Efficiency of Existing Agricultural Marketing Research and Information Services

i) Establishing a Market Research and Intelligence Service Branch to monitor market trends and disseminate information on a regular basis.

ii) Improving the marketing infrastructures by incorporating them with DAL projects/PIPs at regional levels.

iii) Market information collation, storage and dissemination through the district based Extension delivery system and various media presentations.

iv) Training of extension officers on marketing procedures, and

v) Carry out research on market intelligence incooperation with the private sector and other NGOs.

b) The State As Buyer of last Resort

i) In areas where the private sector cannot provide the marketing service for economic reasons, the state will purchase produce as a buyer of last resort until the entry of the private sector. The government adopts this policy to increase participation in cash economy, especially in less developed areas.

ii) The State will encourage buyers who will stimulate growers to increase output of the majority of growers. For example, by providing market support infrastratures and credit facilities.

iii) The State will continue to encourage and support the private sector involvement, especially in the physical marketing of produce, market research and intelligence, and helping market organisations.

iv) The State will encourage and support group marketing by organised smallholder farmers.

## 4. BENEFIT OF HAVING MRIB

The Department of Agriculture and Livestock's approach in establishing Market Research and Intelligence Service Branch, is to emphasize the importance of providing appropriate market information to the clients in order to improve the production potential in Food, Livestock, tree crops and alternative crops. It will help the smallholder sector in making economically rational decisions in production and marketing. The benefits of MRISB will depend on the input support given for it to carryout its objectives.

## 5. THE MARKETING RESEARCH AND INTELLIGENNCE BRANCH SERVICES

The primary objectives of the Marketing Research and Intelligence Service Branch are:-

i) To improve the agriculture market research information storage and communication system in PNG. The main focus is in Village and Provincial markets which are the most obvious recipients of the information system.

ii) To assess and evaluate marketing and pricing of agricultural products and other inputs.

iii) To provide marketing information to those smallholder producers, NGOs, Government agencies and individuals on request.

iv) To encourage "Group Marketing" to help improve product quality, quantity and grower prices.

## 6. THE OPERATION OF MRISB

The operations of MRISB will be at three levels; Headquarters, Regional and District (see Figures 1 & 2). To improve market intelligence within DAL would require increases in manpower and resources. Appropriately qualified staff will be employed to administer the operations of the MRISB at the headquarters level and the criteria and guidelines for export and domestic market, provide practical support to clients, review agriculture market policy and strategy, market research, collect and disseminate offshore promotion of sector, and provide other relevant market information.

The Headquarters will be manned by six economists and one account clerk, and the regional offices will each be manned by one senior marketing officer who is part of the regional advisory cell. The Provincial marketing offices will be at the implementation level liaising with many of the organisations in the provinces and helping farmers as well as extension officers at district level.

Adequate resources including computers will be provided for the organisation to work effectively in producing information for dissemination. A major function of the regional offices will be data collection, storage, market research, compiling research findings and dissemination of information.

It is important to develop a strong base and linkages at the Headquarters, Regional and Provincial levels, that will have ready available and appropriate information for dissemination to the clients.

MRISB will have a line management structure. At the Regional level, the Regional Marketing Officer will be directly responsible to the Regional Manager/Director. Any correspondence will go through

*Figure 1.* **ORGANIZATIONAL STRUCTURE OF MARKETING RESEARCH INTELLIGENCE - HQ LEVEL**

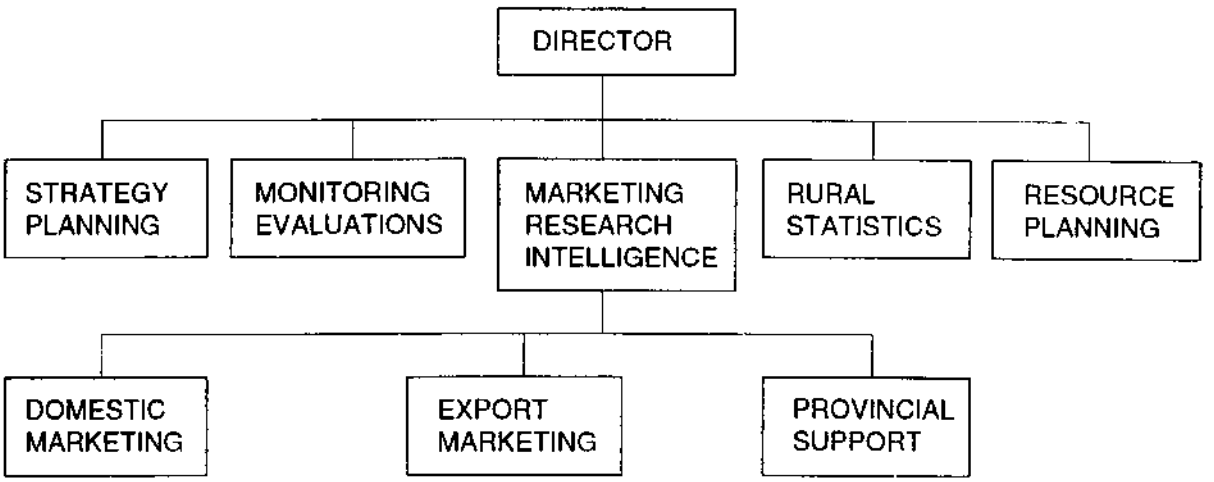



*Figure 2.* **REGIONAL/PROVINCIAL LEVEL STRUCTURE**

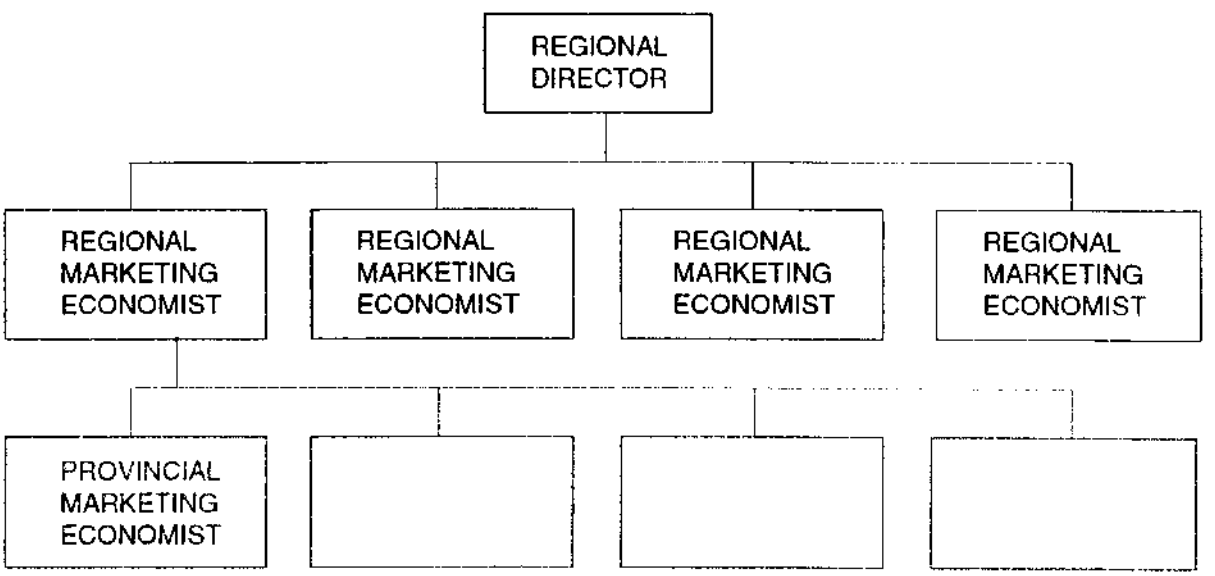



*Figure 3.* **THE FUNCTIONS AND LINKAGES OF AN AGRICULTURAL SYSTEM (ADAMS 1962)**

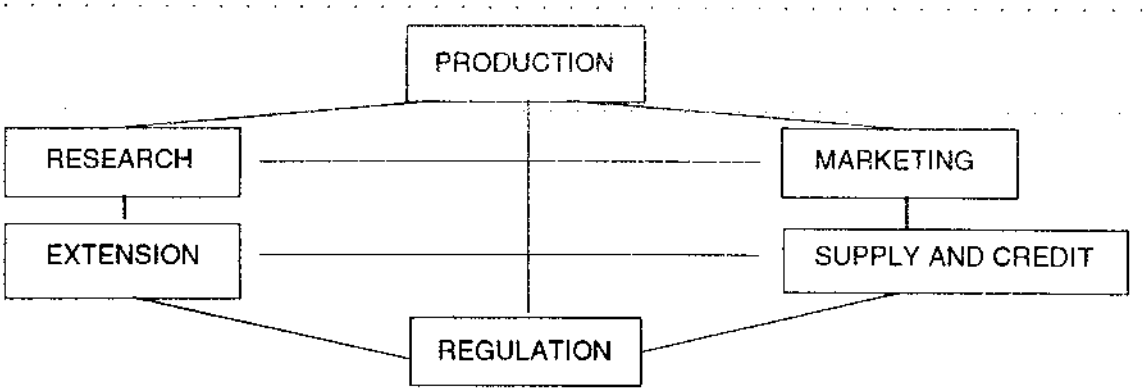
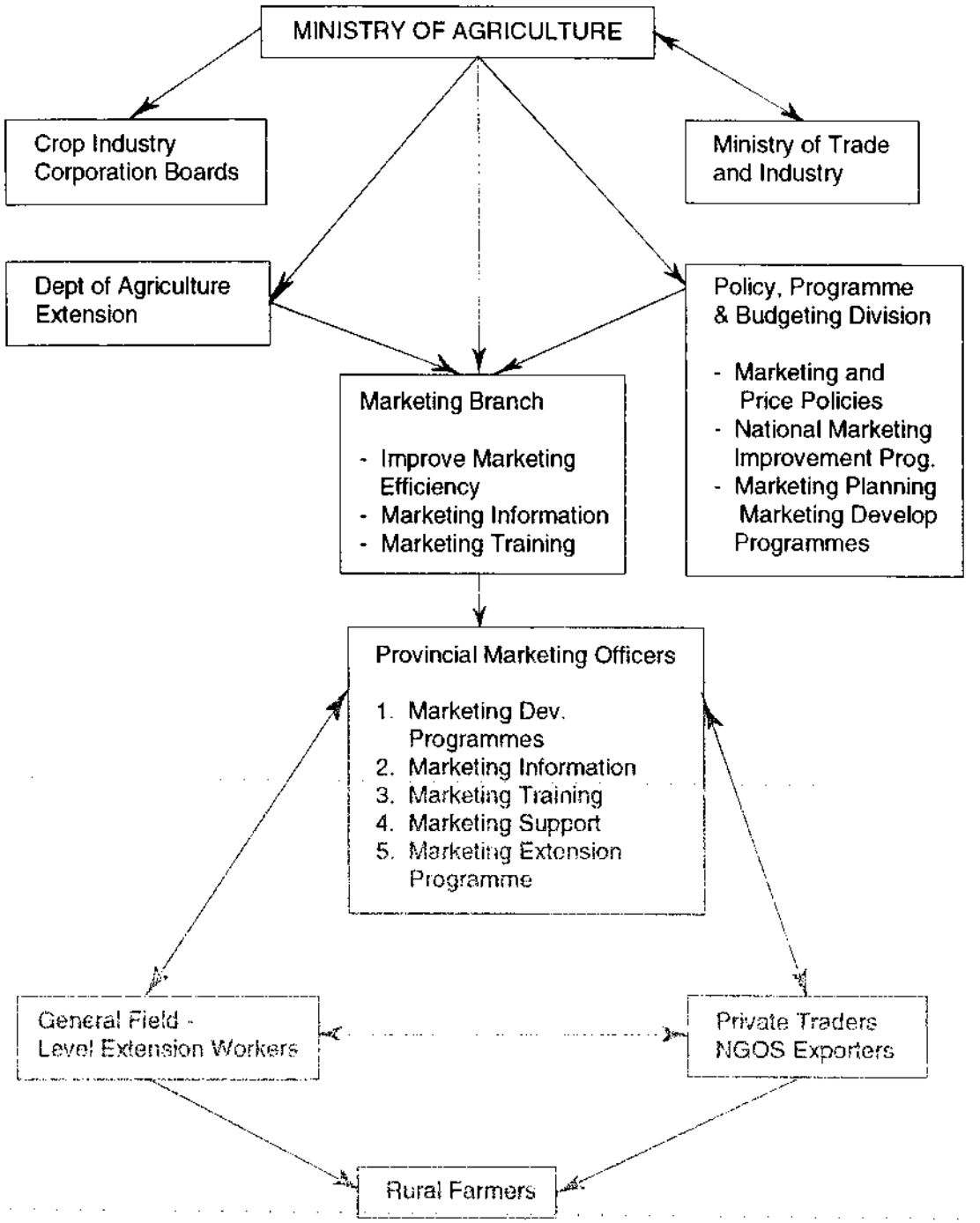


*Figure 4.* **POSSIBLE ORGANISATION FUNCTIONS AND LINKAGES OF A MARKETING BRANCH**



the Regional Director to the DAL Secretary and to the Chief Marketing Officer. The RMOs will be responsible in researching and providing specific marketing requirements and other issues in the regions.

The District Marketing Officer will be responsible to the Regional Marketing Officer. They will be researching on marketing issues specific to the district requirements.

## 7. LINKAGES (Figures 3 & 4)

The MRISB will be linked with many organisations including international and domestic private organisations, NGOs, local level governments, regional, provicial and district level organisations. The success of MRISB will depend on establishing appropriate linkages in the wider sense as well as internal linkages with other DAL functional activities. The private sector in PNG will be encouraged to work closely with the MRISB.

Examples of Linkages:

i) Within DAL - The MRISB staff will channel their findings through the Information Branch of DAL which will disseminate the information to the Extension Delivery system at the regional and district levels. There will be consultation at all levels of the operation.

ii) Other Organisations (e.g. with CIC, Cocoa Industry Board) - There will be consultation and on occassions there will be joint market research carried out depending on situation.

iii) International Organisations - Close links with international trade organisations through close collaborations with Trade and Industry and PNG Embassy in member countries will be established.

## 8. CONCLUSION

This proposal is the result of DAL's recognition of the need to examine the long term role of marketing toward agricultural production in the PNG economy. DAL is concerned with the impetus that a proper market research, intelligence and information dissemination to the smallholder farmers must be established. At present, the smallholder production is hampered by market related problems which leads to low productivity and low farmer incomes.

The lack of knowledge and understanding of the whole gamut of the marketing subject is a fundamental weakness. There is no scope at this stage to delay taking remedial actions to improve the situation, especially the provision of market research and intelligence service, market infrastructure support, involving the private sector and training of manpower.

The government recognises that the importance of private sector involvement in marketing to increase rural agriculture sector production. The private sector will be encouraged to take added responsibilities in areas where they can operate at a economic scale.

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# QUARANTINE - A CLIENT ORIENTED APPROACH

R J Ivess[1]


## ABSTRACT

*The common practice with the international movement of plant produce is for certifying officials to determine what the pests of quarantine concern should be for the importing country and certify produce for export accordingly. It is anticipated that with the successful conclusion of the Uruguay GATT Round, importing countries may attempt to use quarantine as a technical barrier to trade and so in order to prevent this, a series of rules have been developed (FAO Guidelines) for importing countries to adhere to. Such rules would require the importing country to determine which pests associated with the produce would be of quarantine concern and justify any phytosanitary measures required. This implies that the exporting country needs to develop communication systems to ascertain what these pests are and develop systems to ensure that the exported produce meets the importing requirements. It is recognised that importing countries have a choice of suppliers and all things being equal, the supply country that can most effectively and efficiently meet the needs of the buyer should capture the ongoing market. Quality assurance systems are seen as a tool whereby produce can be prepared to meet the stated plant quarantine requirements of the importing country. Such systems should start in the field and involve producers, packers, exporters and government officials.*


***Key words**: Quarantine pest, pest risk analysis, export certification, import inspection, quality control, quality assurance, standards.*

## INTRODUCTION

The traditional approach to international quarantine has tended to be that of the exporting country "guessing" what pests associated with an export product would be of concern to the importing country and certifying freedom from these accordingly. Improved international phytosanitary communication and the concern of the Uruguay GATT Round of phytosanitary measures becoming non tariff barriers have led to the development of international phytosanitary guidelines. Essentially such guidelines are developed to ensure that quarantine is not used as a barrier to trade and that any measures required by an importing country are technically justified. This means that the quarantine requirements of an importing country will become more transparent and enable exporting countries to match their products to both consumer and quarantine requirements. Hence quarantine authorities will be able to become "market oriented" ensuring that exported produce meets the (phytosanitary) needs of their "clients" (import officials).

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## CONCEPT OF MARKETING

The modern concept of marketing, whether it be domestic, industrial, international or whatever, is:

"satisfaction of a consumer need at a profit".

It is generally recognised that in a competitive market, being customer orientated increases an organisation's (or country's) chance of success. Market (customer) orientation, requires the identification of a particular market segment and its associated needs and the production of a service/product that can satisfy these at a profit. The service/product must not be the end in itself, but rather the "means to the end", which should be a satisfied customer who pays accordingly and places a repeat order.

Too often in marketing, the needs of the targeted market segment are not adequately identified and suppliers "push" products/services onto the market in the form that they believe the customer should have. In the case of horticultural products it is important that the purpose of the product be understood and production and distribution planned accordingly. A classic case study to demonstrate

this is the situation of New Zealand kiwifruit. In the early to mid 1980's, the New Zealand kiwifruit industry was a phenomenon and held up to be the marketing example for the world. Nothing could go wrong and no-one could get enough of the unique hairy berry that the whole world wanted to consume. A decade later, the situation is now, that producers are getting approximately one quarter of the '80's income per tray and with hind sight the reason for this is rather obvious. Kiwifruit in itself is not exceptional as a fruit and in fact is not really a preferred fruit (compared with bananas, oranges, grapes, nectarines, etc). The phenomenon of kiwifruit was that there was a market segment containing consumers with a need for something exotic, different and unusual and kiwifruit was a means of satisfying that need. In other words kiwifruit was the means to an end and kiwifruit was consumed for "ego gratification" rather than as a means of satisfying hunger. Because of the high price associated with satisfying this need, increased production resulted (both within and outside New Zealand) with the result that this segment became saturated. The resultant price decrease meant that the fruit was available to the "supermarket" segment and kiwifruit lost its mystique. It is now another commodity fruit competing with apples, oranges, bananas, etc and no amount of promotion will ever return it to its former glory. It should now be recognised for what it is, i.e. a commodity fruit, and packaged and distributed accordingly with the associated price expectations. Many other parallel examples can be given, one from the cut flower industry being cymbidium orchids. This was once considered to be the diamond of flowers, but the fact that you can now buy these in the supermarket by the stem has somewhat lessened its appeal.

