Marketing Systems for Agriculture:

DIAGNOSING PROBLEMS AND PRICE AND MARKET ANALYSIS FOR PAPUA NEW GUINEA

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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.

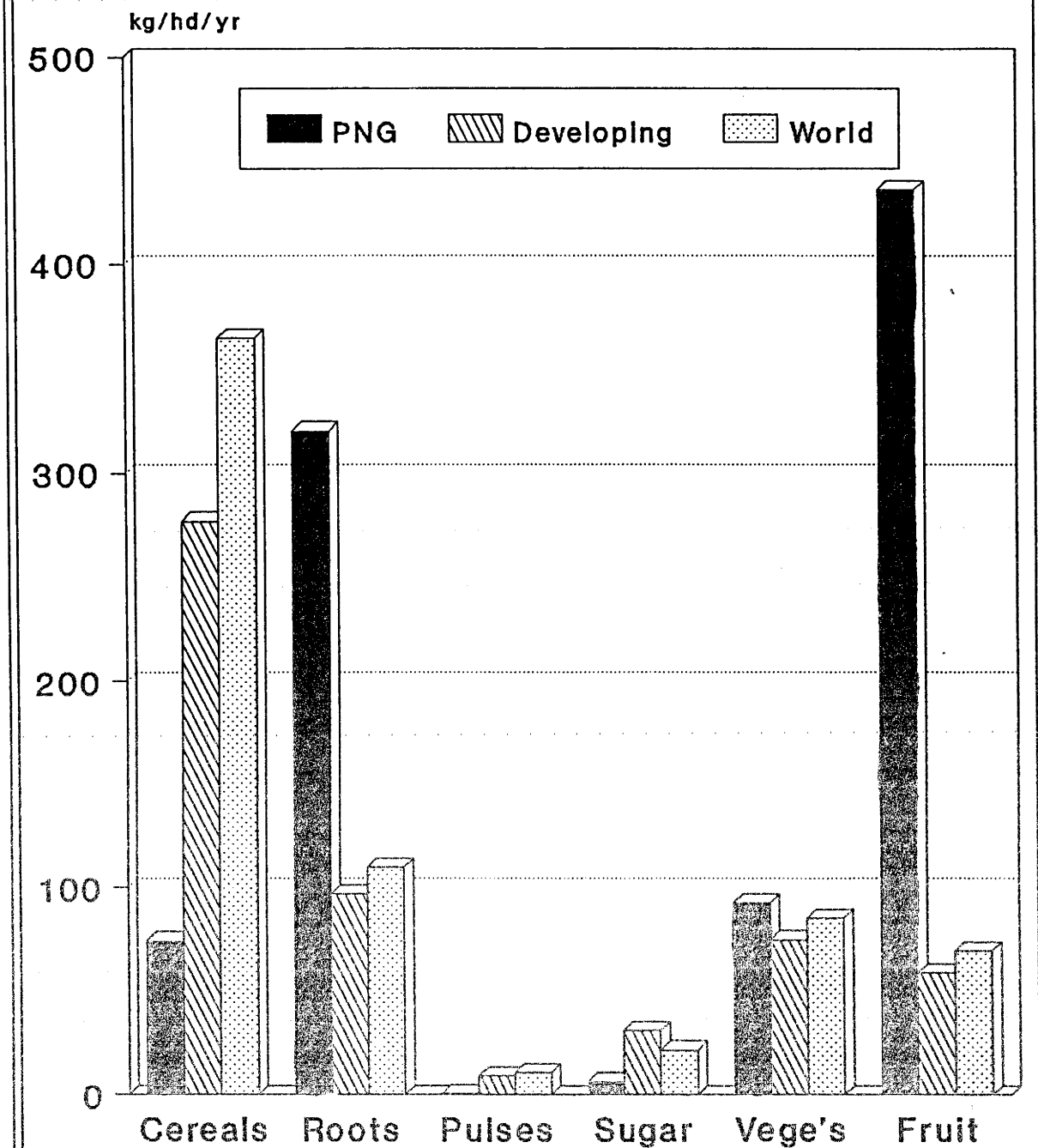
There are two very important considerations relating to agriculture of PNG. Firstly, the rural sector remains the dominant form of employment in the nation. The sector employs about 80-85% of the total workforce, and yet only receives 25% of the national income. Thus there is a large group of comparatively 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:

