Papua New Guinea

THE CHANGING COST OF FOOD IN PAPUA NEW GUINEA - AN ANALYSIS OF PRICES IN FIVE URBAN MARKETS

by

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ABSTRACT

This paper presents an analysis of the fourteen year series of food crop prices collected by the National Statistical Office (NSO) for the Consumer Price Index (CPI). It looks at the degree of integration among the five markets in which prices are collected. It also looks at trends in the prices of each.

The paper concludes that:

(i). By and large there is in no sense a national foodcrops market in Papua New Guinea, rather a series of isolated and unconnected urban markets. The implications of this for policy are discussed.

(ii). Real prices of imported and manufactured foods have fallen consistently over the period 1971-84 while prices for domestic food crops have been rising. The extent to which this is so and the implications are discussed.

(iii). The rising cost of domestically produced foods is a source of concern as regards the record of the traditional staples sector in keeping up with population growth. The evidence seems to suggest that production may be falling behind at least in some areas.

If the trend towards increased consumption of imported foods is to be halted some Government intervention is required. It is suggested that it is necessary to simultaneously increase returns to growers of domestic food crops while ensuring that the market price becomes more competitive with the price of imported substitutes eg rice. Measures by which this might be achieved are listed.

1. Introduction

Prices are formed when buyers and sellers come together to make an exchange. In agriculture this is when farmers send their produce to market. Prices are simultaneous signals to producers and consumers about the cost of producing a commodity and the cost of buying it. Producers, in this case farmers, will use these signals to determine the level of output they wish to produce and sell, consumers to determine the purchases they wish to make. Each will adust these decisions as prices change.

A food price series carries information on the attractiveness of substitute foods, on likely production trends in future years, about alternative sources of supply, about seasonality, about demand pressure etc. To ignore prices would be to ignore information which is therefore important in planning for the future. When markets are not working or are inefficient, automatic adjustment in prices and volumes will not occur as it should and those with the least economic power will be the losers. We want to know who they are and why the market is not working. Then we can act to improve the situation.

2. Foodcrops in Papua New Guinea

In Papua New Guinea the traditional agricultural system was a series of interdependent sub-systems of subsistence field agriculture incorporating starchy staples, tree crops, animal husbandry, the exploitation of marine resources and hunting and gathering. The traditional producing unit was based on the family and was specialised only in its sexual division of labour. Its subsistence activities were shared with other families while it also related more widely, in a social sense, through the contribution of intentional surpluses, to the ceremonial and religious life of the wider society (Yen,1980).

This pure subsistence has, in this century, largely given way to mixed subsistence-cash cropping smallholder systems with considerable variability among, and overlap between, production components eg time allocated to various agricultural tasks and the amount of land and labour devoted to cash cropping. This semi-commercial mode is characterised by

(i) a growing semi-market oriented economy with, in some cases, significant purchases of food, much of it imported.

(ii) a diverse range of smallholder production for the market. This is mostly in non-food items - notably coffee in the highlands - but also covers a wide range of fruits, vegetables, roots and nuts, including betel nut which is a major crop.

About one quarter of the population of PNG is now wholly engaged in the cash economy. The remainder gains their livelihood principally from subsistence agriculture although most of them receive some income from a variety of cash earning activities. Despite its obvious importance, very little reliable data on subsistence production is available. Eele (1983) is a very useful review of this data and its sources and it is useful in the context of this paper to briefly summarise the material.

(i) Consumption

The National Statistical Office's computed figure for the non-marketed component of production is essentially an estimate of total human consumption from subsistence, ie it does not include the considerable quantities of food fed to pigs which some observers have put very high: ie 49% of all food production in a community in Enga in some years (Waddell, 1972) and 41% of all food in a community in Madang Province (Rappapaport, 1968). In real terms the NSO estimate has remained remarkably constant as a proportion of GDP. As a proportion of total production it has also kept steady at 15% to 16% (Shaw, 1985).

(ii) Production

Shaw (1985) believes that, given the growth of the informal market for local produce, subsistence production per capita is probably decreasing but not greatly. He puts the value of subsistence consumption (in 1983 prices) at K350 million and of informally marketed production (which includes fruit and vegetables, betel nut, pandanus, village tobacco, fish and village livestock) at K157 million. The only national level survey ever done on this was carried out in 1962 (Walters, 1963) and converted all production into notional pure stands. It is long out of date.

(iii) Marketed surplus

Table 1 contains the only national estimates for marketed fruit and

Table 1: Estimates of marketed fruits and vegetables 1977

Location	Quantity per year (tonnes)		Average price (K/tonne)	Value (K'000)	
Port Moresby	10,676		300	3,203	
Lae	18,119		180	3,261	
Rabaul	21,352		140	2,989	
Madang	1,752		180	315	
Wewak	2,015		150	302	
Goroka	8,000		230	1,840	
Mount Hagen	8,000		230	1,840	
Other Urban	25,039		150	3,756	
Rural Non-Village	125,195		100	12,520	
Rural	21,200		50	1,060	
TOTAL	241,348			31,086	
Total urban	94,953	(39%)		17,507	(56%)
Total rural	146,395	(61%)		13,580	(44%)

Note: Original source gives the assumptions on which the estimates were made.
Source: Densley (1977)

vegetables from domestic sources. These were done by Macewan and put the total at 241,000 tonnes with a value of K31 million. There are inconsistencies between the different centres - the most obvious being that fruit and vegetable consumption/capita in Rabaul appears to have been nearly 4 kg/day (surely a ridiculously high figure) as compared to less than 0.5 kgs for Port Moresby.

Current estimates for informally marketed fruit and vegetables are not available but there is a strong feeling that domestic food marketing has been increasing strongly (Garnaut and Baxter, 1983; Bourke, 1984).

(iv) Prices

Prices for 14 foodcrops in five urban centres have been collected since 1971 (see section 3) and it is this series which is analysed in this paper. Unfortunately prices are not collected for all the major food crops. Sago, yams and Xanthasoma taro are particularly conspicuous by their absence and urgent consideration must be given to their inclusion in the future if domestic food production is to be adequately monitored nationwide. The following brief survey reviews the important crops for which price data is collected.

2.1 Sweet Potatoes (Ipomoea batatas)

In the highlands sweet potato is easily the most important crop and it is becoming more so in the lowlands, replacing the older taro staple, production of which has seriously declined. Various dietary surveys indicate that sweet potato provides between 65% and 90% of energy intake in the highlands (Bourke, 1985).

About 500 cultivars are maintained on research stations but this is certainly a small proportion of the available germplasm. It is believed that more cultivars of sweet potato could be collected in Papua New Guinea than from any other area in the world.

There is no reliable data on the volume of production although, despite its age, the 1962 national survey is a useful and valuable source of information. Production of staple crops was estimated at 2.04 million tonnes with sweet potato at 1.22 million tonnes accounting for 60 per cent of the total. Sweet potato is very much a year-round crop although actual seasonality varies by area acccording to the timing of the rains. In several parts of the country, eg. North Solomons Province, sweet potato is believed to be replacing the older Colocasia Taro staple (see below). There is very little general economic data on the use of sweet potato as a gift although this is known to be important. When distributed at feasts sweet potato is normally in the cooked form.

2.2 Taro (Colocasia esculenta)

Taro is an ancient crop in PNG. It was the staple food in lowland and intermediate altitude areas where rainfall is well distributed throughout the year. It is also important in certain Highland areas, particularly the Telefomin Star Mountains. It is generally grown

following a long forest fallow and its peak seasonality usually occurs during the wet season.

Currently taro production is declining in many areas. This is usually attributed to leaf blight but Bourke (1982) believes this cause to be overstated and cites a range of causes for its decline - some of them related to the availability of alternative foods with better returns. In Section 3.2 it will be seen how taro prices have risen dramatically in recent years. This is presumably related to its declining availability. Given these high prices it may be that returns to taro production could again become competitive.

2.3 Bananas (Musa spp.)

Bananas are popular throughout the country and the second most important staple. They are the main staple in the lowlands notably in parts of the Markham valley, Central Province, the Gazelle Peninsula and Madang. There are a large number of varieties. Most can be used for cooking or for eating fresh. Cavendish bananas are now the most widespread types used for fresh fruit. There is very little agronomic research on cooking bananas in Papua New Guinea neither has there been much work on the role of bananas in food consumption patterns.