## RELATIONSHIP BETWEEN MARKETING, QUALITY CONTROL AND QUARANTINE

I appreciate that discussing marketing may at first glance seem rather unusual for a subject entitled quarantine and quality control services in the Pacific. However, the marketing concept is so closely related to that of quality control and quarantine that if a market oriented approach is taken, i.e. identifying the quarantine officials of the importing country as your customer and satisfying their needs, the chance of ongoing success will be enhanced. Essentially quarantine is about communication between importing (consumer) and exporting (supplier) countries. The quarantine needs of the importing country must be determined and this is generally that produce shipped to it by a supplier must be free from pests of quarantine concern (note that in some instances the "need" for quarantine may be to act as a means of preventing entry and hence competition to domestic producers! More of that later.). This requires then, that the supplier undertake "market research" to ascertain which pests are of quarantine concern to the importing country and develop the appropriate quality control systems to ensure that these are not "exported".

## QUARANTINE AND INTERNATIONAL TRADE

It is recognised that following the successful conclusion to the GATT Uruguay Round, there may be a temptation, as mentioned above, for importing countries to use quarantine as a substitution for quotas, tariffs, prohibitions, subsidies etc. Consequently there is a strong movement worldwide to ensure that all quarantine measures required by an importing country are technically justified and to support this, a special Agreement has been formulated under the GATT for the application of sanitary and phytosanitary measures. This Agreement outlines a set of "rules" that need to be considered when a country is developing quarantine specifications.

The general procedure (phytosanitary) for plant produce moving in international trade is that the importing country categorises for the exporting country, the organisms that may be associated with the product (pathway) into quarantine (actionable) and non quarantine (non-actionable) pests.

A quarantine pest is defined by the International Plant Protection Convention (IPPC) as being:

> "a pest of potential national economic importance to the country endangered thereby and not yet present there or present but not widely distributed and being actively controlled".

This categorisation becomes the specification to be met by the supply country and such information should be relayed by the quarantine authorities to the exporters and producers of the product. It is then the responsibility of the producers to ensure that the produce is produced in accordance with the wishes of the importing quarantine officials. Produce that does not meet the requirements of the importing country is generally treated on arrival

which adds to the cost of production and either makes the product more expensive to the consumer or less profitable to the supplier. As well, there is the inconvenience of having the product held up and not available for immediate distribution. If the importer has a choice of suppliers, then logic dictates that all things being equal, he will give the repeat purchase orders to that supplier whose product causes the least problems on arrival, i.e. the product that satisfies the needs of the importing quarantine officials.

As quarantine is chiefly concerned with stopping the flow of quarantine pests from one country to another, it is important that both countries are aware of what organisms infest/infect products in their respective countries so that accurate information is available and appropriate categorisation undertaken. In order that both countries are aware of the integrity of the pest lists, some form of surveillance standard (preferably international) is required against which systems can be developed and implemented. This would require services being available that could accurately detect and identify any pests of concern associated with a product.

## REQUIREMENTS OF A QUARANTINE SERVICE

Essentially, the above implies that the key requirements of a quarantine service, regardless of where it is in the world, include:

- Communication

  Communication channels established between the two control organisations that will enable free information flow (eg. organisms present on produce, import regulations, etc).

- Surveillance

  Knowledge of what organisms are present on what crops in a particular country (can be determined by planned surveys, insect traps, general ongoing identifications by scientists and field workers, etc)

- Pest Risk Analysis

  A documented procedure in place that enables organisms associated with a product to be categorised into quarantine (action) and non-quarantine (no action).

- Training - Inspection

  Inspectors (both import and export) trained to recognise pests of concern to the importing country.

- Export Certification

  Procedures in place to ensure that exported produce is inspected in the appropriate manner (eg. sample size, probability of tolerances not being exceeded) so that it satisfies the tolerance levels set by the importing country.

- Import Inspection

  Procedures that would mirror those for export certification. That is, produce sampled at the appropriate rate to ensure the supply country is meeting the import specifications.

- Legislation

  The necessary powers to enable the inspectors to take any appropriate quarantine action (eg. refusal to certify export produce or the requirement to treat imported produce).

## QUARANTINE AND QUALITY CONTROL

As far as phytosanitary quality control is concerned, from an export point of view the final responsibility is that of the certifying organisation. The certifying officials need to know what to inspect for (i.e. take action against) to enable phytosanitary certification and exporters and producers in turn need to know what to check for during packing and what activities need to be undertaken in the field. In other words, quality control should commence at the very start of the operation and proceed throughout with feedback to the previous sector from the following one. If this procedure is followed, then any mistakes that occur can be corrected as soon as possible within the system and the consequences minimised. It makes a great deal of sense to identify a pest problem in the field and fix it then, rather than have the produce harvested, packed and presented for inspection at the export border, only to have it rejected certification with the consequences of having to then sell it on the domestic market at a lesser price.

The International Organisation for Standardisation (ISO) defines quality as:

> "the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs".

Quality control is defined as:

> "the operational techniques and activities that are used to fulfil the requirements for quality".

You will note the very close similarity between the definition of quality and the one given earlier for marketing. As far as quarantine is concerned, the stated or implied needs in the definition of quality, are those of the inspector at the importing border.

## QUARANTINE AND QUALITY ASSURANCE

Depending on the consequences of market failure, it is often appropriate to apply energy within the production system to reduce the chances of this. In other words it may be necessary to identify those areas in the production pathway where faults could develop and develop control measures to ensure this does not happen. Essentially this is a hazard analysis critical control pathway (HACCP) and as such should be documented as part of a quality manual. Documentation would enable those involved (i.e. producers, graders, packers, cool store operators, exporters, inspectors and transporters) to be aware of the duties expected of them and the activities required to maintain the correct condition of the product. If such an approach is to be followed, it requires a degree of organisation and should be coordinated by one sector of the distribution channel. Generally this is the exporter as they are responsible for ensuring the market/customer requirements (i.e. grade) are also known and met. If the exporter happens to also be the producer, this is relatively straight forward. But when there is more than one pack house/supplier it is important that the grade specifications from the exporter are documented and available to suppliers.

It is appreciated that the exporter may not necessarily know how to most effectively and efficiently produce products to meet the grade and phytosanitary specifications and so this is often the role of the extension service of the local Ministry of Agriculture (if such a service exists - in New Zealand it does not) and/or commercial consultants. Advice as to the most appropriate production system can be given and producers, graders and packers monitored to ensure they are undertaking their roles in an appropriate manner.

It is recognised that if all the critical inputs to a process are identified and appropriate controls applied, the end product will very likely satisfy the specifications of the customer. This then means, that rather than inspect produce at the point of export (which may often be too late), energy may be more profitably expended by continually monitoring the whole system to ensure that the particular operations are carried out correctly and hence reduce the likelihood of failure. This is the concept of quality assurance which is:

> "all those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality".

## ACCOUNTABILITY FOR EXPORT CERTIFICATION

Although the exporter may be responsible for ensuring the product that he presents for certification meets the importing country's phytosanitary requirements, as mentioned earlier, the final responsibility is still with the export certification officer. The "rules" that the certification officer must work to are those based on international conventions, guidelines and principles as once the produce leaves the country, it is no longer under their jurisdiction. Hence, any national rules imposed on exports no longer apply after export certification, unless of course they are there to support the international rules developed by FAO and GATT (assuming of course that these are the rules to which the importing country works to). Under these circumstances, the actual "department" that controls the export certification should not be of primary concern as long as the importing country has confidence in the export system and is able to hold someone accountable should failure occur. In most cases however, there tends to be a very strong desire by an importing country to be able to hold the government of the exporting country accountable for certification failure and hence require that the persons responsible for export certification belong to a government department. There should be no reason however, why a government department could not delegate the export certification activities to a third party as long as it is understood that they would still be accountable for any systems failure (this would obviously require the gov-

ernment department to approve/accredit the system employed by the certifying party and undertake appropriate audits).

## SEPARATION OF DEVELOPMENT OF STANDARDS AND DELIVERY OF SYSTEMS

From an organisational point of view, it is useful that the officials responsible for setting the export standards (i.e. ascertaining the importing country's quarantine requirements and the standards which the system must meet to enable certification) are separated from those that develop and deliver the actual systems. This focuses accountability to where it should be and readily enables a second body to be involved (if appropriate) with the development and delivery of the export systems. As mentioned above, the systems would need formal approval which would transfer accountability to those with the overall responsibility for export certification. The control authority would then need to audit the systems to ensure compliance with the agreed accredited system to enable certification.

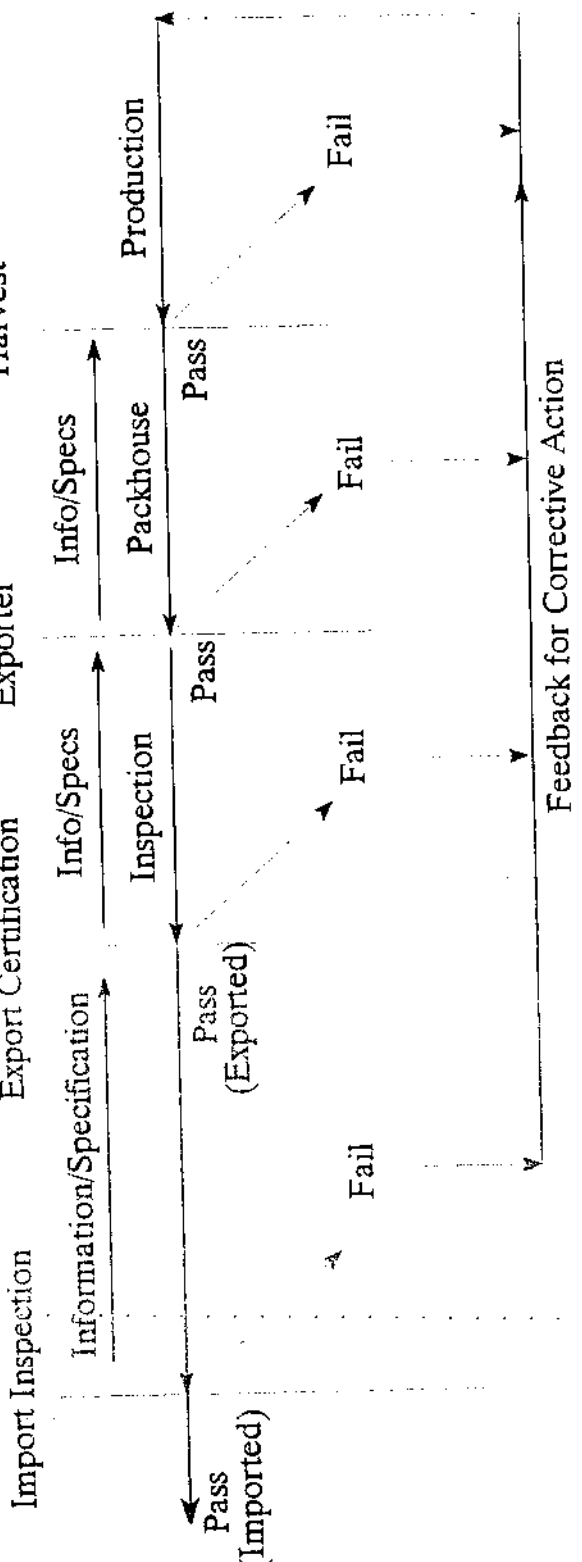
Regardless of who undertakes the certification activities, whether these be at the point of export or as a result of auditing quality assurance systems, two important points remain. These are that:

i) it is the importing country that determines what phytosanitary and grade standards must be met; and

ii) there must be ultimate accountability within a system and with government certification this is generally the responsibility of a government department (even though services may be undertaken on their behalf).

Some of the ideas discussed above are further elaborated in Figures 1-4.

*Figure 1.*


QUALITY SYSTEM FOR EXPORT PRODUCE
Import Inspection
Export Certification
Exporter
Harvest
Information/Specification
Info/Specs
Inspection
Info/Specs
Packhouse
Production
Pass
(Imported)
Pass
(Exported)
Pass
Pass
Fail
Fail
Fail
Fail
Feedback for Corrective Action
11 March 1994

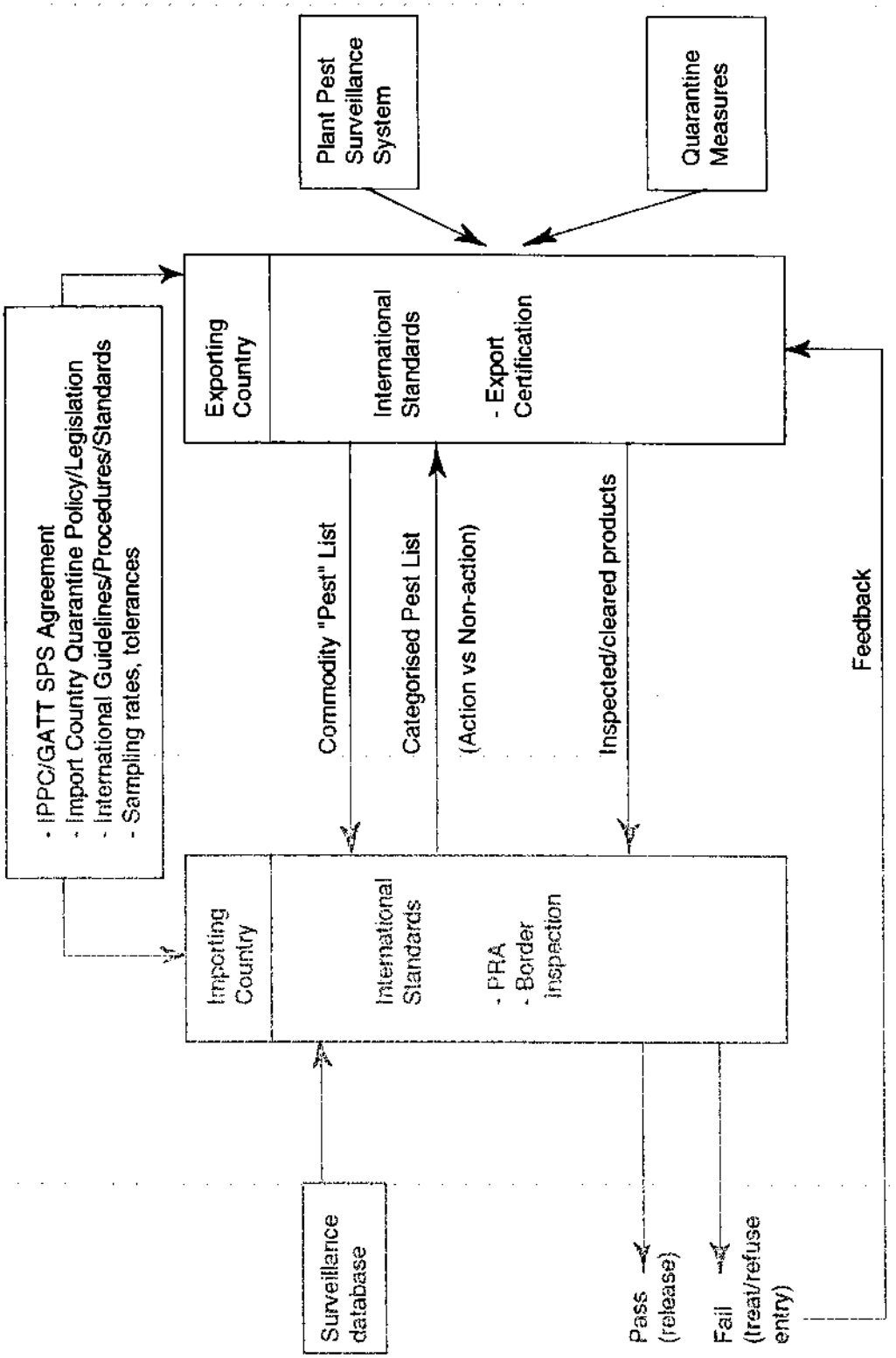



*Figure 2.* **Phytosanitary Proceduresfor Plant Produce Moving in International Trade**

*Figure 3.* **AUDIT PYRAMID**

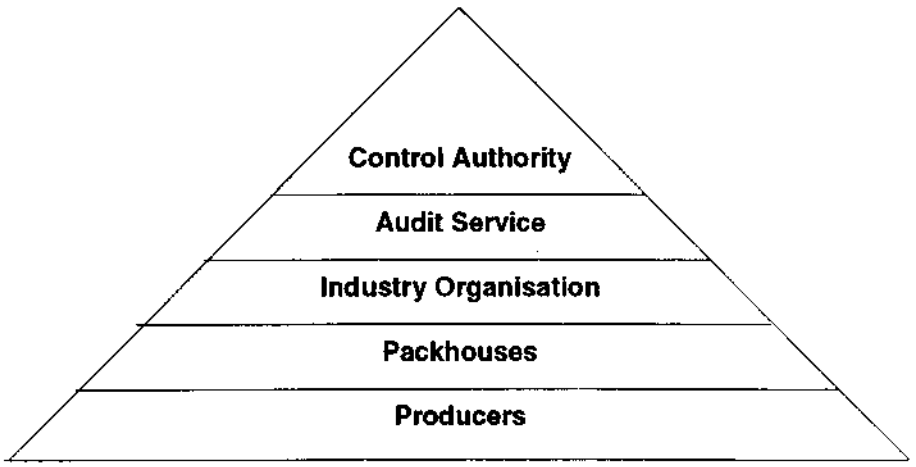
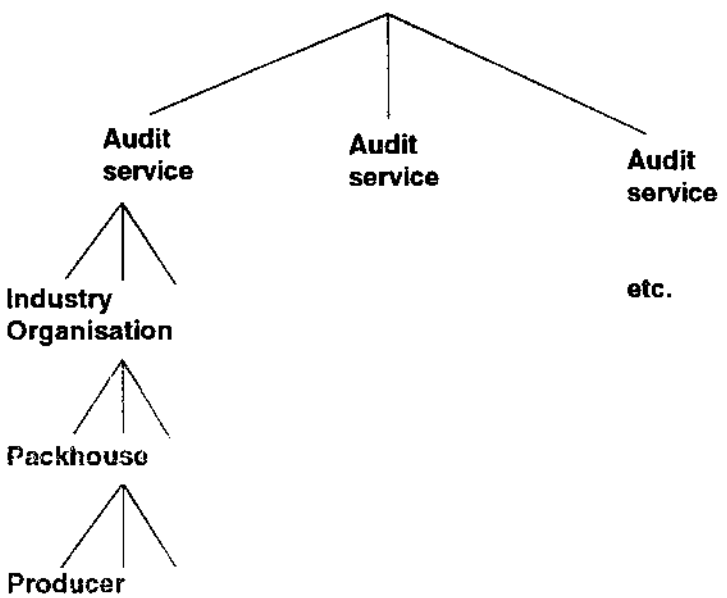



*Figure 4.* **Control Authority**



# THE PROCESS OF QUARANTINE IN PNG AND ITS PRESENT STATUS

D. Kanawi[1], A. Bannick[2], G. Kula[3]

***ABSTRACT***

*The Papua New Guinea Agricultural Quarantine Inspection Service (PNG AQIS) under the existing structure is unable to perform to expected standards. The lack of equipment, facilities and manpower are the major factors resulting in general deterioration of quarantine service in Papua New Guinea. Papua New Guinea is relatively free from serious pests and diseases of plants and animals. In order to protect the health status of our plants and animal resources. PNG must maintain an effective quarantine service to prevent exotic pests, diseases and other harmful plants and animals entering Papua New Guinea. It is about time that changes were made in the existing Quarantine operations and establishment before exotic pests, diseases and harmful plants start establishing themselves in PNG. It is proposed that PNG AQIS be established as a division under the Ministry and administration of the Department of Agriculture and Livestock. Under this set up proper attention be given to improve its organisation, manpower and quarantine facilities in various ports.*

***Key words:*** *Quarantine, manpower needs, service equipment, quarantine facilities, back-up service.*

## 1.0 INTRODUCTION

The AQIS was established under thsanitary Procedures for Plant Produce Movinge Ministry of Public Health and administrated by the Department of Agriculture and Livestock to enforce the Quarantine Act Chapter 234 which is responsible for the prevention of the introduction and spread of pests and diseases affecting animals and plants.