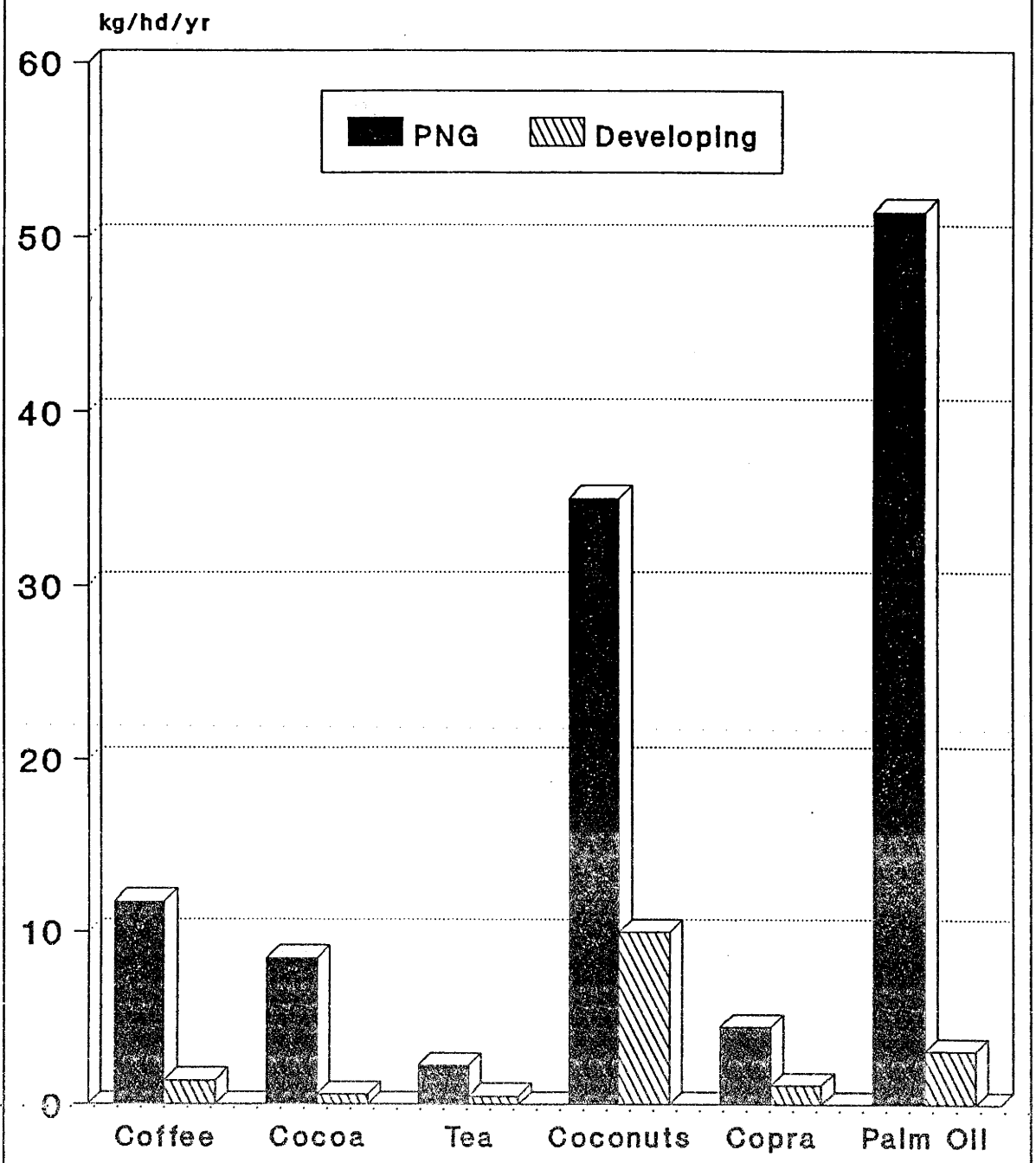
- the complexity of smallholder systems, including interactions between staple and export crops, and crops and livestock, and social and cultural factors influencing behaviour (especially the importance of women in agricultural decision making)