2.4 Cassava (Manihot esculenta)

Cassava is widely grown as a minor crop but is not generally popular and is often used more as a food reserve or for pig food. It is most important in subsistence gardens in the dry Port Moresby area. In areas of strongly seasonal rainfall, eg. in parts of the Eastern Highlands and in the Markam Valley, it is believed to be attaining the status of a co-staple. Cultivars are quite numerous.

2.5 Aibika (Abelmoschus manihot)

This is a leafy green widely grown in the lowland areas of PNG and also, less often, in the highlands. It is a year round crop.

2.6 Tropical fruits

The traditional Papua New Guinean diet was not rich in fruit, in marked contrast with green vegetables, roots and nuts. In the highlands, marita pandanus and eating bananas were the only significant traditional fruit. Most of the now common species were introduced following European settlement. These include mango, pineapple, pawpaw, watermelon, avocado, guava, passion fruit, stawberry and citrus.

3. Foodcrop prices in Papua New Guinea

Brookfield in his influential work "Pacific Market Places" (1969) defined Melanesian markets as, among other things, consisting of sellers who did not seem to be particularly eager to sell their goods. They merely offered them for sale, making no attempt to urge people to buy and they never attempted to haggle or bargain with buyers. From this behaviour, and from observations made in short-term studies it was concluded that no

accommodation was made between buyers and sellers. Rather, sellers set their prices before they came to the market, and refused to change them, preferring to carry home their produce rather than reduce the price. As a result, a Melanesian market could not clear, as there was no prevailing price, and some prices would remain too high for the buyer. Epstein (1982) describes this process in some detail for seven markets in Papua New Guinea based on material collected in the 1960s.

Other writers have disagreed with this analysis however. Von Fleckenstein (1975) shows that the price of sweet potato in the Goroka market in 1974 responded to fluctuations in supply and perhaps that supply responded to price. Bourke and Nema (1985) suggest that since about 1970, marketing chains have been extended. Middlemen now facilitate sales of produce between the ultimate producers and consumers. Such activities were conspicuous by there absence in the 1960s (Brookfield,1969 and Epstein, 1982).

Since 1971 Provincial DPI officers have collected prices, on a weekly basis, for fourteen of Papua New Guinea's domestically produced food crops. They have done this for five markets - Goroka, Lae, Madang, Port Moresby and Rabaul. The details of the price collection procedure are given in the Appendix. Since January 1982 prices have also been collected for the Arawa market. It is the intention of this paper to review this material, and to draw from it conclusions about developments in the nation's food markets although, it has to be emphasised, that these markets represent urban areas only, not the country as a whole, where many other markets exist. It should also be noted that only one of the markets covered here is in the Highlands where one third of the nation's population lives.

Until now the data has only been used for the calculation of the Consumer Price Index (CPI) which is published monthly by the National Statistical Office (NSO). It has never been properly analysed in itself. Clearly it represents a fund of information on domestic food crop production in PNG, an area in which no other long run systematic data is available. As is stated in Section 2, there has been no production data collected since 1962 and there is only scattered micro-study information on quantities of produce marketed (See Bourke and Nema, 1985 for a summary). In the absence of other reliable data, a price series such as this is quite invaluable. Its length is unusual in developing countries and, despite reservations about the methods of collection (see Appendix), and about several serious omissions in the coverage of both crops and towns, (sago, yams and Xanthasoma taro are, as we have said, a notably unfortunate ommission), it is clear that PNG is fortunate to have this series with the wealth of information it contains. (See Harriss, 1979 for a discussion of comparable problems with data runs in West Africa).

In 1982 R. M. Bourke, Principal Agronomist at DPI Aiyura, began to extract the data from the files at NSO. He tabulated about two thirds of the food crop prices available at the time. Some of that data has been reviewed in a paper by Spenser and Heywood (1983). These authors extracted the remaining data (to 1984) as well as prices for twelve other foods with which useful comparisons can be made. Using Knowledgeman, Supercalc 2, Statpak and DR Graph software and an ICL 16 bit Microcomputer we then constructed the series of annual constant prices and the analysis which follows.

3.1 Degree of Market Integration

Efficient marketing systems are characterised by a high degree of market integration. That is, in a national context, participants shift produce from oversupplied, low-priced markets to other markets where supplies are scarcer and prices higher. Provided the difference in prices exceeds the cost of transport - arbitrage - the shift is worthwhile. If there are several merchants operating this way then the prices in different markets will tend to even out. With movements in prices in one market being reflected in movements in price in another, differences between levels of prices should reflect only normal costs.

Table 2 presents the results of correlating annual constant prices in the five urban markets under review for each of the fourteen foodcrops. The "other vegetables" category is a composite of seven less important items using weighting derived from the 1975/6 Household Expenditure Survey. There are five markets and therefore 10 pairs of markets.

For cooking bananas, only one of those pairs shows a correlation coefficient of more than 0.55 while the remaining pairs all show correlation coefficients of less than 0.45. One can therefore say that movements in prices of cooking bananas in any one of the five urban markets have not been reflected in, or cannot be explained by, movements of prices in any of the other markets. In other words the markets for cooking bananas are in no way connected.

Using the total number of pairs for all eight categories of foodcrop, we see that 75 per cent of the observations have a correlation coefficient falling below 0.55 ie there is next to no market integration. In Papua New Guinea where markets are far apart, where there are few operators and where transport is rudimentary and expensive we would expect a low level of integration in foodcrop markets. Foodcrops are low value, bulky and highly perishable and therefore expensive to transport. They are additionally not grown deliberately for market. By and large they are surplus to subsistence production and therefore supplies are irregular and probably not very responsive to price. Interestingly both pineapple and taro show a distribution of correlation coefficients which tends rather higher than for the other items. In the case of pineapples we might expect this because pineapples are a market crop, and not one whose sales are surplus to subsistence. They are a higher value item and therefore more likely to be moved from market to market and, with proper handling, they are only moderately perishable. Nonetheless there is no field evidence to support the idea of a national pineapple market. There is on the other hand evidence of a network of betel nut markets (Bourke, 1986) but, as can be seen from Table 3, the correlation coefficients between prices of betel nut in the markets covered are all very low. This should alert us to the danger of putting too much weight on this data.

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*Jeffries (1979) quotes a study by Mckay and Smith (1974) in which the sweet potato hinterland for Lae is found to extend from Bulolo (70 km to the South West) to Kiapit (110 km up the highlands highway). By now this hinterland could well have expanded and, for a more market-oriented item like pineapples, the hinterland is anyway likely to be considerably larger.

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TABLE 2: CORRELATION COEFFICIENTS FOR FOODCROPS PRICES

CORRELATION COEFFICIENT	COOKING BANANAS	SWEET BANANAS	PINE -APPLES	DRY COCONUTS	PEANUTS	SWEET POTATOES	TARO	OTHER VEGETABLES	ALL FOOD CROPS
0.95 - 1.00	-	-	-	-	-	-	-	-	-
0.85 - 0.95	-	-	1	-	-	-	1	-	2
0.75 - 0.85	-	-	-	-	-	2	4	-	6
0.65 - 0.75	-	1	2	1	-	2	1	1	8
0.55 - 0.65	1	-	1	1	-	-	-	1	4
0.45 - 0.55	-	1	2	-	1	2	-	2	8
0 - 0.45	8	5	4	3	6	1	2	5	34
-1.00 - 0	1	3	-	5	3	3	2	1	18
NO OF MARKET	5	5	5	5	5	5	5	5	5
NO OF PAIRS	10	10	10	10	10	10	10	10	80
1ST QUARTILE	0-0.45	0-0.45	0.65-0.75	0-0.45	0-0.45	0.65-0.75	0.75-0.85	0.45-0.55	0.45-0.55
2ND QUARTILE	0-0.45	0-0.45	0.45-0.55	-1.00-0	0-0.45	0.45-0.55	0.65-0.75	0-0.45	0-0.45