Fortunately, Papua New Guinea is relatively free from serious pests and diseases of animals and plants. Some serious diseases affecting animals and not present in PNG are Foot and Mouth disease of cattle; New Castle disease of poultry and African Swine Fever of pigs. Kphara beetle (storage pest on grains and stored products); Coffee Berry Borer are few examples of serious pests that are absent in PNG.

Introduction of such pests or diseases into PNG can cause economic disaster to the welfare of our agriculture based society.

With increasing trade, tourism and international flights between other countries and PNG, there is also an increasing risk of introduction of exotic pests and diseases. Therefore right organisation, trained manpower and right facilities be placed in each port to maintain our pest and disease free status as long as possible.

This paper is intended to highlight the following:-

i) Functions of PNG AQIS
ii) Existing Structure
iii) Manpower
iv) Equipment and facilities.

## 2.0 FUNCTIONS OF THE PNG AQIS

The Agriculture Quarantine Service is empowered under the Quarantine Act Chapter 234 to police the terms and conditions and the regulations under the Act. The Quarantine Service is responsible for two (2) regulatory functions under the Quarantine Act.

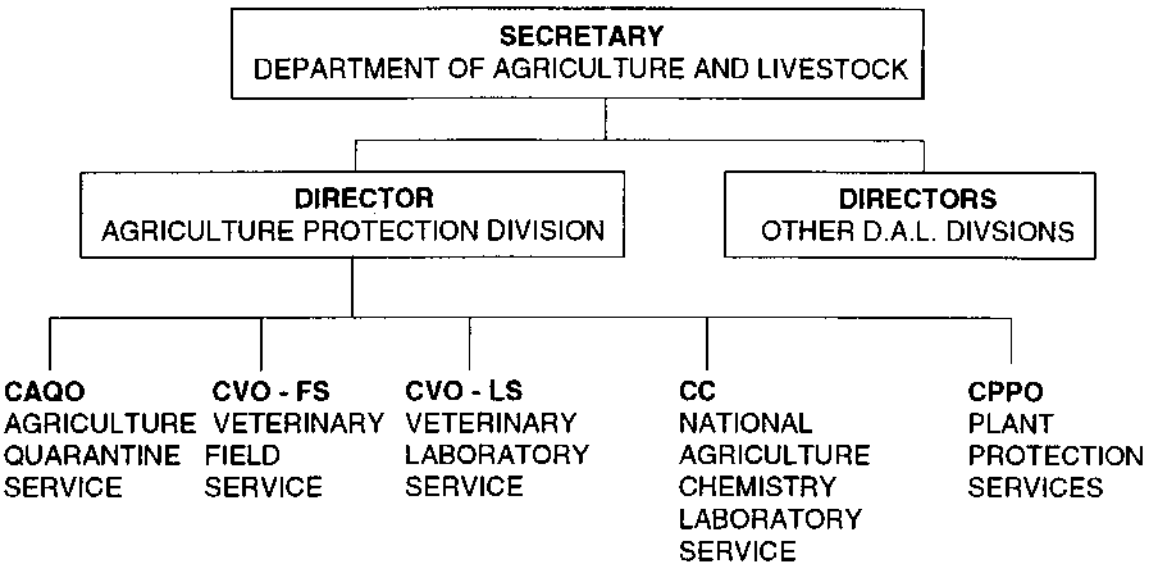
These are:-

(a) **Issue of Permits:**

The Quarantine Service has in place a Permit System through which it regulates and monitors imports of all fresh, frozen and processed food materials, live animals and plants. Permits are

[1,2,3] Agriculture Protection Division, Department of Agriculture and Livestock, P O. Box 2141, Boroko, Papua New Guinea.

*Figure 1.* **AGRICULTURAL QUARANTINE AND INSPECTION SERVICE ESTABLISHMENT UNDER DAL ADMINISTRATION**




CAQO - CHIEF AGRICULTURE QUARANTINE OFFICER
CVO - FS - CHIEF VETERINARY OFFICER - FIELD SERVICES
CVO - LS - CHIEF VETERINARY OFFICER - LABORATORY SERVICES
CC - CHIEF CHEMIST
CPPO - CHIEF PLANT PROTECTION OFFICER

issued for imports of all these commodities.

These permits issue guidelines and import commodities, aimed at providing agricultural and health security of our plant and animal resources by preventing the introduction of harmful pests and diseases into PNG. Similarly phytosanitary and other certificates complying with the quarantine requirements of importing countries of PNG exports are also issued with the intention to emphasize strict quality control of our agricultural exports to be more competitive in the international markets.

b) **Inspection Service:**

The Quarantine Service is also empowered under the Quarantine Act to carry out inspection on arrival of all bulk imports. Examination of incoming used vehicles/machinery and equipment, overseas aircrafts and vessels and issuance of clearance certificates for all imports arriving into the country.

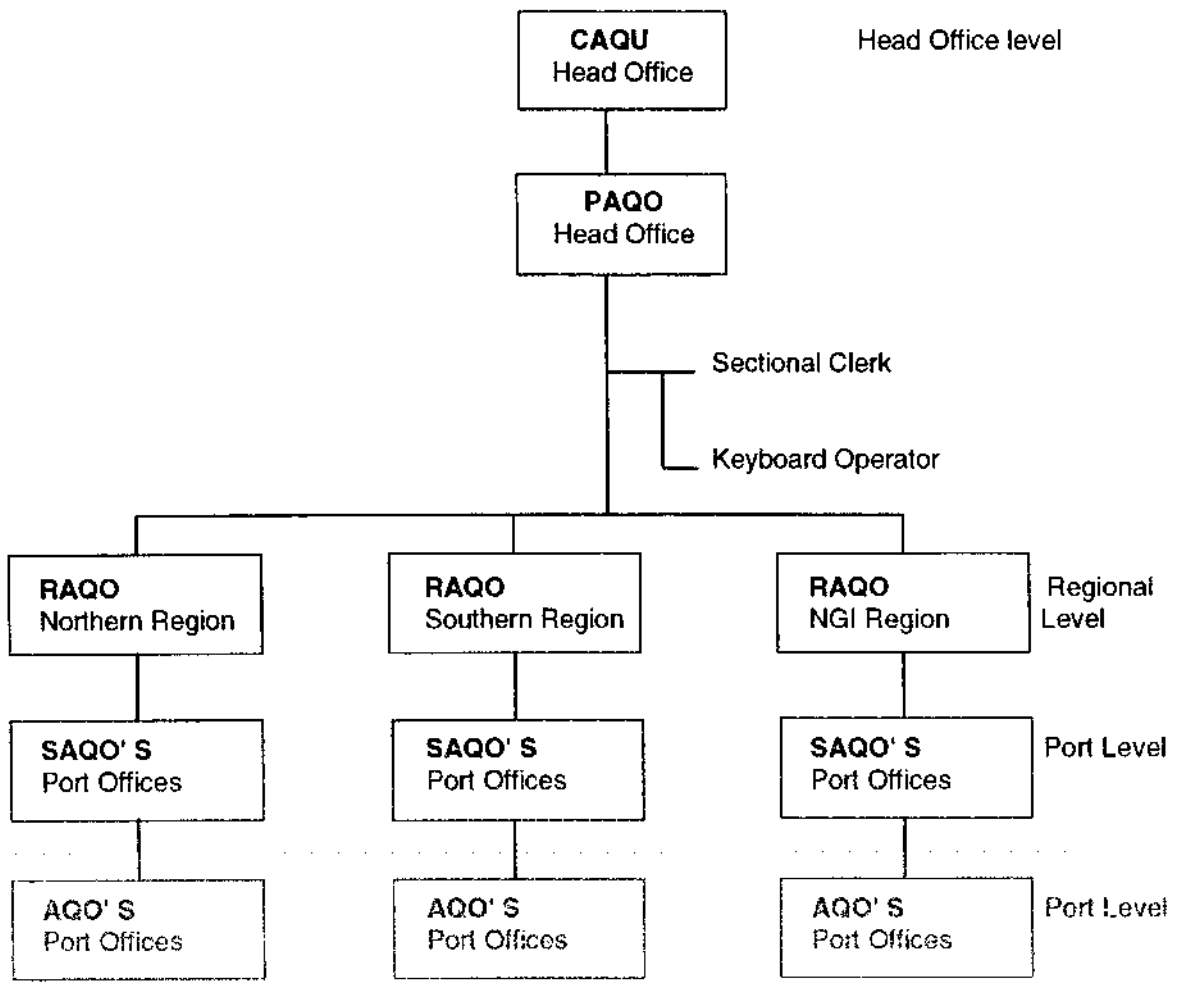
Similarly the Quarantine Service also emphasizes strict quality control of our agricultural exports by inspection, grading and certification of all agricultural commodity exports. Without the appropriate quarantine certification our agricultural exports may not be allowed entry into some countries. Quality control of our exports ensures that we get the maximum value of our commodities in foreign exchange.

## 3.0 EXISTING STRUCTURE

Under the existing structure, Agriculture Quarantine Service operates as a Section of the Agriculture Protection Division under the administration of the Department of Agriculture and Livestock.

The structure is illustrated on Fig. 1. This shows that the Director is also responsible for other sections and is not devoting enough time to deal with quarantine matters.

*Figure 2.* **AQIS CHANNEL OF COMMAND STRUCTURE UNDER EXISTING STRUCTURE**




CAQO - CHIEF AGRICULTURE QUARANTINE OFFICER
PAQO - PRINCIPAL AGRICUTURE QUARANTINE OFFICER
RAQO - REGIOAL AGRICULTURE QUARANTINE OFFICER
SAQO - SENIOR AGRICULTURE QUARANTINE OFFICER
AQO - AGRICULTURE QUARANTINE OFFICER
KBO - KEYBOARD OPERATOR

The present structure does not allow for the recruitment of Plant Pathologists, Entomologists and Veterinary officers and these services are provided by Plant Protection Section and National Veterinary Laboratory Sections which is far from satisfactory.

### 3.0.1 Decentralization of Quarantine Administration

The Quarantine Service underwent structural re-organization in 1992 following recommendation from the New Zealand Consultancy Report 1989 (ANZDEC 1991).

The re-organization (Fig. 2) involved the decentralization of the Quarantine Administration within the DAL Policy guidelines to bring agricultural services closer to the general public, importers and exporters and the rural community. Three (3) Regional Offices were then established viz, the Southern Region with the Regional Office located

in Port Moresby, the Northern Region with Regional Office located in Lae and the New Guinea Islands Region with the Regional Office located in Rabaul.

The Quarantine Service has to date established 17 Port Offices in the major port of entries throughout the country as shown below.

(i) **Southern Region:**

Port Moresby - Wharf (Waterfront)
- Airport/Post Office

Popondetta
Alotau
Misima
Daru
Tabubil

(ii) **Northern Region:**

Lae
Madang
Wewak
Vanimo
Mt Hagen

(iii) **New Guinea Islands Region:**

Rabaul
Kavieng
Kimbe
Manus
Buka

Future plans are underway to restore quarantine services in other ports of the North Solomons Province (Kieta/Buin). A port office will also be established on Lihir Island should the need arise coinciding with the opening of the Lihir Gold Mine.

## 4.0 MANPOWER

Under the existing structure the Quarantine Service has a total staff strength of 43 with additional 5 positions created and pending approval from the Department of Personnel Management.

Occupied positions under the existing structure are shown below:-

| Positions | Number |
|---|---|
| Chief Agricultural Quarantine Officer | 1 |
| Principle Agriculture Quarantine Officer | 1 |
| Regional Agriculture Quarantine Officer | 3 |
| Senior Agriculture Quarantine Officer | 23 |
| Agriculture Quarantine Officer | 13 |
| Keyboard Operator | 1 |
| Section Clerk | 1 |
| | 43 |

The Quarantine Service also employs Support Staff (labourers) to assist Quarantine Officers to carry out quarantine duties. A total Support Staff strength of 25 personnel are engaged and distributed throughout the port offices.

## 5.0 OFFICE FACILITIES, MACHINERY AND EQUIPMENT

Quarantine Section has a total of 17 offices and 7 of this are at the headquarter while 10 are situated in various ports. Those situated in various centres are provided office space by Provincial governments, Mining Companies and various boards or Air Niugini. Most of these office buildings have not been maintained over the last ten years and consequently require major renovation or repair work.

Small incinerators, using wood/fuel were installed in most ports and due to lack of maintenance, they are non operational at present. At Jackson's airport, incinerator is not operating for the last 7 years. This will be replaced by a gas operated incinerator in 1994. In most ports inspection equipment, including rikens, face masks, gas analyzers and handy tools are lacking. This means that proper inspection procedures cannot be followed.

The furniture in most port offices is very old and require replacement. These port offices have adhoc arrangements with Provincial DPIs. Mining Companies and some exporters to assist with typing, fax and photocopying. In most cases these arrangements are inconsistent and have caused frustration among officers.

All quarantine offices are linked with telephone and some are also connected with fax machines.

## 6.0 CONCLUSION

It is proposed that the PNG Quarantine Authority be established in the Department of Agriculture and Livestock in order to facilitate and up-grade the PNG Quarantine Service status and functions comparable to those of our international trading partners such as Australia and New Zealand.

### REFERENCE

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# THE DEVELOPMENT OF SMALL-SCALE FOOD PROCESSING ENTERPRISES

Andrew Jones[1]

***ABSTRACT***

*The development of small-scale food processing enterprises creates employment opportunities and generates income particularly for poor people in rural areas. This paper describes the advantages and benefits of small-scale food processing and the challenges facing small entrepreneurs, enterprise development agencies and Governments. The challenges range from markets and business skills, consumer perceptions, the social and political climate, access to information and access to credit. The paper then describes the approach and activities of Intermediate Technology in helping to overcome these challenges and develop small-scale food processing enterprises. The activities assist the entrepreneur to make informed decisions and achieve quality, profit and sustainability. The principal activities are: training, publications, technical enquiries, technology development and technology transfer.*

***Key words:*** *Small-scale food enterprices, employment, income generation, quality, profit, sustainability.*

## INTRODUCTION

The development of small-scale food processing enterprises creates employment opportunities and generates income. Small-scale food processing is a viable option for poor people in developing countries. It requires low capital investment and technologies which can be easily understood and transferred. At small-scale the diverse range of high quality food products which can be made enables small entrepreneurs to take advantage of market opportunities. However there is a lot of competition both nationally and internationally from all sizes of enterprises. For a small-scale food processing enterprise to be successful and for this sector to continue to make a valuable contribution to economic growth and development there are three essential factors that are all equally important: Quality, Profit and Sustainability. In this paper I shall describe the context and challenges facing small-scale food processing enterprises and describe what Intermediate Technology is doing to help meet these challenges and help develop this sector. In essence I shall describe how to achieve quality, profit and sustainability.

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## THE ADVANTAGES AND BENEFITS OF SMALL-SCALE FOOD PROCESSING

Sustainable small-scale food processing responds to local needs, builds on local knowledge and skills and uses local resources. Small-scale food processing equipment is adaptable. It can be owned locally, managed locally and repaired and maintained locally. Small-scale food processing can also increase the choice of food products available to the consumer.

Small-scale food processing operations have a low capital investment requirement typically between One Hundred and Five Thousand Pounds, use local raw materials, involve technologies that can be easily understood and transferred and make small quantities at a profit.

By combining well established principles and appropriate equipment with good standards of quality and hygiene, small enterprises are able to make products of high, marketable quality.

Typically small enterprises can make a wide range of products using techniques such as drying, pickling, smoking and salting. Other technologies suitable for small-scale food industries include oil extraction, baking, fermentation and the production of juices, jams and snackfoods.

The benefits of small-scale food processing include:

- the potential for adding value to basic agricultural produce and access to wider markets for agricultural produce
- improving the small entrepreneurs' income
- improved use and control of local resources and skills
- helping to create employment for poor people particularly in rural areas.

## ENTERPRISE DEVELOPMENT AND FOOD PROCESSING: THE GLOBAL SCENE

The economic system which has had the greatest impact on the global economy is the market economy. In a market economy there are two contrasting scenarios. On the one hand there is unlimited choice for the consumer who can afford it. On the other hand, for the farmer who supplies the agricultural produce, there is dependence on the demands of the market. There are also two contrasting physical effects. One is that small-scale enterprise development can provide alternative opportunities to agricultural production. The other is that multi-national corporations have expanded and have better access to markets, media and credit than the small entrepreneur. Furthermore they can influence manufacturing practices and standards which do not necesssarily benefit the food industry as a whole but only the larger companies who can afford to implement the required changes.

The other picture in the scene which requires greater examination is food technology itself. Rapid advances in all aspects of modern food processing have created a technology gap in which the specific needs of developing countries have been overlooked. Northern industrialised technologies are not usually appropriate to the requirements of small-scale producers where the need is for low cost technologies which can be operated and maintained locally. There are unfortunately too many examples where modern industrialised plants have been installed only to become redundant after a short time because the local infrastructure could not support them. A typical scenario is that the modern food processing operation is never able to run at anywhere near its production capacity and therefore can never be viable. An example of this is the construction of a modern fruit and vegetable processing factory in Ecuador. At maximum production capacity, this factory would dominate all other processing activities in the region. yet, despite the presence of foreign consultants and five years supply of spare parts for the machinery, the factory has still to start production. Now local farmers are using the factory to clean their vegetables prior to distribution throughout Ecuador. However this particular business still has to continue to compete with the local distributors and the advantages and benefits of selling to the factory continue to be hotly debated amongst the farmers groups.

## CHALLENGES FOR THE SMALL ENTREPRENEUR, ENTERPRISE DEVELOPMENT AGENCIES AND GOVERNMENTS

The market economy and the advances in food technology offer great opportunities for the food industry. However there are a number of challenges for the small-scale sector of this industry which, if not tackled can limit the success not only of the enterprises themselves but also the success and purpose of enterprise development agencies and the consequential benefits to the economy and society. The first step in tackling any challenge is to be able to define it.