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**

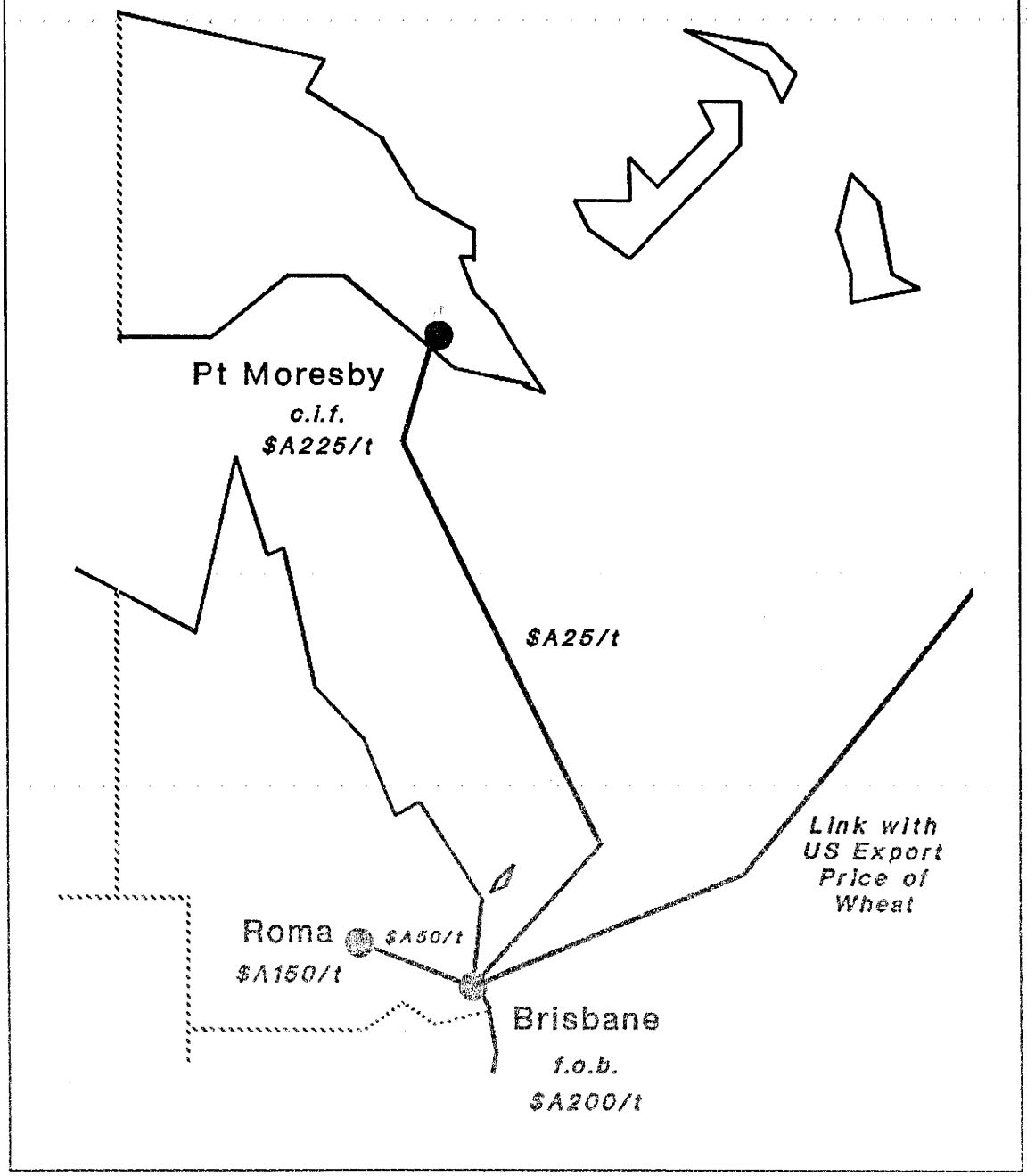
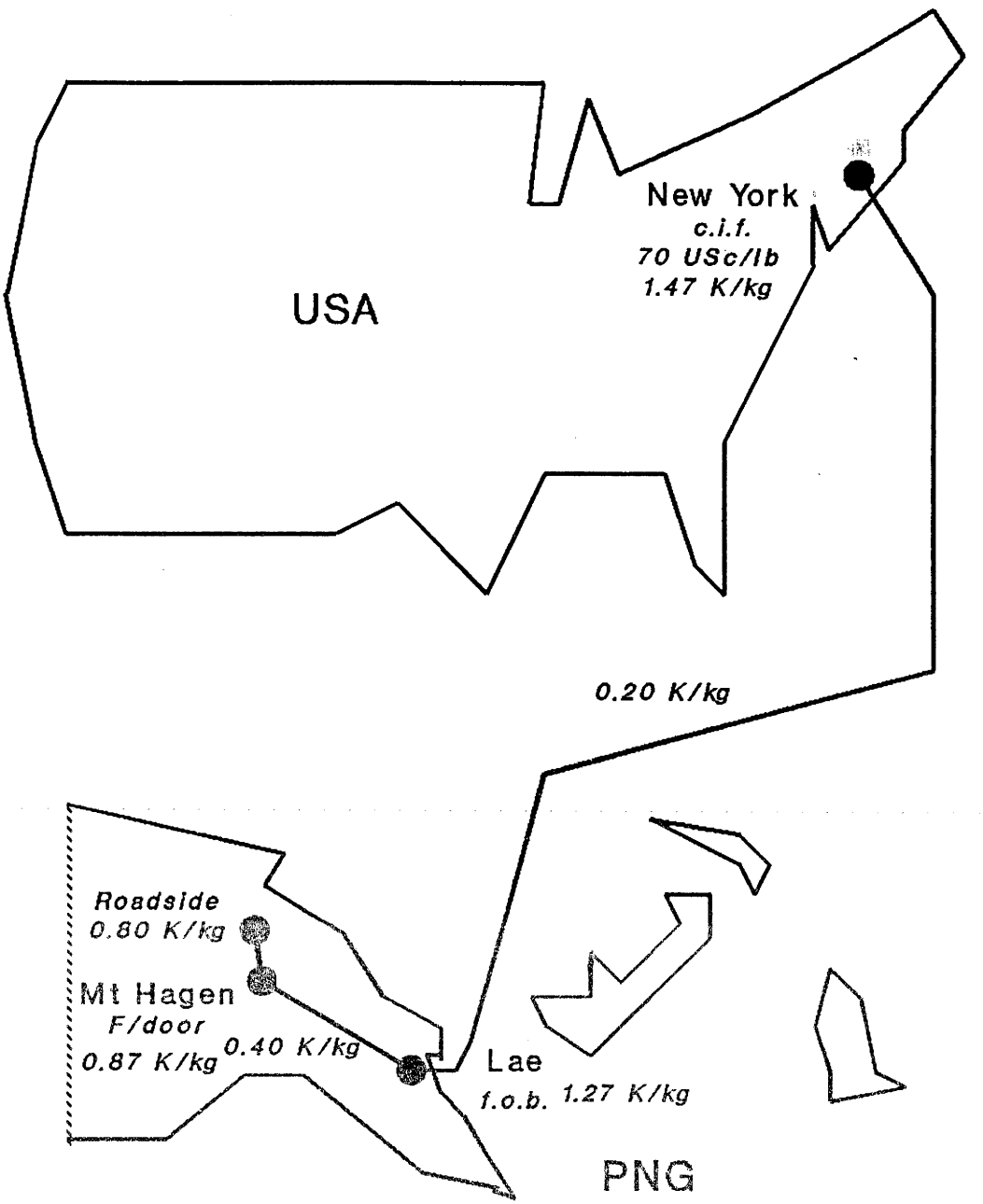


Figure 4. **Simplified Example of Prices in World Arabica Coffee Market**



·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 re ported)
- 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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