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TABLE 3: PRICE CORRELATION COEFFICIENTS FOR FOODS & OTHER ITEMS

CORRELATION COEFFICIENTS	TINNED FISH	TOILET SOAP	BEER SP BROWN	CANNED C/BEEF	CIGARETTES CAMBRIDGE	KERO -SENE	RICE	SUGAR	BETEL NUT	SAO BISCUITS	BREAD	PLAIN FLOUR	EGGS	CHICKEN
0.95 +	3	-	3	5	10	6	3	7	-	1	2	5	-	1
0.85-0.95	5	3	3	5	-	-	4	3	-	7	4	5	2	5
0.75-0.85	2	3	-	-	-	1	3	-	-	2	3	-	1	2
0.65-0.75	-	3	-	-	-	3	-	-	-	-	-	-	1	1
0.55-0.65	-	-	-	-	-	-	-	-	1	-	1	-	2	1
0.45-0.55	-	-	1	-	-	-	-	-	2	-	-	-	-	-
0-0.45	-	1	3	-	-	-	-	-	5	-	-	-	4	-
< 0	-	-	-	-	-	-	-	-	2	-	-	-	-	-
T O T A L	10	10	10	10	10	10	10	10	10	10	10	10	10	10
NO OF MARKETS	5	5	5	5	5	5	5	5	5	5	5	5	5	5
NO OF PAIRS	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1ST QUARTILE	0.95 +	0.85-0.95	0.95 +	0.95 +	0.95 +	0.95 +	0.95 +	0.95 +	0.45-0.55	0.85-0.95	0.85-0.95	0.95 +	0.75-0.85	0.85-0.95
2ND QUARTILE	0.85-95	0.75-0.85	0.85-0.95	0.95+	0.95 +	0.95 +	0.85-0.95	0.95 +	0-0.45	0.85-0.95	0.85-0.95	0.95 +	0.55-0.65	0.85-0.95

It is nonetheless of particular interest that prices for pineapples in Madang and Lae return a correlation coefficient of 0.87. These two towns are some 300 km apart. They are linked by a reasonable road and their hinterlands may overlap.* We might therefore expect that there would be some integration between them. The fact that there is however virtually no connection between these markets for any of the other commodities indicates that generally there is little integration and that other produce, at least, does not appear to be moving between these markets.

Why taro shows a series of higher correlation coefficients than the other items is not clear as it exhibits much the same characteristics as the other roots and tubers and we would not expect the different markets to be linked. Nonetheless the figures indicate a connection, notably between Goroka and Rabaul (.89) but also between Lae and Goroka, Port Moresby and Rabaul respectively as well as between Port Moresby and Rabaul (all above Rabaul and the other centres may be connected because of the food exchange patterns of migrants from East New Britain who have settled in these other centre but there is no evidence for this at all.

By comparison some of the items in Table 3 show a very high level of integration. The same analysis has been done for the major non-foodcrop items on which Papua New Guineans spend money. This is both a useful illustration of the concept of market integration and a helpful comparison with the items in Table 2. A very different pattern to that in Table 2 emerges. For cigarettes, for example, all 10 pairs of markets show a correlation coefficient of more than 0.95. For all of the items shown, except betel nut, which for obvious reasons, is a quite different commodity from the other items, 50 per cent of the correlation coefficients exceed 0.75.

High coefficients could indicate a number of things:

- stable prices, ie simply very little movement
- effective integration ie an efficient and competitive market
- government intervention or some degree of monopoly with really no indication about market integration.

These products are, of course, quite different in nature to the food crops. They are higher value, they are much less perishable, they are easily stored, they are manufactured for sale and transport costs will be a much smaller proportion of their final retail value. Many of them are imports. We would expect a greater degree of market integration for these items but in fact, for many of them, the high proportion of high correlation coefficients is a consequence of government intervention. Many of these commodities are under price control: sugar, rice, cigarettes, canned meat, kerosene, flour and bread. This is of course integration of a sort and the, high level of the correlation coefficients highlights the low level of integration for the foodcrops. For the latter we can see that the markets are not connected, that they do not share a common hinterland and that, if produce is moved from one area to another, it has no bearing on price movements. Whether the high correlation coefficients between pineapple prices in Lae and Madang indicate an embryonic market in that region is a matter of interpretation. However it is clear that, by and large, there is, in no sense, a national foodcrops market in PNG, rather a series of isolated and unconnected urban markets, characterised by poor and

unreliable transport and irregular and inadequate information flows. This is really no surprise. We know that even in markets of close proximity, whether rural, rural non-village or small urban, price differences are often large and that prices can move in somewhat different directions i.e. immaturity is not just a characteristic of these particular markets but of the marketing system as a whole.

This immaturity has implications for policy. There is, for example, much discussion over rising consumption of imported rice. This has followed from the increasing attractiveness of rice to the urban community. It is less bulky, weight for weight more nutritious, easier to store and prepare and (as will be seen in Section 2.3) cheaper.

A recent FAO mission to PNG (FAO, 1986) stated that one of the few policy options available to Government to combat increasing rice consumption was to intervene to make alternative foods, ie traditional staples, cheaper. One way to do this is to improve the marketing of these items and thereby to cut costs. We have shown here that the major urban markets for traditional staples are not connected and therefore that there are considerable inefficiencies within the system. If the nation's markets can be improved, marketing margins can be cut and prices reduced. One obvious and immediate improvement would be the better availability of market information. If producers can learn the prices in different markets from the radio or newspapers then they will be more likely to take their produce to th higher priced markets. This will cause price levels between markets to begin to even out. This may make it possible to improve the supply of traditional staples to the urban consumer and thereby to at least slow down the current increases in rice consumption. It will be seen later how increasing rice consumption has paralleled increasing prices of staples and falling prices of rice. Upgraded market infrastructure is of course another much needed improvement.

3.2 A comparison of trends in the prices of different foods

Using weights which are explained in the Appendix, a series of national urban prices have been constructed for each food crop and the data graphed in constant terms. The same analysis has been done for each of the non-foodcrop foods for comparative purposes. The graphs are shown as Figures 1-10 in the Appendix. Additionally prices for each commodity have been correllated against all the others in order to check for linkages. The results are shown in Table 4.

3.2.1 The graphs show a number of interesting phenomena some of which we cannot at present explain and on which further enquiry is necesssary. This section summarises the main trends.

3.2.1.1 Figure 1 shows prices for some of the nation's major staples - taro, sweet potato and cooking and sweet bananas in the five major urban markets of Papua New Guinea. They have all risen significantly over the period under review with taro exhibiting the most dramatic increase. Since 1983 there has been a fall in prices for all these items but the reasons why are not clear. An analysis of prices for 1985 and 1986 will be useful in determining whether this is a temporary dip or the beginning of a long run trend.

The pattern of price movements shown in these graphs is a function of the heavy weighting assigned to Port Moresby in the construction of the averages (see Appendix). Figure 2 shows how Port Moresby prices for taro rose consistently from 1971-1980 but have fluctuated downwards since. By contrast prices in Goroka rose from a much lower level in 1971 and, while dropping after 1979, they have risen again to near record high levels. One suggestion is that, in those areas where taro is not the major staple and where it is a man's crop, women have not taken over taro production when men have shifted out of garden work and into coffee, and consequently the availability has dropped and prices have risen. However taro production systems vary considerably by region and we would not wish to generalise conclusions across the country.

In Madang, prices have remained broadly constant while in Lae they have climbed fairly consistently. Although prices have risen since 1982 in three out of five markets, the 40 per cent weighting assigned to Port Moresby, where prices have fallen, works to push down average prices, as shown in Figure 1. The appropriateness of the weights is discussed in section 4.3.3. The similarities in pattern between taro prices in different markets observable in the graph are what gives rise to the generally higher series of correlation coefficients for market integration discussed in section 3.1.

Figure 3 shows price movements for sweet potato in the different markets. Again the dramatic situation in Port Moresby is immediately clear. In the capital prices are consistently much higher and they have risen more dramatically than elsewhere, although again, with a big drop in 1984.

3.2.1.2 Figure 4 shows prices for aibika, cucumber, pineapples, pumpkins and pumpkin tips, the indicators of fruit and vegetables in the CPI. Prices for these items move in a remarkably similar way. From 1971 to 1972 they rise, only to fall sharply until 1974 before beginning a long upward trend which peaks around 1978-80. This is followed by a downward trend for all items except pineapple which has fluctuated fairly steadily.

This fall in real prices which occurred in 1973 and 1974 also occurs for the staples in Figure 1 and for almost all the other foodcrops reviewed here with the notable exceptions of betel nut and taro, although for the latter these years register a check in an otherwise dramatic increase. The reason for this is the very high rates of inflation in 1973 and 1974. Current prices for these items did not fall but the all foods index, by which the prices shown here have been deflated, rose by 18.1 per cent and 27.9 per cent in 1972-3 and 1973-4 respectively.

3.2.1.3 In Figure 5 the falling real prices of 1973 and 1974 appear again for all items - corn, beans, cassava, peanut and coconut - although, for some, to a lesser extent. Prices for these rather less important items otherwise remain broadly stable.