### 1. Markets and Business Skills

With any business, large or small, viability depends on there being a market for the goods which are produced. This may sound like an obvious statement but it is surprising how often businesses are established without this prerequisite. Thus, for example, the starting point for a food processing enterprise should not be that there is a glut of tomatoes... therefore we can make tomato sauce. The starting point should be that there is a demand for tomato sauce; where can I buy the tomatoes? Marketing is also affected by the social and political climate, described below, and the competition both from national and international companies.

The other essential prerequisite is the desire to run a small business, whatever the reasons that produce that desire. If that desire is lacking then it is unlikely that the business will be a success. The roles of an enterprise development agency in this process are to emphasise that 'ownership' and responsibility for the enterprise rest with the entrepreneur and to encourage more potential entrepreneurs to 'come forward' as opposed to identifying people thought to be suitable.

2. Consumer Perceptions

Related to the market is of course the perceptions of the consumer towards small-scale food processing businesses. These perceptions can be categorised into two general areas:

a. **Food Safety**

Food safety is the responsibility of all food businesses - large or small. However it is the small businesses who have to work harder to convince the consumer that their food products are just as safe as those produced by large businesses. This task should, in theory, be aided by the fact that the great majority of small-scale food processes have an extremely low risk of causing food poisoning. Surveys carried out in Indonesia, Nepal and India have shown that, for example, the microbiological count in street foods are not a serious problem. (Battcock 1993).

This does not mean of course that there is nothing to be done with regard to food safety: there are cases of food adulteration and food poisoning which can be traced back to small businesses. Thus food processing enterprise development programmes must also include training in quality control techniques to ensure that the entrepreneur knows how to control the process to maximise food safety.

b. **Packaging**

Another key consumer perception that can be a constraint to the success of a small business is the appearance of the product on the shelf and how that relates to the quality of the food inside the package. It is a fact that there are only limited options regarding choice of packaging for a small business. The creative and innovative instincts of the entrepreneur are most clearly called upon here to attract the consumer to buy his or her product.

3. Social and Political Climate

The social and political climate has a critical role in the development of the small-scale business sector and most of the above mentioned constraints can be related in some way to the social and political climate. In fact it can be said to influence all aspects of small-scale food processing enterprise development. For the purposes of this paper I have categorised it into three main areas:

a) **Government Policy**

The following areas are most obviously related to the policy decisions of Governments and can constrain small-scale enterprises: Quality standards, subsidies and import policy.

## QUALITY STANDARDS

Quality management costs money and the increasing legal requirements for more detailed quality management systems mean greater costs. Small businesses are thus at a disadvantage because they can least afford to implement the full requirement of the quality management standards. Already there are examples in Europe where the livelihoods of small companies could be threatened by the Standards Regulations BSS750 and ISO9000.

Another issue is the legal requirement of quality standard certificates for different food products. Often this is an extremely expensive procedure which includes paying for lengthy and detailed food analysis as well as the administrative fees. This puts the small business at a disadvantage. An example is the requirement for a quality standard certificate from the Sri Lanka Standards Institution for jams, cordials and fruit drinks (Ariyabandhu 1993). At small-scale these products, which have an extremely low risk of causing food poisoning, can be made at very high quality. Certainly it is always an advantage to the business if it can show compliance to legal requirements. However a less expensive alternative is required which is applicable to all industries. In this way, in terms of quality assurance, small enterprises can be judged by the consumer as an equal to larger enterprises. Furthermore a less expensive quality assurance system applicable to all industries will avoid any negative perceptions attributed to a two-tier system.

## SUBSIDIES

A clear indication of support for the development of the small-scale sector can be best demonstrated by the provision of subsidies. For example business parks which are tax free zones and include low rent buildings should also be made available to the local small industries.

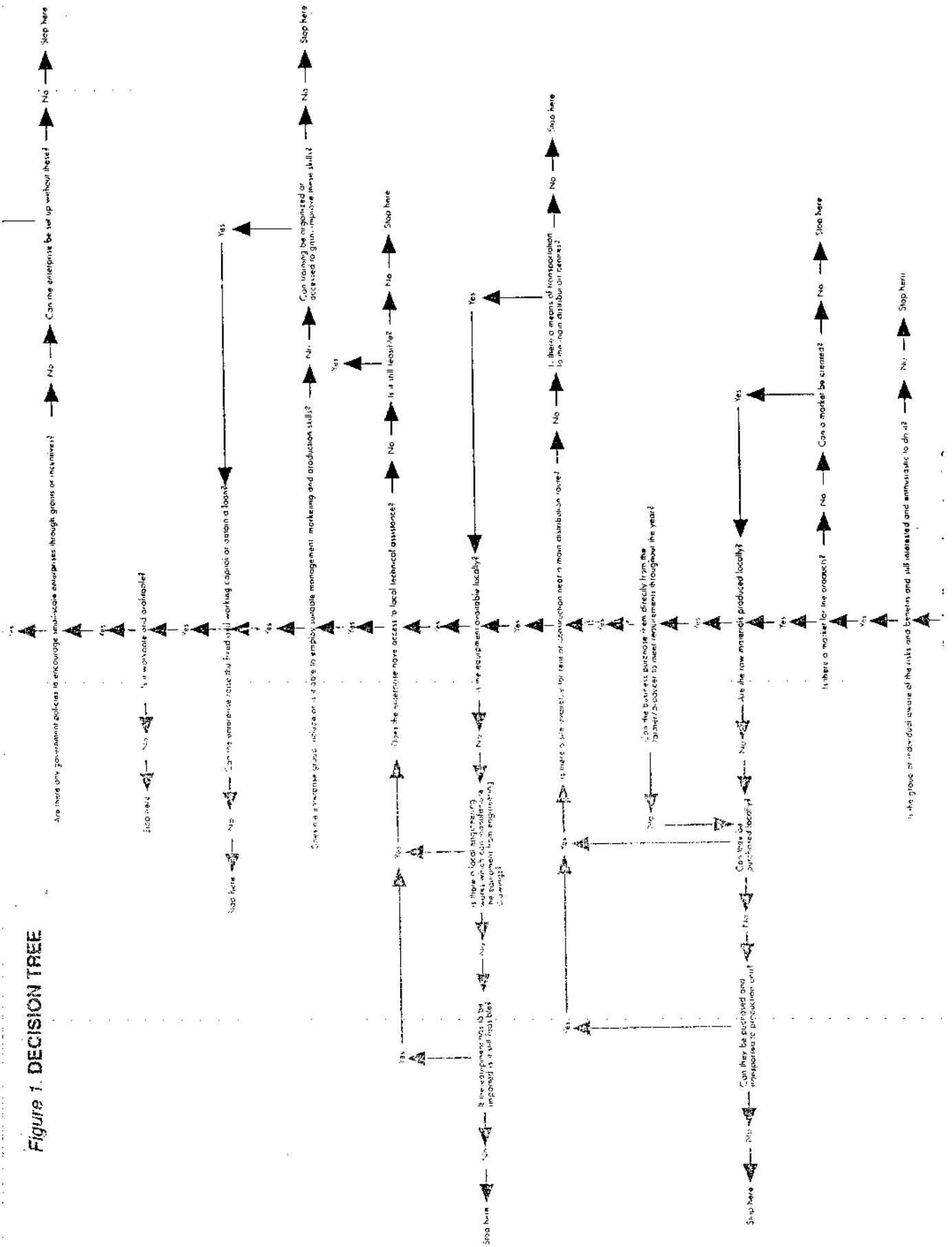


*Figure 1.* **DECISION TREE**

## DECENTRALISATION

Any policy to centralise the food industry clearly limits the opportunities for economic growth in the rural areas. This is discussed later with regard to oil processing in Zimbabwe.

## IMPORT POLICY

High taxes and tariffs on the importation of certain raw materials and low taxes on the import of finished goods can be a disadvantage to the small business if those imported raw materials are required to manufacture a product which is imported at a low tariff. This makes it more difficult for the small business to compete.

### b) Access to Information

Information is a very broad area and includes not only specific technical information but information on business, marketing, credit and training programmes. A lack of good quality information in any one of these areas impairs the ability of the small entrepreneur to compete in the marketplace. Information is also the area where small enterprise development organisations can take a more leading role and achieve early results. Nevertheless, Government policy can certainly influence the information resources available to the small entrepreneur.

### c) Access to Credit

As serious a constraint as a car with an empty fuel tank, credit is often the biggest obstacle to the small entrepreneur before he or she can get the business off the ground and despite the many years of enterprise development programmes, the number of successful credit schemes for small enterprises are very few. Some notable examples are The Grameen Bank in Bangladesh and the Rural Enterprise Development Service (REDS) in Sri Lanka. It therefore seems that, still, small enterprises are seen as a bad risk. Certainly in any evaluation of enterprise development one has to look at the complete picture. In that respect credit is just one of many factors which constrain small enterprise development but it is a factor which is clearly dependent on many social and political aspects. Thus alleviation of the constraints across all the policy areas described above may improve the opportunities for small entrepreneurs to obtain credit. If there is more wide ranging support for small enterprises then the risks and challenges faced by them will be more comparable to those faced by large enterprises and so credit organisations can be more confident about loaning their money.

The decision tree in Figure 1 illustrates the process of analysing the feasibility of any business venture. Many of the factors which challenge a small business are described in a logical manner and their relative importance to the success of a business is indicated. In other words the easier it is for a small business to climb the decision tree the more likely it is that the enterprise will be successful.

## HOW INTERMEDIATE TECHNOLOGY IS HELPING TO DEVELOP SMALL-SCALE FOOD PROCESSING ENTERPRISES

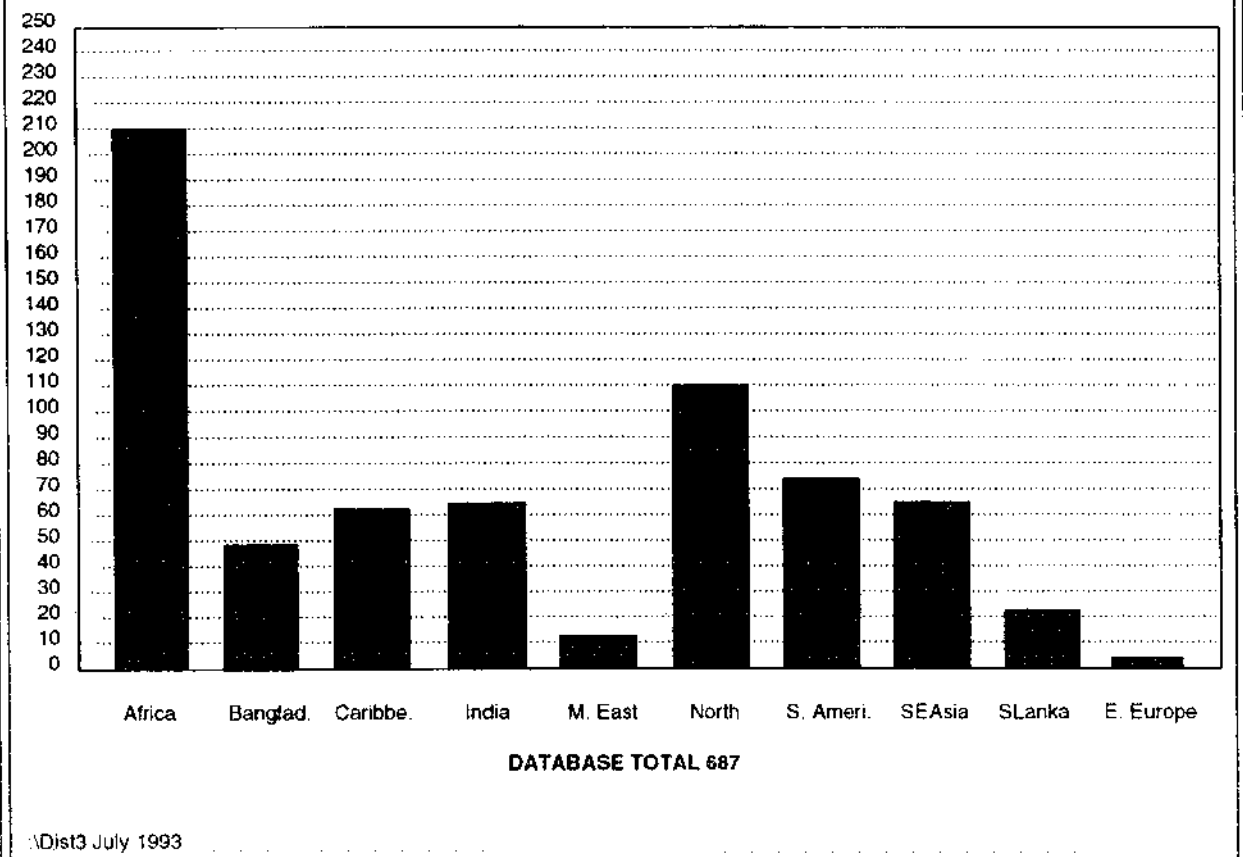
The mission of Intermediate Technology is to enable poor people in Africa, Asia and Latin America to develop and use productive technologies and methods which give them greater control over their own lives and which contribute to the development of their communities. One of ITDG's most important principles is that 'Users must be Choosers'. In other words Intermediate Technology aims to provide technology choices from which the intended beneficiaries must decide what is appropriate to their needs. In this respect, enterprise development is no different. Enterprise must be a choice and the specific activity of that enterprise must also be the choice of the entrepreneur.

Intermediate Technology, a charity established in 1965, now has offices in seven countries including the UK office. Our main technology areas are Food Processing (e.g - Oil extraction in Zimbabwe); Agriculture (e.g - irrigation in Peru); Livestock (e.g - Vets in Kenya); Fisheries (e.g - boat building in India); Energy (e.g - Micro-Hydro, Nepal, e.g - stoves, Sri Lanka); Housing (e.g - Quincha Mejorada, Peru); Textiles (e.g - Dyeing Training Course, Bangladesh); Manufacturing (e.g - blacksmiths, Zimbabwe); and Mining (e.g - Shamva, Zimbabwe).

The choice of technologies and methods begins with information. An informed decision demands an understanding of the needs to be served, the options available and the techniques, skills and resources required for a technology to be adopted successfully.

The food processing programmes of ITDG undertake the following activities to assist the small-

*Figure 2.* **FOOD CHAIN DATABASE COUNTRIES OF CONTRIBUTION**




scale entrepreneur make informed decisions.

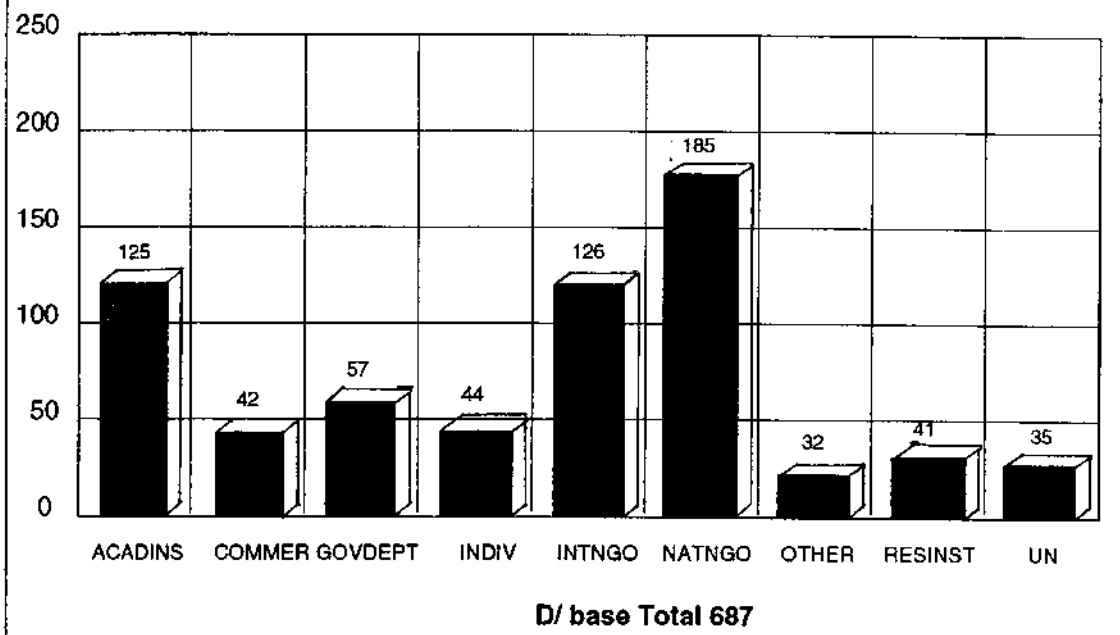
## TRAINING

Training is a very effective way of providing skills and knowledge and is by far the most important activity in all the countries where IT is working in Food Processing. The principal objective is to train trainers from a wide range of development organisations. The courses are not solely limited to technical training but are designed to cover the other important such as marketing, enterprise development, and book- keeping. After the training the trainers continue to transfer this information by training those interested in establishing a small business. The training courses in Bangladesh and Sri Lanka have created 370 businesses and 950 jobs. Sri Lanka has been running these kinds of training courses for the longest period of time and now, is preparing for a Regional Training course in July this year. An interesting coincidence is that one of the participants comes from Lae. Training courses are also now in operation in Bangladesh and Peru.

## PUBLICATIONS

ITDG publishes a broad range of books and journals about appropriate technology and development. The Food Processing Programme contributes to this method of providing information in the form of technology directories such as 'Tools For Food Processing'; technical booklets such as 'Making Safe Food: A guide to safe food handling'; technical briefs such as 'How to make Fruit Juices'; and our in-house journal 'Food Chain' which promotes south-south information exchange and is now read by more than 7,000 people across 95 countries. (Figs 2-3). The most effective way to share the information is to inform those who will inform others. For that reason the majority of the

*Figure 3.* **FOOD CHAIN STATISTICS**
**Subscriber type**




**D/ base Total 687**

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publications are directed to field workers. All the Food Processing Programmes develop their own publications. Hence also available are technical booklets and technical briefs in Bangla, Sinhala, Tamil and Spanish. A pilot version of 'Food Chain' in Spanish is now being also evaluated in Peru.

## TECHNICAL ENQUIRIES

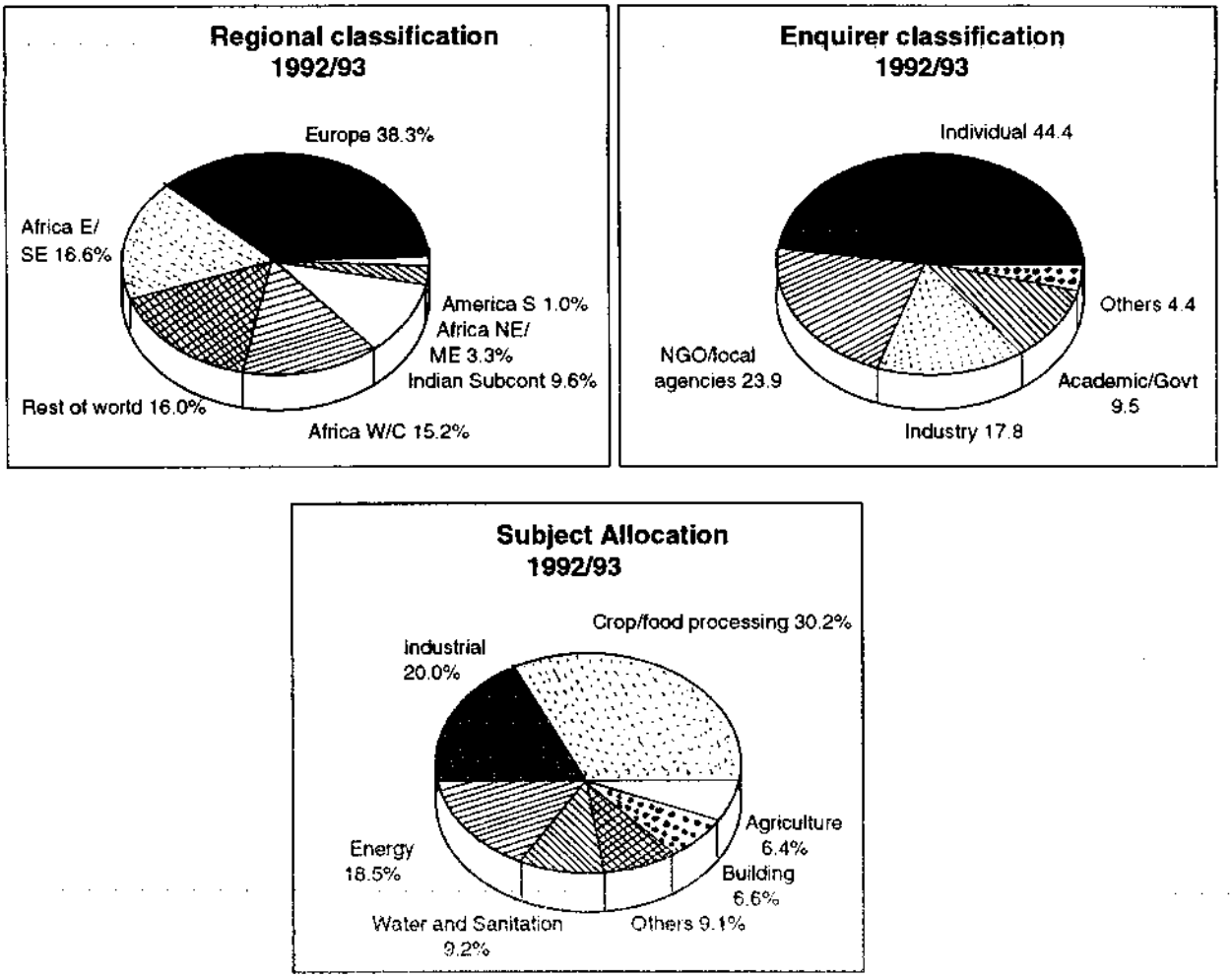
The Technical Enquiry Unit responds to a very wide range of technical enquiries from around the world. However the most common enquiry is on food processing. Of the 1500 enquiries received per year, approximately 30% request information on food processing and 26% were received from NGOs and other development organisations and 45% from individuals. For its resources the TEU can draw upon 30,000 technical articles, databases and networks. The TEU is part of a European network which broadens the range of specialist knowledge available to an enquirer and is actively building south networks to be able to refer enquirers to sources of information in their country or region. One of the advantages here is that IT already has a network with the other IT offices, a few of whom now wish to develop their own enquiry services. (Figure 4: TEU pie charts).

## TECHNOLOGY DEVELOPMENT

As stated at the beginning of this paper, sustainable small-scale food processing responds to local needs, builds on local knowledge and skills and uses local resources. It therefore follows that appropriate technology development should follow the same principles.

Most of the food processing programmes of ITDG are involved in technology development. In Peru a recently completed UNIFEM project mainly concerned the development of a wide range of appropriate food processing technologies and their adoption by women's groups. Food Processing Centres were established in the three distinct geographical zones of the country (Andes, Amazon and Coast) and in collaboration with womens groups

*Figure 4.* **Analysis of Technical Enquiries***




* 493 enquiries were received from individuals, of who 290 enquired from European locations. Of specified developing country application.

from local organisations, small-scale technologies for wine, vinegar, milling, drying, sweets and snacks were developed. The womens groups then had the opportunity to run small businesses from these centres until such time as they were ready to set up their business outside the centre, independent of ITDG and the collaborating NGOs.

In Sri Lanka, the food processing programme is continuing the development of the Tray Dryer - a mechanical drying system originally developed in St. Vincent and then transferred by ITDG to Peru where it has been successfully implemented (see below). The programme in Sri Lanka found that this version of the tray dryer was not suitable for rural enterprises in their country. This dryer which originally required a fuel such as diesel or gas and a source of electricity to power the fan, has now been developed to use waste rice husk and sawdust and needs no electricity. Although the drying capacities are lower, another viable opiton has been developed which broadens the choice for the small entrepreneur.

In Zimbabwe, more appropriate milling techniques are being developed. In Bangladesh and Zimbabwe the programme staff are developing small-scale honey processing.

## TECHNOLOGY TRANSFER

Technology transfer involves taking a technology from one person, country or region and introducing it to another. One of the most important features of sustainable technology transfer is that, like sustainable technology development, the technology should meet the needs of the new users and should be adaptable to the local conditions.

Two examples of technology transfer that ITDG has had involvement are in oil processing and drying.

### OIL PROCESSING

In Zimbabwe, an oil processing technology has been transferred from India. The oil expeller, marketed under the name of Tinytech is an off-the-shell oil expeller with pre-heating and oil filtering units attached.

The edible oil market in Zimbabwe is controlled by four large companies. Oilseeds such as groundnut and sunflower are transported from the rural areas to the urban areas where they are processed into oil. In the rural areas the supply of edible oil is erratic and when available is often sold at inflated prices.

The Tinytech technology provides the opportunity for decentralised oil processing. Such an activity generates employment and income in the rural areas and ensure more reliable and cheaper supplies of cooking oil.

In 1988 the first Tinytech oil expeller was imported to Zimbabwe for pilot testing in collaboration with a local development organisation. On the basis of successful results a processing plant was set up in Murombedzi. Now a further four mills are in the process of being set up.

The Tinytech mill, with ancillary equipment, costs approximately three thousand pounds and can process up to 207 tonnes per year (90 kg/hr) of sunflower and 250 tonnes per year (108 kg/hr) of groundnut. One of the by-products of the process is seed cake which can be incorporated into animal feeds. The programme in Zimbabwe produced a business prospectus on the Tinytech Oil Expeller which describes in detail the oil processing situation and opportunities for decentralisation with this expeller.

### DRYING

As mentioned above one of the food processing programmes most successful technology transfers is the tray dryer technology which is now undergoing technology development in Sri Lanka.

The tray dryer was originally developed in St. Vincent in response to the demand for drying sorrel which is made in to a very popular traditional drink. The tray dryer enabled the sorrel to be dried without significant loss of colour (a key quality indicator) and without going mouldy. It was then stored so it would be available to make sorrel when the fresh sorrel was not available. From St. Vincent the tray dryer was transferred to Guatemala where it underwent further modifications at a farmers cooperative who were making dried culinary herbs. From Guatemala, the technology has now been transferred to Peru, Ecuador, Colombia and Cuba, Lesotho and Bangladesh, India and Sri Lanka. In Peru alone there are 40 dryers known to be in operation. They are mainly used for drying herbal teas. It is estimated that there are now more than fifty dryers in ten countries and with two

to three people employed **directly** as a result of each dryer and up to eight other people per dryer involved in downstream and upstream activities. Hence, in total, approximately 300 jobs have been created.
In nearly all the countries where the tray dryer has been transferred some modifications have taken place to suit local requirements. The most interesting developments to date have taken place in Sri Lanka where an alternative heating system has been developed. One of the key requirements for successful technology transfer is that the technology can be adaptable to suit local conditions. (Jones 1993)

There are two basic types of tray dryer: batch and semi-continuous version is more popular. Costs of equipment range from approximately eight hundred pounds for the small semi-continuous dryer mainly constructed from wood to four thousand pounds for the large semi-continuous dryer which has more ironwork. (These costs may vary depending on the costs of labour and local raw materials). The heater unit is the most expensive component of the dryer and this accounts for the development of the biomass heater in Sri Lanka. However, in Peru a local engineering workshop is now manufacturing its own diesel heater. The drying capacity of the large semi-continuous dryer for parsley is approximately 120 kgs fresh parsley per day; approximately 80 kgs per day for the batch dryer.

## CONCLUSION

Small-scale food processing is a viable option for enterprise development. Technologies that can be understood, require low investment and can make a diverse range of food products are attractive to the potential entrepreneur and have a broad range of benefits to the local community. However for small-scale food processing enterprises to be successful and for this sector to make a valuable contribution to economic growth and development the three key factors: quality; profit and sustainability must be achieved.

The quality of food products not only ensures that food is safe but also that consumers will want to purchase that product again. It concerns the food itself, the harvesting and later processing operations, packaging, distribution and retail right up to the point where the food is consumed. Training courses provide an unparalled opportunity to stress the importance of food quality and inform the participants on the ways and means of achieving consistently high quality foods. The consumer perception to foods produced at small-scale is largely governed by the social and political climate. Where this is unfavourable, the promotion of small enterprises in a positive light should be encouraged to help to change consumer attitudes. This type of promotion even occurs in Rugby (where I live). Small shops and businesses in Rugby are promoting the BEAR campaign - Buy Everything At Rugby.

All enterprises, whatever their size, need to make a profit. Other basic facts about profit are that you need a market for your product and you need technology options to help you choose what you can make and how you make it. Information is the key to helping the entrepreneur make decisions. Training assists the entrepreneur in assessing market potential, devising market strategies and calculating profit.
High quality and profit are perhaps the less difficult to achieve of the three factors which determine success. Sustainability, on the other hand, although dependent on quality and profit, is also more dependent on complex issues such as the nature of the technology - is it appropriate? - and on the social and political climate - the attitudes towards small-scale enterprises and the regulations governing their establishment and management. An approach to support small enterprises which responds to local needs, builds on local knowledge and uses local resources will help achieve sustainability. However until issues such as credit, subsidies and attitudes (which tend to support larger, more modern food processing industries) are more favourable towards small-scale enterprises then sustainability will remain the most difficult challenge facing the small entrepreneur.

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# HUMAN RESOURCE DEVELOPMENT IN AGRICULTURE SECTOR - DAL'S PROJECTIONS

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***Abstract***

*The title of this paper indicates the main theme in that the principal objective in sustainable agriculture is through Human Resource Development at all levels of the sub-sector. As such Human Resource Development must acquire a central role in the practice of agricultural development. It is in this context that Strategy for training for human resources within the agriculture sub-sector was fostered. Thus the training strategy is deliberately aimed at improving knowledge and skills of serving agricultural and livestock officers and emphasized capacity to deliver agricultural services to farmers in the rural sector. Human Resource Development strategy likewise places greater emphasis to promote staff personal needs for growth and development through in-country higher degree programs at masters and doctoral levels. However, such training would be carefully scrutinised to ensure that it clearly relates around job situation and being appropriate and relevant to the farming systems / or agriculture industry in Papua New Guinea. In view of competition for meagre funds between Pre-Service and In-Serve Training Programs, the primary goal of* ***direct*** *contribution to organizational effectiveness should prevail. In another words, as part of DAL reform, Pre-Service Education be given over to Commission for Higher Education or other alternative authorities to control and manage instead of DAL.*

***Key words***: *Human resource development, sustainable agriculture, training strategy, improving skills, improving knowledge.*

## INTRODUCTION

Government's emphasis being placed on agriculture as an economic growth area with the commitment to develop human resources to efficiently produce agricultural products, provide technical and advisory services to producers, assist producers obtain credits from financial institutions and provide trained and competent manpower at all levels of the sub-sector.

Human resource development is concerned with people and as such puts people first in the development process.

In the context of Department of agriculture and Livestock, the development of human resources will be carried out by means of **'training'** as farmer, extension officer, technician, researcher, analyst, clerical and executive level.

## OBJECTIVE

The objective of this paper is to outline the training strategy which stresses the importance of providing effective in-service training for agricultural officers both within DAL as well as provincial DPIs to effectively deliver agricultural services to farmers in the rural sector.

The training strategy is consistent with DAL perpetual three (3) year training plan which came into operation in 1990 as part of government policy governing manpower development in the public sector

DAL training strategy (DAL 1988), however, does not address the Pre-service education, as such function does not contribute directly to the effectiveness of the organization (DAL).

Whilst on this subject I wish to quote the view expressed by Commission for Higher Education (1992) ..." Papua New Guinea is coming to the point where employer demand for certificate trained manpower has been satisfied. Therefore, the trend now is to provide more in-service training at basic degree, masters and doctoral levels. This is to ensure better qualified staff are produced to implement various government initiatives to achieve self-sufficiency for farmers and cash crop producers in the rural sector".

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## TRAINING

This paper will concentrate mainly on the training strategy as a means towards development of human resources for sustainable agriculture in Papua New Guinea.

Training is a process with a key role in capacity building for development, whose prime aim is to:

develop human resources with appropriate tools, both conceptual and technical so as to carry out their work more effectively.

## MEDIUM TERM GOALS

The Human Resource Development Division's mission is to assist the department's mission of promoting investment in agriculture in the rural sector through its investment in human resources.

The main goals of the division in the medium term are:

(a) to provide trained manpower for the agriculture sub-sector through management training.

(b) to produce a manpower plan for the sub-sector in collaboration with provinces and the industry, co-ordinate manpower development and training needs assessment for the sub-sector.

The development of human resources will be concentrated on four areas:

(i) up-grading and developing existing personnel through in-service and other staff training programs;

(ii) increasing the capacity of Highlands Agricultural College and Lae In-service Training Centre;

(iii) providing and arranging overseas training for nationals;

(iv) embarking on in-country higher degree training, especially at masters and doctorate levels related to identified needs in the agriculture sub-sector.

## MANPOWER SURVEY

A major manpower survey has been undertaken by the United Nations Development Programmes (UNDP) and the Food and Agriculture Organisation (FAO) as well as ANZDEC consultants. The findings contained in these reports should enable Department of Agriculture and Livestock to draw up a comprehensive human resource development strategy for the agriculture sub-sector.

It will also help the department to refine training and manpower policies and strategies for developing human resources.

In developing the manpower, emphasis will be given on increasing the capacity of the professional manpower based throughout the sub-sector, particularly in research, extension, veterinary services, plant protection, project planning and other technical fields.

Priority will be given to training for improved monitoring of animal health and productivity. This calls for provision of specialised training overseas for key field and laboratory staff of what is now known as Agriculture Protection Division. In addition existing in-service training to provide improved inputs in the areas of basic epidemiology would be strengthened.

Collaborative programs with research and training institutions will be encouraged as a means by which the skills and experience of nationals can be enhanced. As far as possible "twinning" arrangements with relevant overseas institutions may be negotiated.

The training and manpower development strategy embodies the improvement and upgrading of national manpower available to the sub-sector through in-service training. The strategy will be to utilise existing training institutions (Highlands Agricultural College and Universities).

More emphasis will be placed on a viable working relationship with the Department of Agriculture at the University of Technology in Lae, to promote the training of national manpower particularly at undergraduate level. It is anticipated this relationship will foster training of better qualified graduates which will alleviate DAL's acute manpower problem.

## HIGHER DEGREE TRAINING

As part of a major drive towards capacity building in human resources development within the agriculture sub-sector, DAL will initiate high level in-country training programs geared towards solving some of the common agricultural problems in the country.

Such training will be in the area of higher degree studies leading to Masters and Doctoral degrees. The studies will as much as possible be job related. Hence, the officer undertaking such studies will do his research whilst on the job but supervised by a well qualified and experienced supervisor at professional level. In order to gain global status such studies will be linked with reputable overseas universities for the award of degrees etc.

It makes economic sense for such training to take place in-country because currently similar training being carried out overseas is extremely expensive. The department and the country would gain from such training arrangement whilst at the same time the officer would benefit by way of obtaining higher qualifications from a recognised overseas university.

The private sector will be encouraged to actively participate in training manpower for the agricultural sub-sector. Private sector involvement in other areas of training and manpower development will include sponsorship of students (under-graduate and post-graduate) during their training, inputs into the development and evaluation of curricula at colleges and membership on the governing councils of training institutions.

## TRAINING NEEDS

In determining the gap in trained manpower, and thereby, the training needs of the sector, relevant factors include deviations between the actual and prescribed educational qualifications both for the relevant staff category and for the occupational level of the job performed would be kept in mind.

Manpower study (FAO 1989) identified four main areas in which training is needed.

(a) Underqualification arising from a mismatch between the staff categories and the occupational levels of the job being undertaken.

(b) Skills gap currently filled by expatriate staff.

(c) Training needs related to effecting an improvement in productivity and job competence for all staff including those already posessing the appropriate educational qualifications.

(d) Training needs were also identified in relation to certain agricultural occupations for which adequate preparation is not provided through pre-service education at the diploma and degree levels. Notable amongst such occupations are those of agricultural economist, agricultural statistician, soil surveyor at degree level and farm manager, laboratory technician, husbandry agriculturalist at Diploma level.

The training needs of DAL and provincial DPIs outlined in this paper were derived from previous studies commissioned by the department including Manpower study (1989), the Agriculture Extension Improvement Study (ANZDEC 1990), holding a series of discussions with divisional directors, provincial DPI assistant secretaries and/or staff development officers.

## PRIORITY AREAS FOR TRAINING

The broadly defined areas of training needs are research, agricultural extension, veterinary services, DAL/DPI management staff and agricultural college teaching staff.

### 1. Research

With the establishment of National Agriculture Research Institute (NARI), following responsibilities will be carried out.

- function as an effective national research coordinating apparatus
- strengthen national research capabilities and
- develop appropriate research programs.

Given the above responsibilities Research staff will need to be prepared adequately in the following areas:

- definition of research problem
- research and experimentation methodology

- analytical research.

## 2. Agricultural Extension

The following training needs for extension workers were identified to strengthen their confidence while on the job.

- extension service organisation and operation
- extension administration, management and supervision
- extension programme development and evaluation
- extension teaching methods
- extension communication strategies
- location specific agro-technology recommended practices
- locaton specific basic, agricultural marketing practices.

## 3. Veterinary Services

To provide trained manpower required to ensure improved monitoring of animal health and productivity by:

- provision of specialised training overseas for key personnel and laboratory staff;
- strengthening of existing in-service training to provide improved inputs in the areas of basic epidemiology and economics;
- strengthening linkages between field and laboratory services at provincial and national levels.

## 4. DAL and DPI Management

Senior and Middle (line supervisors or project and team leaders and sectional heads) management will undergo training in the following areas.

- organization and administration skills
- management and supervision skills
- project planning and preparation techniques
- project appraisal, monitoring and evaluation
- communication skills
- staff appraisal and identification of individual training needs.