3.2.1.4 Turning to the non-foodcrop foods, Figure 6 presents prices over time for major manufactured food items: tinned fish, rice and sugar. Prices of tinned fish have fluctuated but on a broadly constant level. Prices of sugar have of course fluctuated wildly. The graph shows the dramatic effect of the great international sugar price hike of 1980. It also shows changes in the sugar price since the establishment in 1982 of

Ramu Sugar Ltd (RSL) which is a protected monopoly supplier of sugar to the domestic market. It has been RSL's consistent contention that while retail prices of sugar are currently well in excess of what they might be were PNG to purchase sugar on the world market, the price of RSL sugar in the long run should be favourably comparable with the long run world price. This is not borne out by the evidence here.

For the pre-RSL years, 1971-81, the retail price of sugar in PNG which ranged from 64t to 106t per kg, averaged 81t per kg. In the subsequent years, 1982-4, the average price was 84t per kg. Ex factory prices are now linked to inflation and therefore, while the rate of growth in prices for the latter years indicated by the graph, will have slowed, the average ex-factory price, 1982-6, will probably exceed 90t. This represents a price some 11 per cent above pre-RSL levels.

Figure 6 also shows prices for rice and these can be seen to have moved consistently downwards. Between 1971 and 1984 prices fell by 26 per cent. The implications of this particularly in view of the rising prices of roots and tubers is discussed in Section 3.3.

3.2.1.5 Figure 7 shows prices for flour, bread and imported biscuits. The most striking point here is that prices moved broadly together between 1971 and 1976 but since then there has been a dramatic divergence.

After 1976, flour prices fell sharply and by 1984 were 29.8 per cent down on their 1976 levels, despite the establishment of a domestic milling project which might have been expected to cause an increase in flour prices. Bread prices on the other hand continued to climb and by 1984 were 12.7 per cent up on their 1976 levels. Before 1975, flour prices consistently exceeded bread prices but by 1984 represented only 58 per cent of the latter. More investigation may be necessary to establish why bread prices have behaved in this way when their major ingredient has fallen so much in value.

The pattern of biscuit prices is similarly strange. They tracked flour prices very closely between 1971 and 1980 but after that they increased dramatically (39 per cent between 1980 and 1984). Again one is forced to ask whether it is costs or profits for the industry which have risen.

3.2.1.6 Figure 8 shows prices for chicken, eggs, and canned corned beef. These all show a falling trend and contribute to the general pattern of falling prices for imported and manufactured goods. The implications of this are discussed in Section 3.3.3.

3.2.1.7 Figure 9 shows prices for beer, cigarettes and betel nut. Beer and cigarettes track together more or less steadily. The rise of betel nut is fascinating. The data shows three striking facets. Firstly, average urban prices rose by 133 per cent over the period under review, an enormous leap, as the graph shows. Secondly, as can be seen from Figure 10, the rate of growth, 1971-1984, is quite different in different centres: Goroka -26 per cent (after a period of rising prices, 1974-82, prices fall rapidly away); Lae +249 per cent: Madang +234 per cent; Port Moresby +195 per cent; and Rabaul +70 per cent. It is difficult to see how there could be such a difference between Goroka and the other centres. The nut is transported there from the Markham Valley and from the coast and Goroka is at the

centre of a large and apparently growing market. Why supply should be outstripping demand in Goroka is not clear particularly given the dramatic rise in price in the adjacent producing areas, Lae and Madang. Demand in Goroka has clearly been increasing. There was very little consumption of betel nut in the highlands pre 1968 (when the highway was upgraded) and virtually none pre 1960. Now sales are considerable yet clearly availability of supply is still greater.

The third point to note is that as well as there being a dramatic difference in the rates of growth of prices in different markets, the actual level of prices also differs significantly. Average prices in Rabaul, the cheapest market, were 52.2t/kg, only 27 per cent of the average price in Port Moresby over the same period. Prices in the other centres fell between these extremes. This further highlights the lack of market integration discussed earlier.

3.2.1.8 In summary, it is clear that, prices of imported and manufactured items have been falling in real terms while for domestic food crops, particularly the staples, prices have been rising. This will be shown more clearly in section 3.3 where the implications are also discussed. In this section we have highlighted those areas of interest which relate to individual crops and the cases of sugar, rice, bread, flour, betel nut, traditional staples and vegetables have been particularly discussed.

3.2.2 Table 4 presents an analysis of movements of prices of one commodity against those of another. There are 28 commodities in all, that is 378 pairs. They have been aggregated, as explained, from the original market specific data so some fine detail will have been lost. There are nonetheless some interesting results. There are no pairs with correlation coefficients exceeding 0.95 per cent but 14 with coefficients between 0.8 and 0.95 and 13 between - 1.00 and - 0.80, ie 93 per cent are not significantly correlated. Of the 7 per cent that are interesting, there are a number of seemingly spurious results not listed in the final column of the table. However the prices of the main staples, sweet potato, taro and cooking bananas, are among the 7 per cent and it is significant that they move so closely together. This has implications for policy. As prices of traditional staples have risen, so people have switched to rice. At the same time prices of staples have moved generally together which suggests that interventions that affect the price of one staple will also affect that of the others. Probably this is because, in urban areas, each one is a good substitute for the others and as the price of one staple rises so consumers switch to another.

3.3 A comparison of different categories of foods

In order to get a better understanding of general trends in the market we have constructed a series of three food baskets using those items for which we have collected data. Trends in these baskets are shown for each urban market in Figures 11,12,13.

3.3.1 The basket of food crops was constructed using prices for all the fourteen crops (See Appendix). It is shown in Figure 11. Port Moresby has been markedly the most expensive market, followed by Goroka and, some way behind, the other three markets. Overall there appears to be a broadly upward trend in prices although the rate of increase varies considerably by

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TABLE 4: PRICE CORRELATION COEFFICIENTS OF FOOD CROPS & OTHER ITEMS

CLASS INTERVAL OF COEFFICIENTS	TOTAL PAIRS PER CLASS INTERVAL	PERCENTAGE OF PAIRS PER INTERVAL	NOTABLE PAIRS OF FOOD CROPS & OTHER ITEMS
< 0.95	-	-	
0.80 TO 0.95	14	3.70	SWEET POTATO & COOKING BANANAS SWEET POTATO & BETEL NUT SWEET POTATO & TARO COOKING BANANAS & SWEET BANANAS COOKING BANANAS & TARO SWEET BANANAS & PINEAPPLES EGG & CHICKEN FLOUR & RICE CIGARETTES & BEER
0 TO 0.80	199	52.65	
-0.80 TO 0	152	40.21	
-1 TO -0.80	13	3.44	FLOUR & SWEET POTATO RICE & COOKING BANANAS RICE & SWEET BANANAS RICE & SWEET POTATO RICE & TARO
TOTAL PAIRS	378	100	

market; in Goroka there has been a dramatic increase in prices, by 167 per cent between 1971 and 1984. The trend in the other markets is much less pronounced. In Moresby where prices have been consistently highest we see the characteristic fall in prices in 1974 followed by a steep increase 1974-8, in turn followed by a relative stability, then, from 1981 to 1984, a period of fluctuation.

The rapid rate of increase in Goroka resulted in average prices in Goroka and Port Moresby being virtually on a par in 1984. We look forward to the publication of the data for 1985 and 1986 as this will show where this trend is leading.

At present it seems that pressure on supply in Goroka is worse than that in Port Moresby which has always been cited as the most difficult market to supply. If produce is becoming scarcer in Goroka where land is fertile and abundant and links to the market are relatively good, it may be because of the considerable potential there for alternative agricultural entreprises. Goroka is the centre of the coffee industry and it may be that farmers are increasingly moving out of subsistence and semi-subsistence gardening and into cash cropping. The implications of this for general welfare have been explored in Bourke, Carrad and Heywood (1981), Harris (1982), Shaw (1985), and FAO (1986b) and are as yet unresolved. In conjunction with the Institute of Medical Research (IMR) and the International Food Policy Research Institute (IFPRI), DPI intends undertaking a study of the processes by which increased commercialisation of semi-subsistence agriculture affects income and nutrition in South Chimbu. This should cast considerable light on this difficult area.

Of the other markets featured in Figure 11, Lae shows a consistent but moderate upward trend; Rabaul shows a sharp increase in 1976 from which prices fall until 1981 before slightly picking up again; while in Madang, the cheapest market since 1976, prices have been remarkably constant.