## 5. Agricultural Colleges (HAC and LISTC)

Revitalise the in-service training programs for agricultural staff by:

- improving the infrastructure of Highlands Agricultural College and Lae In-Service Training Centre;
- making course syllabus more appropriate to existing agricultural systems;
- upgrading qualifications of lecturing staff to degree and post-graduate degree level;
- expose lecturing staff to technical fields and field experience;
- revitalise PMTP so that agricultural management training may continue to serve small-medium scale cash crop producers.

## 6. Farmer Training

In order for DAL to stimulate economic development in the rural areas, strong efforts will be made to collaborate with the provinces to revitalise the farmer training concept. The farmer training school/ or centre may be established in each of the provincial extension centres in each province.

National Department of Agriculture and Livestock to provide input into the farmer training school at Regional level through the office of Regional Director who will be responsible for subject matter specialists and other support staff including Staff Development and Training Officer.

## 7. Post Training Evaluation

In line with planned training programme for each officer, a comprehensive follow-up evaluation of training will be carried out by staff within Human Resource Development Division after an officer has successfully completed his/her training.

The evaluation may cover various aspects particularly relating to course curricula and perceived effects of training in terms of work performance and productivity.

The evaluator would be required to possess a broad knowledge of the context of training programme, gained through observation and experience.

## 8. Bonding system

In order for the Department of Agriculture and Livestock to gain maximum benefit from officers

who successfully completed long academic courses, either abroad or in-country to be required to sign an agreement to continue to serve the department for up to 5 years after completion of studies.

Such bonding system would ensure continuity in the department's operations whilst at the same time giving the officer concerned a sense of commitment and dedication to the department and the country as a whole.

## CONCLUSION

The important consideration in the proposals/strategies outlined here is for the functions to be achieved. In order for such functions to be achieved it is important that DAL through Human Resource Development Division develops viable working relationships with agricultural based Universities and with all those involved in agriculture. In doing so, we can be able to produce manpower that will give 85% of our country's population a better livelihood and 15% better food at cheaper prices.

## RECOMMENDATION

In view of competition for scarce financial resources between Pre-service Education and In-service Training programs, it is recommended that the function of Pre-service Education be handed over to Commission for Higher Education or other authorities to control and manage.

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# AGRICULTURAL INFORMATION AND PUBLICATION SYSTEMS AND SERVICES

Ho Thian Hua[1],

***ABSTRACT***

*An overview is given of the role and value of agricultural information to policy makers, researchers, scientists and extension workers. The need for ready access to agricultural research information and repackaging of such information for other users such as extension workers is stressed. Ways of obtaining such information are highlighted with emphasis given to recent developments in information technology, particularly the use of electronic databases and CD-ROM technology. CABI's role as information provider and publisher with a special focus on the needs of developing countries is discussed briefly. The importance of training and familiarisation with developments in information technology is also emphasised. Some new information products based on CD-ROM technology (such as the Crop Protection Compendium and the proposed Forestry Compendium) add on encouraging prospects for information support of user needs in the region. These and similar developments together with the existing range of printed and electronic products have equipped the Organisation with the tools to play a dynamic role in bridging the information gap between developed and the developing countries. Some proposals to address this imbalance for Papua New Guinea are tabled for discussion.*

***Key words***: *Agriculture, information, publications, research, extension, database technology.*

## INTRODUCTION

It is an acknowledged fact that agricultural scientists and farmers in the developed world can have immediate access scientific and technical information that is unavailable to many developing countries. There are varied reasons for this continuing scenario but one of the most important one is the lack of foreign exchange to allow the purchase of publications that are so vital to the scientific community to enable them to play their roles effectively. Other reasons could be the lack of recognition of the importance of information by policy makers or the lack of a proper infrastructure to cater for the different functions of an organisation. Policy makers at times find it difficult to understand the fuss that is being made on information needs, citing other more important priorities like feeding the poor and blinded to the fact that satisfying the information needs of scientists and farmers has the potentials to boost productivity and hence to reduce poverty. Fortunately, in economic development planning, policy makers are beginning to stress the role of information (Hammond 1990) especially in the areas of science and technology. Similarly, donor agencies are beginning to accept information provision as an important component in the rehabilitation of National Agricultural Research Systems (NARS).

NARS in developing countries can operate effectively if they have adequate resources and facilities to allow scientists to carry out research. The results of research would subsequently be fed to the end-users (the farmers, in this case) in a form suitable to the needs of the farmer. In the absence of information, time and funds are wasted through duplication of research which a developing country can ill afford.

Information is a vital component of NARS. Its value lies in the fact that knowledge can be used either to guide decision making or to encourage the introduction of more productive agricultural systems or technologies that will enable adoption of such systems.

## INFORMATION SOURCES

Depending on the nature or type required, information may be sourced through books, journals or electronic databases. These are obtainable from

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libraries or institutions (either research or industry, including advisory groups) providing such services. Communications between scientists (peer groups) in the research community remain an important basis for exchange of information. Conference proceedings (subject-specific or crop-specific) are important sources of information and abstracts may be found in the more reliable databases.

One of the most important developments in the past 5 years has been CD-ROM technology and the use of CD-ROMs as a medium of information storage. It is already fast gaining popularity and will no doubt be widely used or promoted as the medium for information transfer by the information providers catering to agriculture worldwide. Among the notable organisations that are great proponents of this technology are CABI (for CAB ABSTRACTS), IFIS (for Food Science and Technology Abstracts), CARIS (Current Agricultural Research and Information Systems), AGRIS (the FAO Abstracts database) and AGRICOLA ( database of the National Agricultural Library (NAL) of the United States Department of Agriculture).

I would like at this point to talk at some length of CAB International and how I perceive its resources and services can assist Papua New Guinea in the areas of information transfer and training.

## ROLE OF CABI AS AN INFORMATION PROVIDER

CAB International (or CABI) is an intergovernmental not-for-profit organisation with its Headquarters based at Wallingford in the United Kingdom. The Organisation, established in 1928, currently has 36 member countries which enjoy certain privileges in terms of availability of resources and member country rates for its wide range of information products.

The Scientific Services provided by CABI's four scientific institutes focus on identification services for insects, fungi and other microorganisms as well as research and consultancy services in biological control and integrated pest management. All the four institutes also offer training courses in their specializations.

The Information Services of CABI are largely responsible for collating and disseminating scientific and technical information in support of agriculture, forestry, veterinary science, human nutrition and health, the environment, rural development and related subjects world-wide (Ogbourne 1993). This it does through its bibliographic database (the CAB ABSTRACTS database) from which a number of information products are produced. These are abstract journals (46 titles), primary journals (4 titles) and electronic products such as CABCD and the more specialised CD-ROMs, the CAB SPECTRUM series (12 titles).

CABI has expertise in the use of information technology for the development of new electronic products and publication systems to expedite the transfer or dissemination of agricultural information and online access to the agricultural database (Gilmore 1993).

CABI also has an expanding book publishing programme covering a similar range of topics with some 50 new titles targeted yearly.

A Marketing Department handles all aspects of marketing and sales of printed and electronic products, while project management is handled by Developing Services.

Since this Meeting is centred on agricultural information and publication systems we have to address two issues that would be pertinent if "effective delivery of agricultural services to the farmers" is to be achieved. These issues are:

1. Access to scientific information
2. Repackaging and delivery of scientific information

## ACCESS TO SCIENTIFIC INFORMATION

Prior to the development of electronic databases, it has been the practice to scan through volumes of hard prints either through author search or subject search to access the relevant literature on the topic of interest to the researcher. Where computerisation has taken its hold, this practice has given way to the use of electronic databases from which access to the required information is through the use of a user-friendly search software. Several electronic databases are currently available on agriculture (including livestock), forestry and related sciences. Among the most renowned of these is the CAB ABSTRACTS database "in terms of coverage and quality of abstracts" (quoting the words of Librarians of some of the biggest agricultural libraries in Southeast Asia). Perhaps some understanding of how this database has

been developed is necessary, as some or all these steps may be necessary should PNG decide at a later date to develop its own electronic database from national literature available.

### The CAB ABSTRACTS Database

Over 100 scientists and linguists in five subject-specialized Divisions scan, abstract and index primary literature published world-wide on agriculture, forestry, human health, the environment, and related sciences. More than 150,000 new records (> 95% with abstracts) are added to the database each year. These records are also published in a series of abstract journals currently nearly 50 in number. The whole database dates back to 1973 and contains over 3.0 million records.

## ACQUISITION OF LITERATURE

An Accessions Unit acquires all the relevant scientific and technical literature for the editorial staff preparing input to CAB ABSTRACTS. Every year over 14000 serials(more than 50,000 issues per year, published in some 60 languages), books, conference reports as well as more than 4000 monographs are handled by this Unit. To obtain all these titles, the Unit liaises with several thousand publishers, cooperating libraries and other sources of literature worldwide.

## SUBJECT COVERAGE

Subjects covered include : animal and crop husbandry, animal and plant breeding, plant protection, plant and animal genetics, land management, soils, the environment in relation to land use, forestry, agricultural engineering, agricultural economics, veterinary medicine, human nutrition, human health including community medicine and communicable diseases, rural development, agricultural leisure, recreation and tourism.

## QUALITY STANDARDS

Items selected for abstracting are mainly those which report original research or contain new interpretations or applications of scientific knowledge. New records must be as up-to-date as possible, high in information content and well indexed. Citations of journal titles need to conform to international guidelines, subject indexing needs to be consistent, precise and comprehensive (Wightman 1991).

### Access to CAB ABSTRACTS

CAB ABSTRACTS is available through printed journals, online, on magnetic tapes and diskettes as well as on CD-ROM.

**Online:** The database is accessible through a number of online hosts namely, DIALOG Information Services, Inc (USA), ESA-IRS (Italy), DIMDI (Germany), DATA-STAR (UK), STN International/ JICST (Japan) and CAN/OLE (Canada).

**Magnetic Tapes:** These are available on lease to organisations who prefer to use their own computer systems to provide information services to their management and professional staff. Updates are on monthly basis.

**CD-ROM:** Abstracts prepared since 1984 may also be accessed via CABCD on 4 compact discs covering 1984-86 (Vol.1), 1987-89 (Vol.2) and 1990-92 (Vol.3). The first issue covering 1993 for the period 1993-96 (Vol.4) is to be released soon. CD-ROM a storage medium is by far the most popular and fast gaining popularity as computers and CD-ROM drives become more easily available and pricing of such hardware becomes more competitive. Updates which used to be annually are now on quarterly basis.

In addition, a series of 10 CD-ROM titles in the CAB SPECTRUM series each cover at least 20 years of literature, from 1973 to the present, on a particular discipline. They are BEASTCD (animal production and breeding), VETCD (veterinary medicine), TREECD (forestry), CABPESTCD (crop protection), HORTCD (horticulture and plantation crops), SOILCD (land management, soils and water), PLANTGENECD (plant genetics and biotechnology), CROPCD (field crops and grasslands), AGECONCD (agricultural economics and rural development), and E-CD (environmental quality and degradation).

## CD-ROM TECHNOLOGY

Compact Disc Read Only Memory (CD-ROM) is a new technology for the retrieval of large amounts of information from an optical disc. Physically the CD-ROM device has a laser disc drive (or "player") which is about the same size as a normal 5 1/4" drive. The removable disc is 4 3/4" in diameter and has a capacity of 550-650Mb, equivalent to more

than 1500 360K floppy disks. Information stored in a CD-ROM can be loaded into memory (RAM), displayed and printed, as with other media but is different only in that the data in RAM cannot be altered so that the original copy is always intact. The CD-ROM is a major advance in the provision of machine-readable bibliographic databases for regions where telecommunications are unreliable and the cost of online searching makes the use of online databases difficult or impossible. Fast, flexible, user-friendly access to large volumes of information is possible for a modest capital outlay and low running costs. Capital expenditure is limited to a compatible personal computer (PC), disc player/drive, printer and the CD-ROMs themselves. With a little training, the only costs after that would be staff time spent on the searches.

For those with little or no knowledge of computers, special training courses are available or could be arranged and CD-ROM training manuals can be made available to augment training needs.

## ADVANTAGES OF CD-ROM

Durable medium
Powerful retrieval
Vast storage capacity
Simple technology
No telecommunications network necessary
Rapid access
Use with any desktop microcomputer
Easy to use

## HOW CD-ROMS ARE USED

| | | |
|---|---|---|
| Single workstations | - | one CD, one computer |
| Daisy chaining | - | linking 2 or more CD-ROMs, up to 7 can be linked. |
| Networking | - | multiuser access to a CD-ROM station through a local area network (LAN). |
| Site licensing | - | multiple workstations using multiple CD-ROM players. |
| Modem access | - | dial-up access to a CD-ROM workstation through a modem and a telephone line. |

## REQUIREMENTS FOR USING A CD-ROM

- A computer (IBM XT,AT,PS/2 or 100% Compatibles)
- DOS version 3.1 or higher
- 640K RAM
- CD-ROM Extensions
- Controller Card
- CD-ROM Drive

[ For Macintosh, System version 6.02 or higher; 2 MB memory, a hard disk of minimum 20Mb; a Macintosh-compatible SCSI CD-ROM drive ]

## DOCUMENT DELIVERY

CAB International also provides a document delivery service for the full text of papers referred to in the CAB ABSTRACTS database. This service is coordinated from the CABI Library Services Centre at Silwood Park, United Kingdom. The Centre is in a position to provide copies of most articles cited in the CAB ABSTRACTS journals and database.

## PUBLICATION SYSTEMS

CAB International has a well established book and primary journal publishing arm and is responsible for the publication and timely distribution of books and journals worldwide. The organisation has now 12 primary journal titles with some 50 new book titles published each year while several new journal titles have been added in the past 3 years. Publications of the Bureau of Hygiene and Tropical Diseases (BHTD) have recently been added to the list. These high quality publications are of enormous importance to both developed and developing countries. The latter can often obtain them through funding agencies under projects which allow an information component to be factored in.

CAB International has a strong commitment to getting information products to users in the developing world (1993,Twelith Review Conference) and has embarked on a number of new sponsorship programmes which effectively place journals and CD-ROM products in many developing countries. Such programmes are however on a short term basis and longer-term solutions are being sought through policies that allow self-sustaining programmes to be developed.

The introduction of desktop publishing softwares (e.g.Pagemaker, Ventura) and even the further development of existing word processors (Word 5.5 or Word for Windows, Ami-Pro, Wordstar, WordPerfect) allow modest publications to be undertaken by information/extension workers or the publishing unit within the country at minimal costs. This would be particularly useful for publications aimed for dissemination by extension workers to the farm level. Training in the use of such software would not be a problem.

## OTHER SERVICES

In addition to the identification services offered by CABI's Scientific Services and the database, journals and other products from the Information Services, CABI can also provide expertise in information technology, including the production of CD-ROMs and advice on database development.

CABI can also offer training for information staff in abstracting, indexing and other aspects of information science either at CABI, Wallingford, UK or at the client's own location.

## REPACKAGING AND DELIVERY OF SCIENTIFIC INFORMATION

While scientific information may be accessed in the ways described above, the information may need to be collated, re-worded or simplified in a language that is easily understood by extension workers or at the farmers level. This could be the English language itself or in the local language. The final version would be in the form of extension leaflets, brochures, manuals or booklets confined to a topic or problem or on a crop/commodity which are disseminated through an extension system. Desktop publishing of the kind described above could be provided and used to achieve this goal.

What is to be published, the depth of the subject, how the information is to be presented, and the level of technical terminology to be used would depend on various factors such as the target users, their needs and their level of literacy. Crucial to this process is for the scientists or researchers (considered the first level in the transfer of information technology) to be able to access reliable scientific information which already exists and needs only to be tapped by the various methods indicated earlier. Scientific papers are typically written by scientists for the consumption of other scientists and therefore there is need to repackage or modify the information in order to make it easily understood by other users, for example policy makers or extension officers.

## THE GREY LITERATURE

In the past few years there has been a clamour for access to information that has not been formally published in either journals or books and which collectively has been designated "grey literature". Such literature may be difficult to find in conventional libraries and bibliographies. Examples are research reports circulated within an organisation and prepared for internal seminars. Product leaflets, extension materials, and market data also fall within this category. There may be of value in including selected literature of this type in regional or local information compilations, as for example in the IPM Bibliographic Database for SE Asia being compiled by CABI.

## SOME NEW TRENDS

Several exciting developments in specialised or scientific software have emerged in recent years, such as electronic taxonomic keys for the identification of insects, weeds, etc with accompanying illustrations (e.g.CABIKEY) and textual data sheets providing standardised information on the species. CABI's Electronic Compendium for Crop Protection (Scott 1994), whose development has been supported by ACIAR, provides information on pests and diseases, including text, illustrations, distribution maps, bibliographic records, taxonomic keys, etc. in a user-friendly package on a PC. The Compendium can be linked with other information systems e.g.CABPESTCD, and the CLIMEX, a system for predicting climatic range of pests. A similar product, the Forestry Compendium will be developed in 1994. Geographical Information Systems (GIS) which have wider applications in the development of distribution maps of pests and diseases and crop production/agronomic information relating to districts, climate, soil types and crop yields provide another example.

Current interest in developing a Crop Protection Compendium for the Southeast Asia Region has stimulated a proposal to develop a bibliographic database for integrated pest management (IPM) which would be retrievable within the Compendium. The compilation and collation of this important database would place pest control in an envi-

ronmentally appropriate perspective: biological control would be featured as an important component of IPM where such information exists.

## BIOSYSTEMATIC NETWORKING AND INFORMATION SHARING (BIONET INTERNATIONAL)

Sharing of taxonomic information (and expertise) on invertebrates and microorganisms is proposed in CABI's concept of BioNET International. Training programmes envisaged under this programme will benefit developing countries as apart from information sharing and human resource development there are also possibilities for institutional development.

## PROPOSALS FOR PAPUA NEW GUINEA

With the objective of making global scientific information available to researchers which are relevant to Papua New Guinea and the need for repackaging such information to cater for extension/farmer levels, five proposals are tabled for your discussion. These are:

1. Training in CD-ROM use for researchers, as distinct from training for agricultural librarians which has a much wider scope and which could be provided and continued by CABI in the UK.

2. Training in desktop publishing for extension/information units. This will involve use of desktop publishing software.

3. Local database development for efficient information management (e.g. using CDS/ISIS or dBASE 4 software).

4. Acquisition of CD-ROMs, scientific books and journals that have relevance to the needs of the scientific community.

5. Local participation in development of the Crop Protection Compendium for SE Asia.

These proposals could be incorporated into a single project for submission to donor funding or be the information component of a larger project that would stand a better chance of donor funding. CABI has had considerable experience in formulating such proposals and would be in a position to offer assistance.

The Asia Regional Office, backed by the full resources of CABI, would be able to support the formulation and implementation of such projects.

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# AGRICULTURAL INFORMATION AND PUBLICATION SYSTEMS AND SERIVCES (AI & PSS) SUITABLE FOR PNG NEEDS

Hilarion Erai[1] and Ray Kumar[2]

***ABSTRACT***

*A full-fledged division viz. Agricultural Information, Extension and Publication Systems and Services should be set up with the ultimate objective of upgrading technical skills in the rural agriculture sector and strengthening delivery of technical extension services by providing provincial extensionists with appropriate authoritative information, technical and education materials. The dissemination of agricultural development information through mass media e.g. radio, television, audio-visual aids, newspapers would be a vital function of the proposed division.*

*The development, preparation, production and distribution of wide ranging agricultural publications to different levels of audience throughout Papua New Guinea would be an improtant objective of the proposed division. This would assist research and extension in PNG by filling in key knowledge gaps by utilising the results from studies conducted elsewhere in the Pacific and other regions and by making information available from international data bases. These would provide Information Servicing, Information Transfer, Data Management and Computer Software Information Packages and nurture the knowledge sector in PNG.*

***Key words:*** *Information Servicing, information transfer, publications, data management, computer solftware, knowledge sector.*

## INTRODUCTION

Information, both verbal and written, is to-day world's must valuable commodity. Without accurate information - researchers, technologists, media experts and extension specialists would become incapacitated. The advanced countries are already planning electronically operated information highways for "instant" dissemination of information.

The development of new information technologies using computers, satellite communications and compact discs, etc has made information processing and dissemination easier, faster and more efficient. However, a group study on new technologies relevant to developing countries has observed as follows:-

"The introduction of computers and the application of classical computing techniques, while benefitting the modern sector in urban areas, has had little or no impact on the traditional sector of developing countries, especially in rural areas" (Seshagiri 1983).

The above statement, a decade later, still holds true for Papua New Guinea. Time has now come to devise information and publication systems and services, catering especially for the needs of the Agricultural situation in PNG.

## INFORMATION POLICY

The following considerations would guide the development of Agricultural Information Systems and Services in PNG:-

1. Assist in the upgrading of the technical skills necessary for the transformation of rural agriculture and livestock sector.

2. Strengthen the delivery of technical extension services by providing them with

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authoritative information, technical and educational materials.

3. Disseminate Agricultural Information to diverse audience.

4. Development, preparation, production and distributions of wide ranging agricultural publications to different strata of Agricultural professionals.

5. Obtain and provide, to researchers, extensionists and other interested agriculturists results of relevant studies conducted elsewhere in the world.

## STRATEGIES

The Agricultural Information Programmes would be developed to focus on three strata of our society:-

1. Rural Agriculture and Livestock sector composed mainly of smallholders and evolution of an information base for development and planning at village level;

2. Agricultural Extensionists and general public;

3. Agricultural researchers and other professionals.

## THE AGRICULTURAL INFORMATION AND PUBLICATION SYSTEMS AND SERVICES (AI&PSS)

With a view to implement the policies and strategies outlined above it is proposed that the existing Information Services Section (ISS) of the Education and Training Division be upgraded to divisional status with the title of "Agricultural Information Systems and Services (AI&PSS). The various components of this division may be further discussed as follows:-

### A. NATIONAL CARIS CENTRE AND CENTRAL LIBRARY

CARIS (Current Agricultural Research Information Systems) deals with information on agricultural research projects currently being carried out in an international co-operative network composed of national, regional and international centres, with the co-ordinating centre located at FAO Headquarters in Rome.

CARIS is a source of information to researchers, planners, managers or adiminstrators, policy and decision makers, production and development specialists. CARIS covers the whole range of research in agriculture and related fields. CARIS in PNG was established in 1987 at the Department of Agriculture and Livestock Headquarters at Konedobu. In 1990, CARIS produced the first directory of Current Agricultural Research in PNG (Erai 1993 a). Fiscal constraints have however slowed down and sometimes stopped our operations. CARIS and AGRIS operations would be greatly strenghtened under the proposed AI&PSS, scattered information units in DAL such as CARIS, PNGRIS, Marketing, Rural Statistics etc would be brought under one umbrella. They would provide be information servicing, information transfer, data management and computer software packages.

The Central Library for DAL, located at Konedobu, was established in early 1960s and serves all the agricultural institutions in Papua New Guinea. The main functions of the library is to co-ordinate and provide various library services. It has over 20,000 volumes, most print materials and 500 periodical titles the number of which on current subcription has unfortunately been steadily declining due to insufficient budgetary allocations.

### B. AUDIO - VISUAL TOOLS

Video programmes can greatly assist the extensionists by showing farmers how exactly to do something or what a crop/livestock looks like or should look like. It doesn't require a high standard of literacy and combines words, pictures and music.

A person typically retains about 10% of the information he reads, a full 20% of what he hears, but 80% of what he sees, hears and discusses. This is the potential of visual and audio visual screening as a teaching tool. And if "hands on" practice or demonstrations is included, a person's retention-level can rise to a high 90% to (Erai 1993 b).

Some twenty two (22) films produced by the DAL Audio-Visual Unit in English, Pidgin and Motu

using hired equipment have proved highly popular. Under the proposed AI&PSS the use of audio-visual tools as an aid to extensionists would be emphasized and strengthened.

## C. RADIO COMMUNICATIONS

ISS provides ideas, informations and staff for the formulation and production of National Broadcasting Corporation's agricultural radio programmes. These send out simple messages on practical agriculture that can be understood even by someone who cannot read and write. The messages are received quickly, and absorbed over long distances by large groups of our people.

The development of above programmes is only possible if the staff have the backing of a well rum and up-to-date agricultural library with latest books, journals, research reports, handbooks, encyclopaedias, bibliographies, literature guides, directories, reviews, and other publications.

## D. PUBLICATIONS

These are the single most important means of information by which research-extension-farmer linkage in agricultural sector is maintained. For the continutity of publications, the system must ensure regular publication of results. The publications from DAL publication unit address various strata of our society and are intended for didiman, didimeri, teachers, farmers, general public, extensionists, research workers, project co-ordinators, national and international organizations, experts and consultants, scientists, technologists and other professionals in schools, colleges and universities throughout Papua New Guinea. They fall into the following catagories:-

### 1. Extension Publications

ISS publishes as a wide range of Extension Bulletins, Farming Notes, Rural Development Handbooks, Village Talks, Field Pocket Books, DAL Posters, Discussion Papers, Agriculture in Economy Series and Agriculture Booklets. Also produced are extension materials such as videos, films and audio-tapes on agricultural topics and developments.

ISS produces and publish the only extension journal of developing South Pacific nations viz. HARVEST which is a widely distributed and eagerly sought after journal.

### 2. Rural Newsletter

The widely read Agricultural Newsletter, Didimag has been hailed as the best Rural Newsletter in PNG and needs to be strengthened.

### 3. Scientific Publications

ISS publishes specialist scientific bulletins, technical reports, research bulletins and PNG Journal of Agriculture, Forestry and Fisheries which is the only Agricultural Journal being published from the developing Pacific Island nations. This scientific journal published since 1935. This journal has had standards and presentation which earned it an international recognition. It is a national heritage publishing articles based on research in PNG and the Pacific Island nations.

The above wide range of agricultural extension and scientific publications aimed at different levels of audience are prepared by ISS staff specializing in writing, editing, designing, typesetting. They distribute 10,000 publications and over 50 titles each year throughout PNG. A recent Reader and Listener survey showed that there is demand for more publications to be distributed to more centres.

## E. KNOWLEDGE SECTOR

According to a February 1993 issue of the Economist the fastest growing part of all rich countries is neither manufacturing nor traditional services but the "knowledge sector". The magazine noted that over half of all workers in rich countries are currently employed in the production, storage, retrieval or distribution of knowledge. New journals are being established at the rate of one day in the industrialized world. We are therefore often hoodwinked by people who discourage us either from starting new journals in the world or revitalising old ones on the pretext that there are enough journals already and it is in a scientist's interest to publish in a Western Journal.

We need to wrench ourselves from the above legacy, by establishing high-level scientific journal worthy of the best papers from anywhere else in the world. The stocks-in-trade of scientific journals are ideas, high standard of published papers and regularity of their appearance, and we must therefore be in the market-place for journals if we are to be competing participants in this trade.

The proposed AI&PSS would greatly further the cause of knowledge sector in PNG. Unless we are prepared to invest in the "knowledge sector" now we would find it very difficult to catch up with the brain power of our competitors, in the 21st century.

**REFERENCES**

**Erai, H. 1993 a. CARIS Springs into life.** ***DIDIMAG.*** **25(i):7-9.**

**Erai, H. 1993 b. Audio-Visual Tool for rural agricultural development.** ***DIDIMAG.*** **25(2):5-6.**

**Seshagiri, N. 1983. New Informations technologies relelvant for developing countries. Marseiles: Data for Development.**

# RESOLUTIONS AND RECOMMENDATIONS ARISING FROM THE CONSULTATIVE SEMINAR

## RESEARCH

1.That all concerned be advised that research for agriculture has a high return and the benefits are distributed widely across the community (mainly to farmers, villagers and poor urban consumers). That Agricultural research being of long term nature requires consistent and sustained funding to realize its objectives.

2.That PNG research managers seek to attract top quality researchers and to retain them with improved research facilities, financial support and special research positions (to offer a career path in research, not in administration).

3.That a special effort in research be made to involve women, major participants in agricultural production and marketing. That many more women should participate in various facets of the research enterprise, especially the socio-economic and technology transfer issues which should also be actively researched.

4.That current food crops and livestock research resources within DAL be reallocated and reorganised to provide clearer and more flexible focus on linkage mechanisms between research, extension and farmers, so that research system can be more responsive to farmers needs.

5.That an autonomous, statutory, and public funded research organization called the **NATIONAL AGRICULTURAL RESEARCH INSTITUTE (NARI)** for research into and improvement of food crops, livestock, alternate crops and resource management be established. This institute would have close working relationship with National Agricultural Research Council and Agriculture Research Technical Committee.

6.That PNG researchers be actively encouraged to capture and take advantage of research spillovers from neighbouring countries, so that agriculture research effort is focused on major opportunities.

7.That a process of research priority be put in place at all levels of the research system by the National Agricultural Research Council in consultation between farmers, researchers, extensionists and other interested organizations.

8.That NARI would emphasize EXCELLENCE IN RESEARCH and publish findings in national and international journals.

9.That it is quite clearly understood by all concerned, that NARI is neither DAL nor PNG. While the institute will have its own internal information and training programes, services such as Human Resources Development and Agricultural Information and Publication Systems and Services which cut across and benefit all sections of agricultural community in PNG shall continue to be the responsibility of DAL.

10.That Livestock Research requires urgent resource allocation, adequate research facilities, proper planning and that these constraints would be tackled by NARI with emphasis on integrated food and livestock research.

## LIVESTOCK

11.That proper Livestock policies be formulated for greatly increased efficiency in livestock production to achieve national self sufficiency in beef, mutton and dairy industries as has been done in the case of Poultry and Pigs. For this purpose a **Livestock Development Branch** be established in DAL.

12.That downstream processing of livestock by products be undertaken to obtain value added benefits and that proper staughter facilities and policies formulated and developed.

13.That farming of indigenous wild animals in PNG be developed as an additional source of proteins for the populace.

## EXTENSION SERVICES

14.That carefully planned pre-service training is required for an extension officer and this should be urgently examined.

15.That there is the need to re-organise current extension services and that a merger of DAL and

Provincial DPIs is recommended. It is further, recommended that a **NATIONAL EXTENSION MANAGEMENT BRANCH** under DAL be established.

16.That employment of significantly large number of women in extension should be encouraged.

17.That there is a need to re-orient agricultural extension towards a customer-based service and that a provision of adequate resources is required for effective extension.

18.That a provision of regular in-service training is essential for extensionists and that any extension systems must be flexible, forge beneficial linkages and encourage the development of Private Extension Organizations.

## SUBSIDIES AND CREDITS

19.That the national government/her agencies should play the role of an active facilitator in rural finance by formulating appropriate lending policies and liasing with lending institutions and aid agencies.

20.That the government/her agencies should continue building rural financial infrastructure with appropriate financial policies and meaningful research and training support.

21.That credit be inbuilt as a component of all agro-rural projects and that smallholder credit be subsidized and guaranteed.

22.That a crop and livestock insurance scheme be formulated and introduced and that formation of village co-operatives be encouraged as a source of micro - credit facilities to the farmers and villagers.

## MARKETING

23.That government/her agencies should provide and extend price monitoring and market reporting services and that a produce grading system should be established.

24.That Market Research seeking to establish the size, nature and future scope of various commodities and determining the strength of both domestic and international competition be emphasized through the establishment of a **MARKET RESEARCH AND INTELLIGENCE BRANCH** in DAL.

25.That government/her agencies should provide market infrastructure and encourage enterprise development for the benefit of smallholder farmers, villages and consumers.

## AGRO-INDUSTRIES/DOWNSTREAM PROCESSING

26.That the government/her agencies should seek and undertake the transfer of appropriate technologies from other parts of the world in the development of sustainable small-scale agro-industrial enterprises in the villages of Papua New Guinea.

27.That development of small scale agro-industries through downstream processing be vigorously pursued and encouraged in order to create employment opportunities and generate incomes.

## QUARANTINE AND QUALITY CONTROL

28.That an, autonomous, statutory and public funded **PNG QUARANTINE AND QUALITY CONTROL AUTHORITY** be established in DAL capable of developing and implementing International Phytosanitary measures in accordance with the international rules and guidelines developed under the auspices of the FAO International Plant Protection Convention.

## HUMAN RESOURCES DEVELOPMENT

29.That Pre-service Education be given over to the Commission for Higher Education/Suitable Authorities to control and manage.

30.That DAL should establish a **HUMAN RESOURCES DEVELOPMENT DIVISION (HRD) BRANCH** to cater for diverse training needs of the Agriculture Sector.

31.That HRD should assist in general upgrading and further development of existing DAL personnel through various training programmes including Higher Degree Training.

32.That HRD shall undertake dissemination of information on Farmer Training and related Training programmes at regular intervals.

**AGRICULTURAL INFORMATION AND PUBLICATIONS**

33. That a new **AGRICULTURAL INFORMATION AND PUBLICATION SYSTEMS AND SERVICES (AI&PSS) BRANCH** be created by amalgmating and upgrading scattered information units in DAL to cater for the pressing information needs of didiman, didimeri, farmers, extensionists, teachers, researchers and other professionals in schools, colleges and universities throughout PNG.

34. That AI&PSS should harness recent developments in information technology such as electronic databases and CD-ROM technology to provide instant access to developments in Agriculture, nationally, regionally and internationally.

35. That AI&PSS should create and provide information packages suitable for all strata of Agricultural Society in PNG and utilize computers to connect provincial resource centres, thereby creating channels for supply and receipt of agricultural information.

36. That AI&PSS should collaborate with international organizations, PNG universities, government and non-government organizations in obtaining and absorbing agricultural technology and making it available to information resource centres in PNG provinces.

37. That a **National Consultative Seminar** on Agricultural Reforms and Delivery of Farming Services to PNG Villages be held every 2 years to take stock of the progress made in this field.

38. That every commodity corporation should hold her commodity group meeting prior to the National Consultative Seminar and present report(s) at the biennial meeting.

**J. KAPTIGAU**
Chairman
Drafting Committee

## ORGANISING COMMITTEE

Mr T. Kepui **(Chairman)**
Mr. H. Erai (Member)
Prof. R. Kumar (Member)
Mr. V. Kegena (Member)
Mr. J. Kaptigau **(Co-ordinator)**

# SEMINAR PROGRAMME

## TUESDAY, 15TH MARCH

## Opening Session

### INVITED ADDRESSES

Chairman: Mr Miri Setae, Acting Secretary
Department of Agriculture & Livestock, DAL, Konedobu
Rapporters: Messers Elijah Philemon and William Gwaisuk

0900 - 0915 hrs: Opening Address - Working for a Better Tomorrow for Agriculture in PNG.
- Honorable Roy Evara, MP, Minister for Agriculture & Livestock, Konedobu.

0915 - 1000 hrs: Keynote Address - Management of Agriculture Sector in PNG Economy.
- Mrs Flora Carruthers, Executive Manager, Economics Department, Bank of Papua New Guinea, P.O. Box 121, Port Moresby, Papua New Guinea.

1000 - 1020 hrs: Special Address - Delivery of Agricultural Services in PNG: ADB's Perspective.
- Dr. R.C. May, Manager, Agriculture Department, Asian Development Bank, Manila.

1020 - 1050 hrs: Tea/Coffee

### STRATEGIES AND OPTIONS

Chairman: Dr Kenneth Menz
Rapporter: Mr Francis Mangila

1050 - 1135 hrs: Delivery of Agricultural Services in PNG - Strategies and options towards the next decade - DAL views.
- Mr Miri Setae, Acting Secretary, DAL, Konedobu

1135 - 1155 hrs: Discussion

1200 - 1300 hrs: Lunch

### TOWARDS EXCELLENCE IN RESEARCH

Chairman: Dr Jim Longmire, Department of Economics, University of Queensland, Brisbane.
Rapporters: Mr Tony Hobiage and Dr Ray Kumar

1300 -1330 hrs: Pros and cons of Agricultural Research in Developing countries - a prospect.
- Dr Kenneth M. Menz, ACIAR, Canberra.

1330 - 1350 hrs: Technology Assessment and Transfer for Sustainable Agriculture and Rural Development - an FAO Global Review.
- Mr Bruce R. French

1350- 1420 hrs: The Papua New Guinea National Agriculture Research System: Its policy frame work and development per spective.
- Messers Ted Sitapai, Balthasar Wayi and R.D. Ghodake

1420 - 1440 hrs: Discussion

## SECOND SESSION

### LIVESTOCK ISSUES

Chairman: Mr Philip Holzknecht, Mirisa Associates, Fernvale, Qld, Australia.
Rapporters: Messer Alphonse Bannick and Keno Wenge

1440 - 1500 hrs: Meeting the development challenges of Livestock Industry in Papua New Guinea.
- Dr Alfred Ihekoronye, Applied Sciences Department, PNG University of Tecnology, Lae.

1500 - 1520 hrs: Tea/Coffee

1520 - 1540 hrs: Livestock Research and Development in PNG.
- Mr Bill Bakau (DAL, LABU) and Keith Galgal (DAL, ERAP).

1540 - 1550 hrs: Discussion

## THIRD SESSION

### EXTENSION SERVICES

Chairman: Mr Sydney P. Saville, Brisbane
Rapporters: Mr Fred Dori and Mr Sim Sar

1550 - 1610 hrs: Extension Performance Management, International Trends for the 1990s.
- Mr Bob McKillop, South Melbourne.

1610 - 1630 hrs: Reorganization of Extension Services in PNG.
- Mr Felix Bakani, Director, Export Crops, DAL, Konedobu

1630 - 1645 hrs: Agricultural Extension Services in Madang.
- Mr Lawrence Daur, Assistant Secretary, DPI, Madang.

1645 - 1700 hrs: Agriculture Extension and Associated Factors in Eastern Highlands Province.
- Mr Ian Mofafi, Assistant Secretary, DPI, Goroka

1700 - 1715 hrs: Agricultural Extension Services in Manus Province.
- Mr Kulen'en Hamou, Assistant Secretary, Division of Natural Resources, Manus.

1715 - 1735 hrs: Discussion.