Harris (1980) refers to a study by McCulloch (1971) in which the author found virtually no change in produce prices in Port Moresby during the 1960s. This is what we would expect from the type of "Melanesian market" as described by Brookfield (1969) although it has to be emphasised that inflation during the 1960s was very low (15 per cent 1961-70). Our data shows that during the 1970s there has been a change away from this type of market towards one where orthodox market behaviour is more prevalent. In the 1980s Harris attributed the increasing price of domestic foods to increases in the Urban Minimum Wage and to the fact that, as prices of imported food rose, so urban sellers of domestic food crops, who were increasingly consuming tinned fish and rice, had to raise their own prices in order to maintain their income. As will be seen however the prices of the main imported foods have not been rising. Indeed they have been dropping. We are therefore inclined to conclude that where staples prices have been rising there is a problem with supply and that this is most serious in Goroka and that,since 1980, the situation in Port Moresby has been variable rather than deteriorating.

Figure 12 covers trends in the prices of manufactured foods over the period under review and shows a very different picture. The items are beer, biscuits, bread, canned corn beef, chicken, eggs, flour, rice, sugar and tinned fish (See Appendix). It is clear that there has been a steadily

declining trend (with the characteristic major fall in prices in 1973-4, already noted) and that prices in the various markets track together, with margins, fairly closely. This we would expect given the high correlation coefficients recorded in Table 3. Goroka is the most expensive of the urban areas considered probably due to the extra transport costs required, followed by Port Moresby, with the other three broadly together.

Constructing a basket for imported foods is difficult for the period under review as, during this time, some foods which were previously imported have been replaced by domestically produced, often protected, foods, eg sugar, flour and chicken. Consequently if these foods were included, the basis of calculation of the basket would not remain constant. The basket shown in Figure 13 therefore includes only those foods which were consistently imported throughout the entire period ie biscuits, canned corned beef, rice and tinned fish, the latter three, at least, being among the most important imported foods consumed in Papua New Guinea. As with manufactured foods the graph shows a marked fall over the period, with prices in each market tracking very closely together. Goroka is, by and large, slightly more expensive, again presumably reflecting transport costs.

It should be noted that this index is quite different from that given in Shaw (1985) which is based on the value of imported food as shown in the Trade Statistics with each item appearing to have equal weight in the final average. This latter index shows a rise in values of imported food. We believe that despite the drawbacks with our index (too few items), its length and the method of weighting make it superior to Shaw's which, in addition to the problems with weighting, is missing data for the years 1977-82. From the declining trend also shown for prices of manufactured foods (Figure 12), we have anyway no reason to believe that a wider sample of imported food prices would look very much different from the one we have.

3.3.2 The national weighted averages of these baskets are shown together in Figure 14. Because of the scale necessary, the effect is not dramatic but the falling prices of imported and manufactured foods is quite clear. Because of the heavy weighting assigned to Port Moresby the trend for national foodcrop prices closely resembles the trend in Port Moresby ie there is a significant increase in prices, 1974-9, followed by a period of fluctuation. Over the period the trend is however clearly upwards. While the value of the foodcrops index was, in 1971, 31 per cent of the value of the manufactured foods index, by 1984 it had risen to 41%.

3.3.3 The critical factor in these comparisons is, of course, the appropriateness of the weights used to construct the baskets. As already explained, the weights both for constructing the individual baskets and for constructing a national urban average from the five urban centres reviewed, are based on the 1975-6 Household Expenditure Survey.
There are a number of problems with this however, not least:

(i) The survey and its findings are considerably out of date. Both the item weights and those with which the national urban averages are calculated could well be significantly different now following the rapid urbanisation of the last ten years and the changes in diet and tastes that this will have entailed. In fact the National Statistical Office is currently updating the work with an expanded and more

detailed Urban Household Survey.

(ii) The weights generated are expenditure weights. If we had accurate consumption weights the picture would be very different. It would be biased much more towards the major consumption items. Figure 15 points the way. It shows trends in the price of rice, perhaps the major urban consumption item, against the major staples, sweet potatoes, taro and cooking bananas. Against the backdrop of rising rice imports we can see to what extent rice has become cheaper as measured against the traditional staples. It is quite clear from this graph just why rice imports have been rising as steeply as they have. The traditional staples are simply no longer competitive.

Figure 16 highlights this still further. Using consumption weights calculated from the figures in Table 5 (See Appendix for details), a different picture has emerged. In this context consumption is defined as purchases plus home production plus gifts received minus gifts given away. This definition is important as, for example, in Goroka in 1975, purchases of sweet potato represented only 47 per cent of consumption. The graph shows the familiar declining curve for rice prices set against prices of cooking bananas, sweet potato and taro for the five urban centres, this time weighted according to population size rather than expenditure. The decline in the competitive position of the traditional staples is all the more apparent.

Figure 17 shows the price per unit of energy for the major staple foods. Prices for the four commodities in Figure 15 plus wheat flour have been converted into their energy value. The situation looks bleaker still. Since 1971 when rice and flour were broadly competitive with sweet potato and bananas, and about two thirds the value of taro, they have fallen such that by 1984, the average of their price was just 46 per cent of that of sweet potato, 42 per cent of that of cooking bananas and only 21 per cent of the price of taro. The situation is much worse than the average in Port Moresby where staple prices are the highest (see figures 7-8) but nationwide it has to be a matter of serious concern.

In this connection Table 5 is instructive. Using 1975 food prices and consumption data for the five markets from the Household Expenditure Survey 1975, we have calculated the quantities of the major foods purchased in each centre in 1975. From this we can calculate the energy value of consumption by each food in each centre. We can see that as far back as 1975 consumers were behaving rationally and had turned to imported cereals. It can be seen immediately from the table that, in Port Moresby*, where sweet potato prices were twice that of the next highest market (Madang), consumption of sweet potato was easily the lowest of all the urban centres and the total energy value of consumption from all staples was barely one third of that from rice. In four of the five centres, rice was already a more important source of energy than all the staples put together. behind.

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* It will be noted that the total energy available from rice and staples in Port Moresby is much less than in the other centres. This is because consumption of other items - meat, fish, dairy products, takeaways, bread and other cereals - was much greater in Port Moresby than elsewhere.

Only in Goroka where sweet potatoes were cheap and where consumption was an astonishing 60 kg/household/fortnight was rice consumption still in check.

The message is quite clear. If the prices of staples rise, consumers will seek out alternative, better value, foods. As a corrolary, we believe that if prices can be kept down traditional consumption patterns can be maintained.

4. Discussion

We know that the prices of imported food, particularly rice, have fallen, that rice and other food imports have risen and that the prices of staples have increased. One possible interpretation of this is that urban consumption of staples has fallen. Once the results of the Urban Household Survey 1985/6

Table 5: Food Purchases 1975

(i) Average prices 1975 (current toea/kg)

Centre	Goroka	Lae	Madang	Port Moresby	Rabaul
Cooking banana	23.39	11.84	8.65	22.97	15.59
Taro	43.74	18.56	13.48	39.75	20.86
Sweet potato	7.27	7.56	11.30	22.91	8.22
Rice	42.45	40.19	41.34	40.19	39.41

Source: NSO

(ii) Consumption expenditure (kina/fortnight)

Cooking banana	.51	1.30	1.30	2.69	1.84
Taro	.55	1.74	.94	.78	1.80
Sweet potato	4.38	2.45	1.49	1.00	1.12
Rice	4.87	6.90	7.02	6.42	6.49

Source: Household Expenditure Survey 1975, NSO

(iii) Consumption (kg/household/fortnight) [(i)/(ii)]

Cooking banana	2.18	10.98	15.03	11.71	11.80
Taro	1.26	9.38	6.97	1.96	8.63
Sweet potato	60.25	32.41	13.19	4.36	13.63
Rice	11.47	17.17	16.98	15.97	16.47

(iv) No of households	3,403	9,112	3,374	15,914	2,693

Table 5 continued

(v) Quantity purchased/annum (tonnes) [(iii)*(iv)*26/1000]

						Total
Cooking banana	193	2,601	1,318	4,846	826	9,784
Taro	111	2,221	612	812	604	4,360
Sweet potato	5,331	7,678	1,157	1,806	954	16,925
Rice	1,015	4,067	1,490	6,610	1,153	14,335

(vi) Food values

	a. Edible portion (%)	b. Kcal/kg of edible portion
Cooking banana	69	1120
Taro	84	940
Sweet potato	87	1080
Yams	88	870
Sago meal	100	3570
Rice	100	3660
Wheat flour	100	3660

Source: WHO (1979).Health aspects of food & nutrition, Manila

(vii) Energy value of purchases (kcal/household/fortnight) [(v)*1000/(iv)*(vi)b/26]

Centre	Goroka	Lae	Madang	Port Moresby	Rabaul
Cooking banana	2,443	12,297	16,832	13,116	13,219
Taro	1,182	8,813	6,555	1,844	8,111
Sweet potato	65,067	35,000	14,240	4,714	14,715
Total staples	68,692	56,110	37,627	19,674	36,045
Rice	41,989	62,837	62,151	58,465	60,273

are available we will be able to see the extent of the fall and calculate price and income elasticities for these items. This latter will be a very useful exercise.

In the meantime however we must ask why prices for traditional staples have been rising. Is it the most obvious explanation, that they are in short supply? We know that consumption of rice and other imported foods has been increasing (FAO,1986b) therefore, in the absence of evidence for increased per capita food consumption, we would expect to find that demand for, and consumption of, traditional staples had fallen. It is often asserted (eg Shaw, 1985) that production of foodcrops has kept pace with population

growth but if this were the case we would expect that total food supply had increased, indeed that supply was exceeding demand, and that prices of food crops had declined. However we have seen that food crop prices have been increasing which must make us question this contention. The FAO team (FAO,1986b) has already done this. In their report they conclude:

> "It should be assumed for food policy and planning purposes that there has been a decline in food production for human consumption, some of which results from the increase in export cropping. In the future, without specific policy countermeasures, this decline would be expected to continue with a consequent increase in demand for rice and other imported foods."

The evidence from the five major urban markets which is examined in this paper certainly seems to support this conclusion. One problem in detecting this arises because surplus sweet potato production in the highlands has traditionally been fed to pigs (See Section 2). It could be that production of locally grown foods is stable but as consumption falls through increasing substitution of imported foods, a growing surplus from local production above human requirements is being fed to pigs. However if there is an increasing surplus one wonders why, at the existing high prices, it is not brought to market. If we were to observe in the future the beginnings of a fall in prices we might wish to look at increased surplus as a possible cause.

In the meantime if we are correct and rising foodcrop prices are an indication of falling production what should be done? Are their interventions that can be made? International examples could be illustrative here. The orthodox view is that when incomes rise, there is a shift in consumption away from roots and tubers towards cereals. Several demand studies suggest this is the case (Goering, 1979) although it was not the case in Europe where there was a shift from cereals to potatoes in the nineteenth century.

Recent work in Africa (FAO,1986a) seems to indicate that the main factor behind the shift away from roots and plantains has been the rapid rate of urbanization rather than changes in income or tastes. Most of the available evidence suggests that changes in taste are a consequence of other factors notably the price of substitutes. Income elasticities of demand are not negative as they would be were roots actually perceived as an "inferior" good. Additionally the factors which make cereals more popular tend to be more important in the cities, most obviously the relative difference in prices which is apparent in Papua New Guinea and is normally a function of the availability of supply, itself a function of marketing and transport infrastructures. If we posit a situation of declining or even static production, rising population and increasing urbanisation (with the attendant marketing and transport problems and easily available cheap imported cereals) we would expect prices of staples to be rising and their consumption to be in decline. That is not to say the trend is irreversible. If changes in preference can be traced back to a response to changes in relative prices, then if these relativities can be altered it should be possible, provided the new tastes are not too well established (and there is much anecdotal evidence to suggest that, in Papua New Guinea, they are not), to change taste preferences back in favour of

traditional staples.

How this can be done is a question which has been addressed many times before (Bourke, Carrad and Heywood, 1981; Harris, 1982; Macewan, 1978; Sackett, 1976;) but the answer must lie in increasing the supplies of produce to the urban market. The fundamental problem is of course that while market prices for traditional staples are high relative to those for alternative foods, returns to producers are low. Harris (1980) estimates that a villager near Port Moresby would gross around K350 from marketing traditional staples and selling them in the market, that is before deductions for transport and other costs. FAO (1986b) puts returns per man day for sweet potato production in the highlands at K2.10-K3.10, less than the rural minimum wage (K3.40). Harris (1980) also notes that, in a 1978 study in the Kwikila/Marshall Lagoon area, mean income from gifts from employed relations exceeded that from food and export crops in four of the six villages studied.

It is clear that returns to labour must be improved if more traditional staples are to be brought to market and that this must be acheived in parallel with a fall in the market price of these items. This is a tall but not impossible order. Ways forward include:

(i) Higher yields per hectare and per person hour through

a. Improved techniques in crop husbandry
b. Higher yielding varieties
c. Pest and disease resistant varieties

These are areas in which the new Farming Systems Research Teams will be working.

(ii) Reduced marketing margins so that the producer's share of the market price is increased. This involves a major improvement in the marketing system and might involve some or all of the following: more and better roads, better transportation, more cold stores and containers, better shipping, improved produce handling, more market facilities and better market information.

The potential for changes in the existing infrastucture are currently being reviewed and DPI hopes that this exercise will lead to the design and implementation of a number of related projects, all geared to improving the marketing of food crops.

There is no doubt that Papua New Guinea faces a challenge. The traditional diet and eating habits of the nation are changing at a dramatic rate. Consumers are developing tastes for imported food. It is suggested however that this is not a given historical phenomenon and that, even if not entirely irreversible, it is controllable by Government. Policies which support the subsistence sector in the production and marketing of food will not only promote self reliance and save valuable foreign exchange but provide work for a rural community that increasingly desperately needs it. Papua New Guinea need not resign itself to becoming a nation dependent on imported food. At the very least it can make a contribution to growing what the people want to eat.

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Fig 1. AV.PRICES: FOOD CROPS 1 (1971-84)

Constant 1984 Toea (Five Markets)