## WEDNESDAY, 16TH MARCH

### SUBSIDIES AND CREDITS

Chairman: Dr Kenneth M. Menz, ACIAR, Canberra.
Rapporter: Mr Steven Rambe

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|---|---|
| 0900 - 0930 hrs: | Role of Price Subsidies in Agriculture in PNG.<br>- Mr Modowa Gumoi, National Research Institute, Waigani |
| 0930 - 0940 hrs: | Discussion |
| 0940 - 1000 hrs: | Improving Rural Institutional Finance: Some Lessons.<br>- Dr Nimal A. Fernando, ADB, Manila<br>(Presented by Dr Robert C. May) |
| 1000 - 1020 hrs: | Tea/Coffee |
| 1020 - 1040 hrs: | Sustainable Rural Credit for Agricultural Development in Papua New Guinea.<br>- Mr C. Kannapiran, DAL, Konedobu. |
| 1040 - 1100 hrs: | Discussion |

## FIFTH SESSION

### MARKETING, AGRO - INDUSTRY AND QUALITY CONTROL

Chairman: Mr Ted Sitapai, Deputy Secretary (Technical Services), DAL, Konedobu
Rapporters: Mr Alfred Bala and Dr R.D. Ghodake

| | |
|---|---|
| 1100 - 1130 hrs: | Marketing Systems for Agriculture: Diagnosing Problems and Price and Market Analysis for PNG.<br>- Dr Jim Longmire, Department of Economics, University of Queensland, Brisbane. |
| 1130 - 1150 hrs: | Proposed Market Research and Intelligence Service Branch.<br>- Mr Francis Mangila, Acting Director, PPBD, DAL, Konedobu. |
| 1150 - 1210 hrs: | Discussion |
| 1210 - 1310 hrs: | Lunch |
| 1310 - 1340 hrs: | Quarantine and Quality Control Services in the Pacific.<br>- Mr Richard Ivess, Chief Plants Officer, MAAF, Wellington, New Zealand. |
| 1340 - 1400 hrs: | Quarantine Services in PNG - the need for a review.<br>- Mr David Kanawi, Mr Alphonse Bannick and Gapi Kula, Agriculture Protection Division, DAL, Kilakila. |
| 1400 - 1420 hrs: | Discussion |
| 1420 - 1450 hrs: | Development of Small-scale food processing enterprises in some developing countries.<br>- Mr Andrew Jones, Intermediate Technology, Rugby, England. |
| 1450 - 1500 hrs: | Discussion |
| 1500 - 1525 hrs: | Tea/Coffee |

## SIXTH SESSION

## HUMAN RESOURCES DEVELOPMENT

Chairman: Mr Tim Kepui, Deputy Secretary (General Services), DAL, Konedobu.
Rapporters: Dr I. Puana and Mr G. Mosa.

1525 - 1545 hrs: Human Resources Development for Sustainable Agriculture in PNG.
- Mr Philp Pondikou, Chief Training Officer, DAL, Konedobu.
1545 - 1605 hrs: Discussion

## SEVENTH SESSION

## INFORMATION AND PUBLICATIONS

Chairman: Mr Joseph Wohuinangu, Director, Food Management Branch, Konedobu.
Rapporters: Mr Philip Pondikou and Mathew Kanua

1605 - 1635 hrs: Information and Publications Systems and Services operated by CABI International and other Commonweatlh Countries.
- Mr Ho Thian Hua, CAB Regional Office, Kuala Lumpur.
1635 - 1705 hrs: Agricultural Information and Publications Systems and Services (AI&PSS) suitable for PNG needs.
- Mr Hilarion Erai and Ray Kumar, Agriculture Education and Training Division, DAL.
1705 - 1720 hrs: Discussion

## THURSDAY, 17TH MAY

## PRESENTATION OF CONFERENCE REPORTS

Chairman: Mr Miri Setae
Rapporters: Mr Hilarion Erai and Ray Kumar

0900 - 1200 hrs: Presentation by Mr Joseph Kaptigau, Chairman Drafting Committee.
: Discussion and Adoption of reports/resolutions.
1200 hrs: Conference Lunch

## AFTERNOON: DEPARTURE

# PARTICIPANTS TO THE CONSULTATIVE SEMINAR

## Agricultural Reforms and Delivery of Farming Services to PNG Villages (15-17th March, 1994, Port Moresby)

### DAL PARTICIPANTS

#### TOP MANAGEMENT

1. Hon. Roy Evara, MP - Minister for Agriculture and Livestock.
2. Mr. Miri Setae - Secretary, Department of Agriculture and Livestock
3. Mr. Ted Sitapai - Deputy Secretary (Technical Services)
4. Mr. Tim Kepui - Acting Deputy Secretary (General Services)
5. Mr. Emmanuel Semoso - Director, Personnel and Administration Division
6. Mr. Lucas Poloe - Director, Finance Division
7. Mr. Joseph Kaptigau - Director, Agriculture Education and Training Division
8. Mr. B. Wayi - Ag. Director, Agriculture Research Division
9. Mr. Felix Bakani - Director, Export Crops Branch
10. Mr. J. Wohuinangu - Director, Food Management Branch
11. Mr. Francis Mangila - Ag. Director, Planning, Programming and Budgeting Division
12. Mr. Gapi Kula - Acting Director, Agricultural Protection Division

### RESOURCE PERSONS

#### RESEARCH DIVISION

13. Mr. Bill Bakau - OIC, Labu Animal Husbandry Centre, Lae
14. Dr. R.D. Ghodake - Co-ordinator, Adap. Research, Agric. Research Division, Konedobu
15. Mr. Fred Dori - Principal Entomologist, Laloki Research Station, Laloki
16. Mr. Sim Sar - Team Leader, Bubia Research Station, Lae
17. Mr. Mathew Kanua - Team Leader, Aiyura Research Station, Aiyura

#### AGRICULTURE EDUCATION AND TRAINING DIVISION

18. Mr. Hilarion Erai - Chief Information Officer
19. Professor Ray Kumar - Senior Principal Publications Officer
20. Mr. Philip Pondikou - Chief Training Officer
21. Mr. Vele Kagena - Chief Education Officer

#### AGRICULTURAL PROTECTION DIVISION

22. Mr. Alphonse Bannick - Acting Chief Agricultural Quarantine Officer

23. Mr. Elijah Philemon - Principal Plant Pathologist
24. Dr. I. Puana - Acting Chief Veterinary Officer

**EXPORT CROP BRANCH**

25. Mr. G. Mosusu - Senior Project Officer
26. Mr. L. Makara - Manager, SCCREP
27. Mr.. K. Kunhamboo
28. Mr. T.Teni

**FOOD MANAGEMENT BRANCH**

29. Mr. Alfred Bala - Acting Chief Commercial Food Invest.
30. Mr. Tony Hobiagi - Farming System Officer
31. Mr. Keith Galgal - OIC, ERAP Agricultural Research Station

**PROJECT PREPARATION BRANCH**

32. Mr. C. Kannapiran - Acting Chief Project Economist
33. Mr. Keno Wenge - Chief Project Economist
34. Mr. Amos Taporaie - Senior Project Economist

**PLANNING, PROGRAMMING & BUDGETING DIVISION**

35. Mr. Steven Rambe - Principal Commodity Planner
36. Mr. W. Gwaisuk - Food Nutrition Planner

**NON- DAL PARTICIPANTS**

**GOVERNMENT DEPARTMENTS**

**DEPARTMENT OF FINANCE AND PLANNING, WAIGANI**

37. Mr Robert Layine, Principal Budget Officer
38. Mr Lazarus Enker, Senior Budget Officer

**DEPARTMENT OF PERSONNEL MANAGEMENT**

39. Mr Paul Saii

**DEPARTMENT OF LABOUR**

40. Mr Arthur Dialla, Executive Officer,

**Council of Higher Education**

41. Dr Jim MacPherson, Director, Institutional Development
42. Ms Angela M. Filer, Senior Project Officer

**BANK OF PAPUA NEW GUINEA**

43. Ms Flora Carruthers, Executive Manager, Department of Economics

**NATIONAL RESEARCH INSTITUTE, NCD**

44. Mr. Modowa Gumoi, Senior Economist, Economic Studies Division

**DEPARTMENT OF EASTERN HIGHLANDS PROVINCE**

45. Mr. Ian Mofafi, Assistant Secretary, Division of Primary Industry

**DEPARTMENT OF CENTRAL PROVINCE**

46. Mr. Uve Rova, Assistant Secretary, Division of Primary Industry

**DEPARTMENT OF GULF PROVINCE**

47 Mr. Sari Tamasi, First Assistant Secretary, Resource and Investment Division
48. Mr. Gaisa Tipasa, First Assistant Secretary, Resource and Investment Division

**DEPARTMENT OF MADANG**

49. Mr. Lawerence Daur, Assistant Sectretary, Division of Primary Industry

**DEPARTMENT OF MANUS**

50. Mr. Kulen'en Hamou, First Assistant Secretary, Resource Management Division

**INDUSTRY CORPORATIONS**

51. Mr Mike Thomas, General Secretary, Oil Palm Industry Corporation, Port Moresby
52. Mr Wellington Geroro, General Manager,. Coffee Industry Corporation, Goroka
53. Mr Colin Benton, Consultant, Cocoa Quality Improvement Project, Rabaul

**PNG UNIVERSITIES**

54. Professor Michael Darkoh, Geography Department, University of Papua New Guinea, NCD.
55. Dr Alfred Ihekoronye, Department of Applied Sciences, PNG University of Technology, Lae.

**INTERNATIONAL ORGANIZATIONS**

**AUSTRALIAN INTERNATIONAL DEVELOPMENT ASSISTANCE BUREAU**

56. Mr Terry Sedoon, AIDAB Representative

**EUROPEAN ECONOMIC COMMUNITY (EEC)**

57. Dr David MacRae, EEC Delegate

**FOOD AND AGRICULTURE ORGANIZATION (FAO)**

58. Mr B. French, Consultant
59. Mr J.B. Harbaker, Consultant

**UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)**

60. Mr Nicolai Ruge, Programme Officer, P. O. Box 1041, Port Moresby

**OTHERS**

61. Mr Philip Holzknecht, Mirisa Associates, MS240 FERNVALE, Qld 4306, AUSTRALIA
62. Mr Dennis Ellingson, Chief Economist/ General Manager, ADS (PNG) PTY Ltd. P. O. Box 853, Boroko.

**OVERSEAS PARTICIPANTS**

63. Dr R. C. May, Manager, Agriculture Department, ADB, Manila
64. Dr Jim Longmire, Senior Lecturer, Department of Economics, University of Queensland, Brisbane, Australia
65. Mr Sydney P. Saville, Director, El Cid Services, Burpengary, Brisbane, Australia
66. Mr Richard Ivess, Chief Plants Officer, MAAF, Wellington, New Zealand
67. Mr Andrew Jones, Intermediate Technology, Rugby, England
68. Mr Ho Thian Hua, Senior Scientific Officer, CAB International Regional Office, Kuala Lumpur, Malaysia
69. Dr Kenneth Menz, Chief, Farming Systems Programme, ACIAR, Canberra
70. Bob McKillop, Shedden Agribusiness Pty Ltd, 2 Bay Street, South Melbourne, 3207.

# INSTRUCTIONS FOR CONTRIBUTORS

Papers must usually contribute to the advancement of knowledge in the discipline(s) concerned but short papers discussing techniques or published results, notes, bibliographies, book reviews and invited reviews of current knowledge in selected areas of interest to the journal would also be considered for publication. Articles offered for publication elsewhere or published previously will not be considered. All material submitted for publication will be refereed, reviewed and edited to meet the standards of the journal.

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1. **Presentation** - Papers should be double-spaced throughout with wide margins on both sides. The first line of each paragraph should be indented three spaces. A4 size paper should be used. Send the top copy plus two photocopies to the editor of the journal. Captions to plates and figures must be typed on a separate sheets. All pages of typing including references, appendices, captions and tables should be numbered consecutively at the top right.

2. **Title** - The title should be as brief as possible but should clearly indicate the content. It is not necessary to start the title with"A ... or" The ... or other non-significant words.

3. **Author's name** - First names or initials can be used according to the preference of the author, however, authors are strongly advised to use the same style for their name in all publications to avoid giving the impression that they are two or more different authors. The address of each author at the place where the work was done is given in a footnote. If there has been a change of address, the present address is also given for the first author.

4. **Abstract** - An informative abstract suitable for use by abstracting publications and services should precede the introductory paragraph. Because it is not part of the paper, an abstract should be intelligible on its own and should summarise the contents and conclusions of the paper. It should be written as simply as possible to assist people who are not specialists. It should not include unfamiliar terms, acronyms, trade names, abbreviations of symbols without explanation. The abstract should not exceed 2% of the total extent of the contribution; maximum 300 words.

5. **Key words** - A short list of key words should be provided for rapid scanning of the contents of the paper and use by abstracting agencies/journals.

6. **Headings** - In experimental papers the general order of headings is: Abstract, Introduction, Materials and Methods, Results, Discussion, Acknowledgements, References, Appendix. In descriptive, or other types of papers, as far as possible a similar format should be followed. No headings should be underlined.

7. **Text** - Papers should be concise. Extensive introductions referring to the work of earlier authors should be avoided. Lengthy discussions and detailed descriptions should be reduced by the use of tables and diagrams. The text should not repeat in detail what is apparent from a table or diagram.

Names of countries or organisations may be abbreviated to capitals without full stops but must be given in full at the first mention.

Numbers under 11 should be spelt out unless qualifying a unit of measurement. If a number over 10 and a number under 11 appear in the same sentence, both are written as numerals. Do not begin a sentence with a numeral. Fractions should be given as decimals or spelt out. All decimal numbers less than unity should have a zero before the decimal marker, e.g. 0.25. All units should be in the S.I. system.

All scientific names of animals and plants must be underlined to indicate that they should be set in italic type. The authority should be cited in full on the first occasion a scientific name is used. Where the same name is used repeatedly, the genus may be abbreviated to a capital letter after the first citation. For example, use *Homo sapiens Linnaeus* on the first occasion and *H. sapiens* thereafter.

Common or local names may be used but the scientific name should be quoted on the first occasion. An agricultural chemical must be referred to by its generic or common name when it is first quoted.

8. **Tables** - Numerical results should be displayed as means with relevant standard errors rather than as detailed data. Standard errors should be given to one place of decimals more than the means to which they refer and the number of degrees of freedom should also be quoted. Tables should be complete in themselves so that they can be understood without reference to accompanying text. Each table should have a brief and self explanatory title. The presentation of the same data in tubular and graphic form is not permitted.

9. **Figures and photographs** - Line drawings should be drawn in black water-proof ink on smooth tough paper. Labelling should be clear and always produced with stencils using black water-proof ink and should be legible when reduced. No alterations or additions to artwork can be made by the editors. Figures should be no larger than an A3 page, and no smaller than final published size. Photographs should be glossy prints of good quality and must make a definite contribution to the value of the paper. Indicate the top of figures and photographs on the back. Also indicate clearly on the back: the plate number of each figure and photograph, the author's name, and the title of the paper. Do not write on the back of photographs: use an adhesive label with the data previously written on it. Artwork should be of appropriate proportions for the final page dimensions.

10. **Acknowledgements** - The names, initials and place of work of those the author wishes to mention may be included. It is necessary to mention everyone who has been marginally involved in the work.

11. **References** - These should be cited in the text by the author's name and date as follows:

"Moran and Brown (1956) showed" or "Various works" (Miller and Smith 1956; Adams et al. 1960; Wilson 1978, 1979a;) found ..." The term *et al.* should be used when there are more than two authors. The letters a,b,c, should be used to distinguish several papers by the same author in one year.

All references in the bibliography should be given in full and in alphabetical order. For a journal the reference should include surname and initials of all authors, (year), title of paper, full title of the journal, volume, (part) and full page numbers. For a book the reference should include authors surname and initials, (year), title of chapter and page numbers if appropriate, full title of book, publisher and city and total page number. Conference proceedings should include the year and place of the conference. The title of the journal or book is underlined to be printed in italics. Examples:

BOWET, C.M. and SMITH, L.N. (1950). Measurement of phosphorus. *Methods of Soil Analysis.* Ed. C.A. Lack. Department of Primary Industry, Port Moresby. 400 pp.

SANDERS, A.J. (1940). Plant responses to molybdenum. *Papua New Guinea Agricultural Journal.* 48(4): 981-995.

TROBEN, M.M. (1973). Genetic fine structure in *Drosophila. Department of Primary Industry Research Bulletin* No. 102, pp. 196-197.

VANCE, P.N. (1976). Maize in the Markham Valley. pp. 215-220. *In: 1975 Papua New Guinea Food Crops Conference Proceedings.* K. Wilson and R.M. Bourke (Eds.) Department of Primary Industry, Port Moresby.

Internal reports, communications and memoranda are not valid references. The criteria for valid publications (in the scientific world) are that publications are distributed widely among those interested in the subject and are available to the international public in major libraries and from the publisher. This therefore excludes reports circulated only within a department and to a few outsiders and conference documents available only to those who attended the conference and the like.

Work that has not been accepted for publication (unpublished data) and personal communications are not included in the list of references but may be referred to in the text. References cited in an appendix should be included in the list of references at the end of the paper.

Special care should be taken to see that every reference in the text is included in the list of references and vice versa, and that there is consistency in the spelling of author's names and the citation of the dates throughout the paper.

12. **Review of papers** - All papers will be submitted to suitable professional referees. Major changes will be referred to the author for consideration. Minor editorial changes will be made without consultation but will be presented to the author(s) at proof stage. The final decision to accept or reject a paper, rests with the Editor-in-Chief.

13. **Offprints** - Twenty five free off-prints are given to the author. Where there are several authors, the senior author will be sent the off-print. Extra off-prints may be ordered at the time the galley proofs are returned to the editor. Costs will be determined at the time of printing.

14. Recognised abbreviations in this journal are:

| | |
|---|---|
| g | - gram |
| kg | - kilogram |
| t | - tonne |
| l | - litre |
| ml | - millilitre |
| ha | - hectare |
| mm | - millimetre |
| cm | - centimetre |
| m | - metre |
| a.s.l. | - above sea level |
| yr | - year |
| wk | - week |
| h | - hour |
| min | - minute |
| s | - second |
| K | - kina |
| n.a. | - not applicable or not available |
| n.r. | - not recorded |
| var | - variance |
| s.d. | - standard deviation |
| s.e.m. | - standard error of difference |
| d.f | - degrees of freedom |

Levels of significance

| | |
|---|---|
| n.s. | not significant |
| * | - $0.01 \leq p < 0.05$ |
| ** | - $0.001 \leq p < 0.01$ |
| *** | - $p < 0.001$ |

Either kg/ha or $kg.ha^{-1}$ is acceptable, but large combinations of units should be in the form kg.ha to avoid possible mathematical ambiguity.

**15. Submission of manuscripts - All correspondence should be addressed to: Editor-in-Chief, PNG Journal of Agriculture, Forestry and Fisheries, Information and Publications Section, Agricultural Education and Training Division, Department of Agriculture and Livestock, P.O. Box 417, Konedobu, Papua New Guinea.**