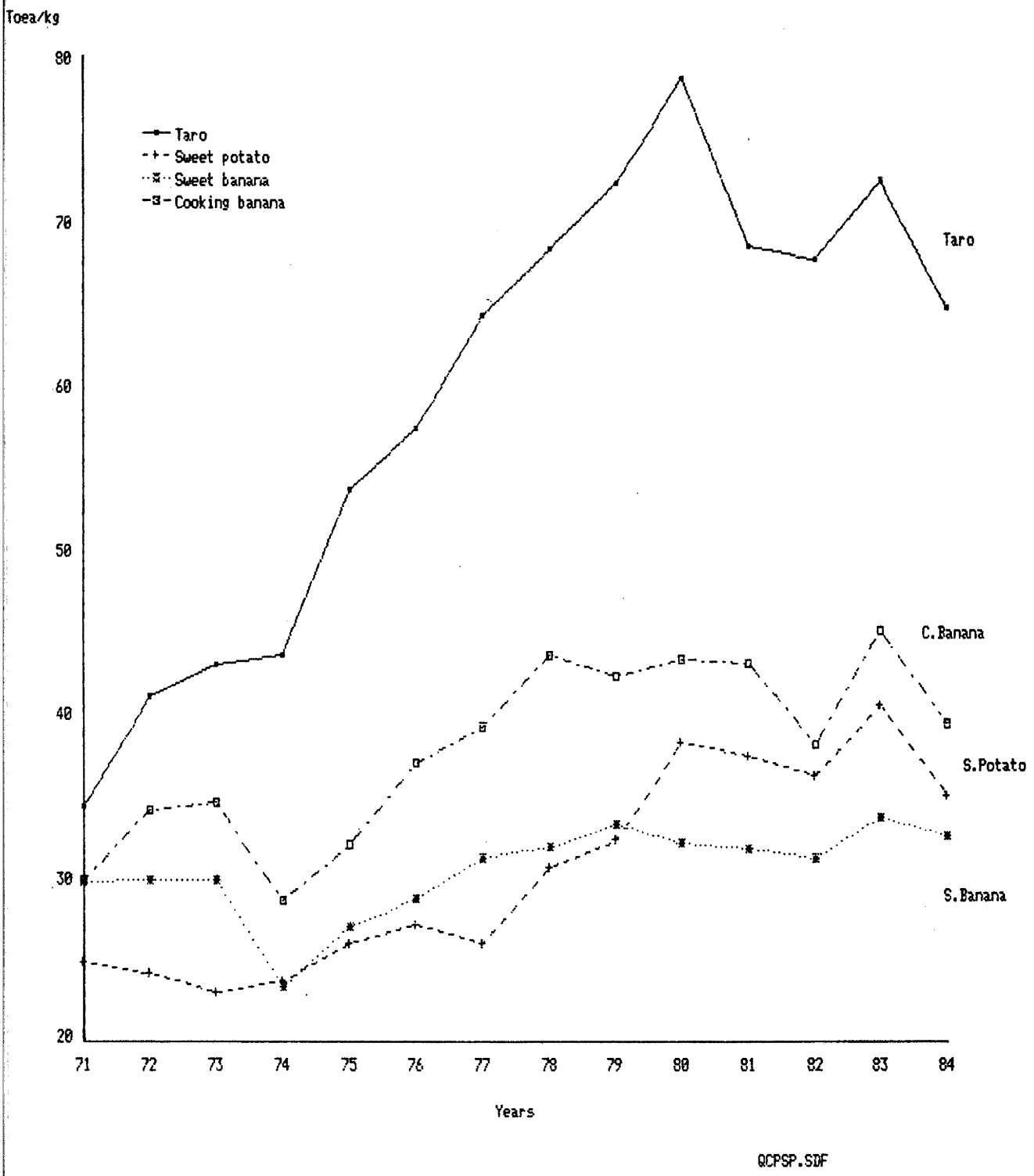


Fig 2. AV.PRICES: TARO (C.ESCUL) 1971-84

Constant 1984 Toea

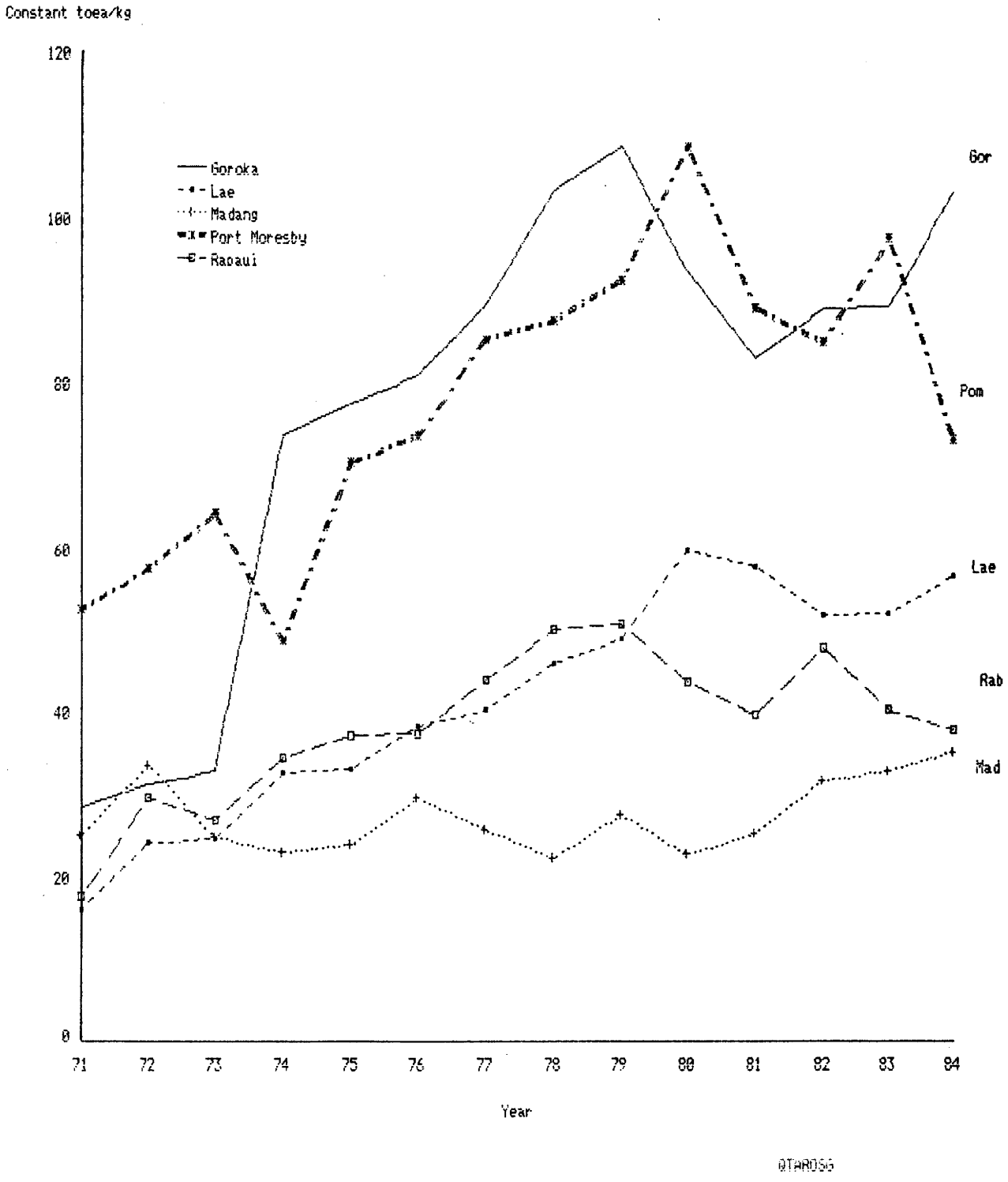


Fig 3. AV.PRICES: SWEET POTATO (1971-84)

Constant 1984 Toea

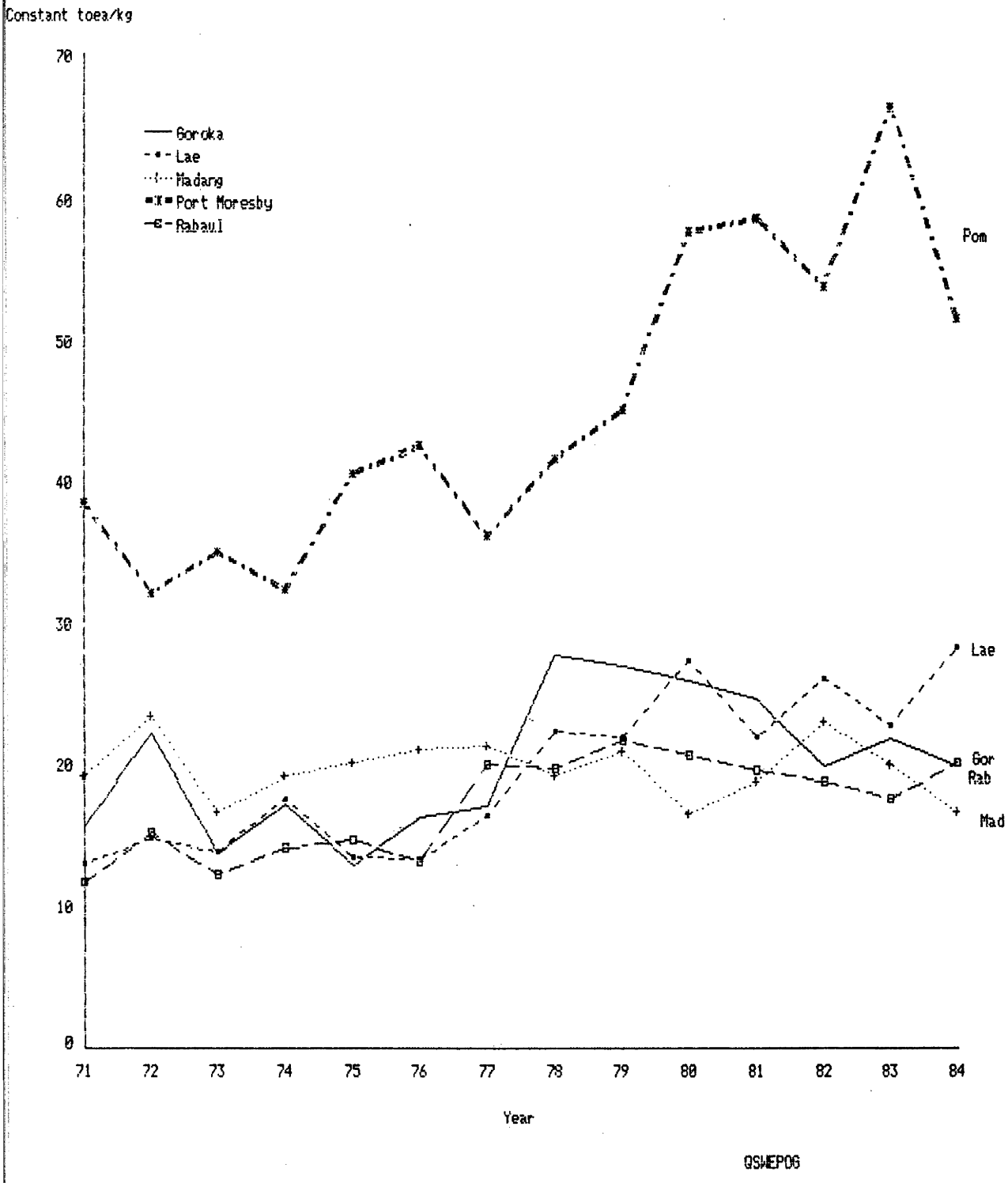


Fig 4. AV.PRICES: FOOD CROPS 2 (1971-84)

Constant 1984 Toea (Five Markets)

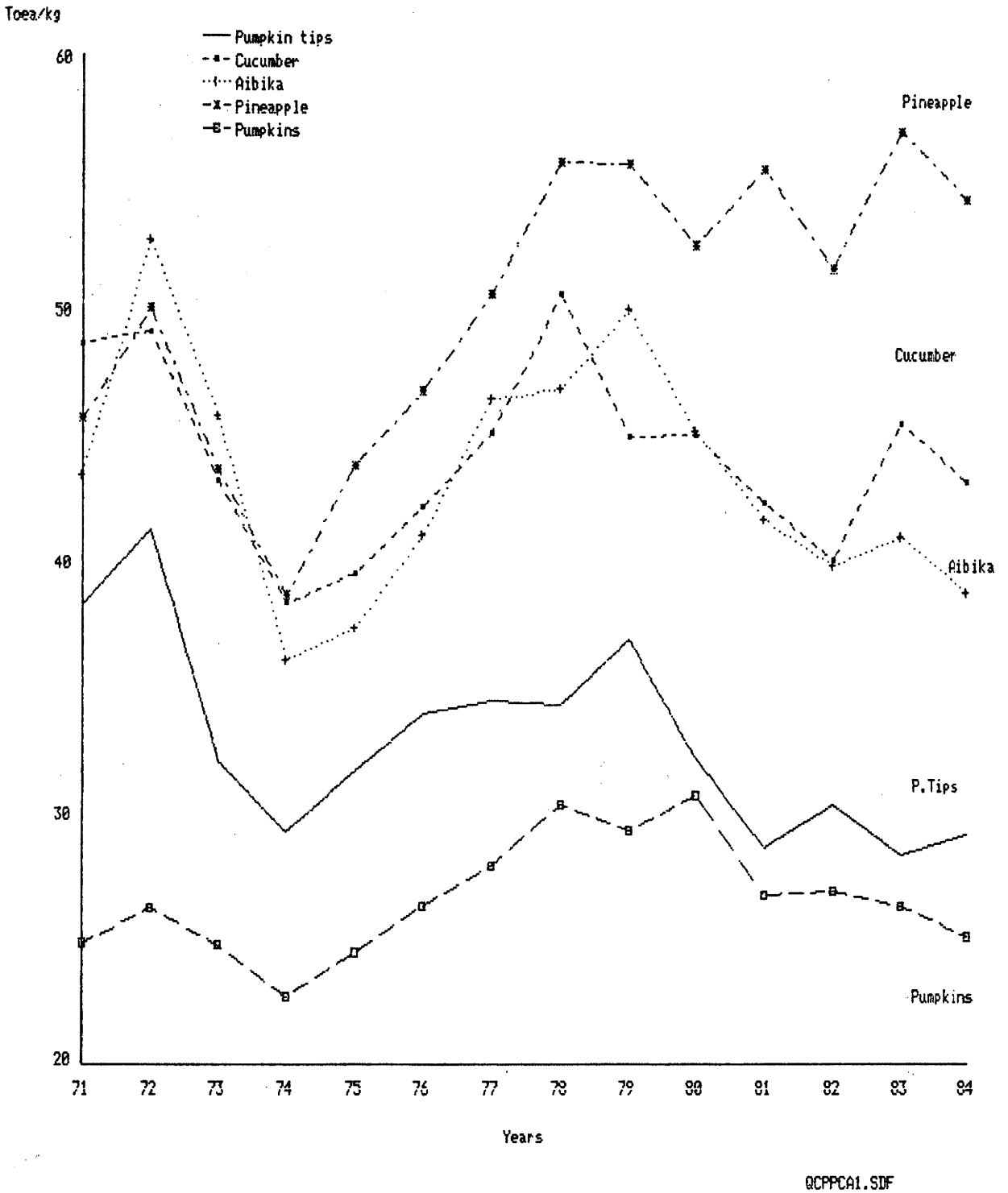


Fig 5. AV.PRICES: FOOD CROPS 3 (1971-84)

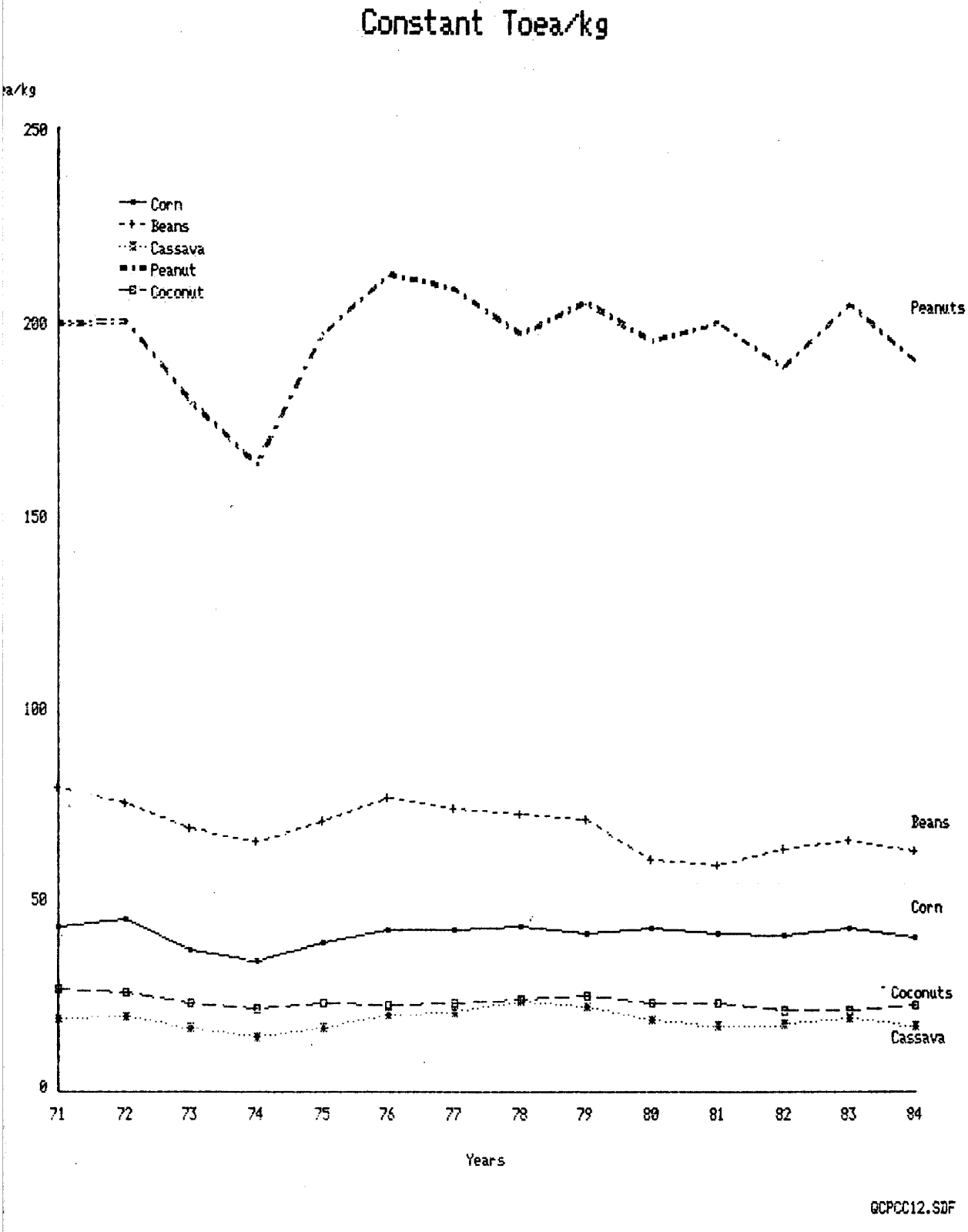


Fig 6. AV.PRICES: FOOD 1 (1971-84)

Constant 1984 Toea (Five Markets)

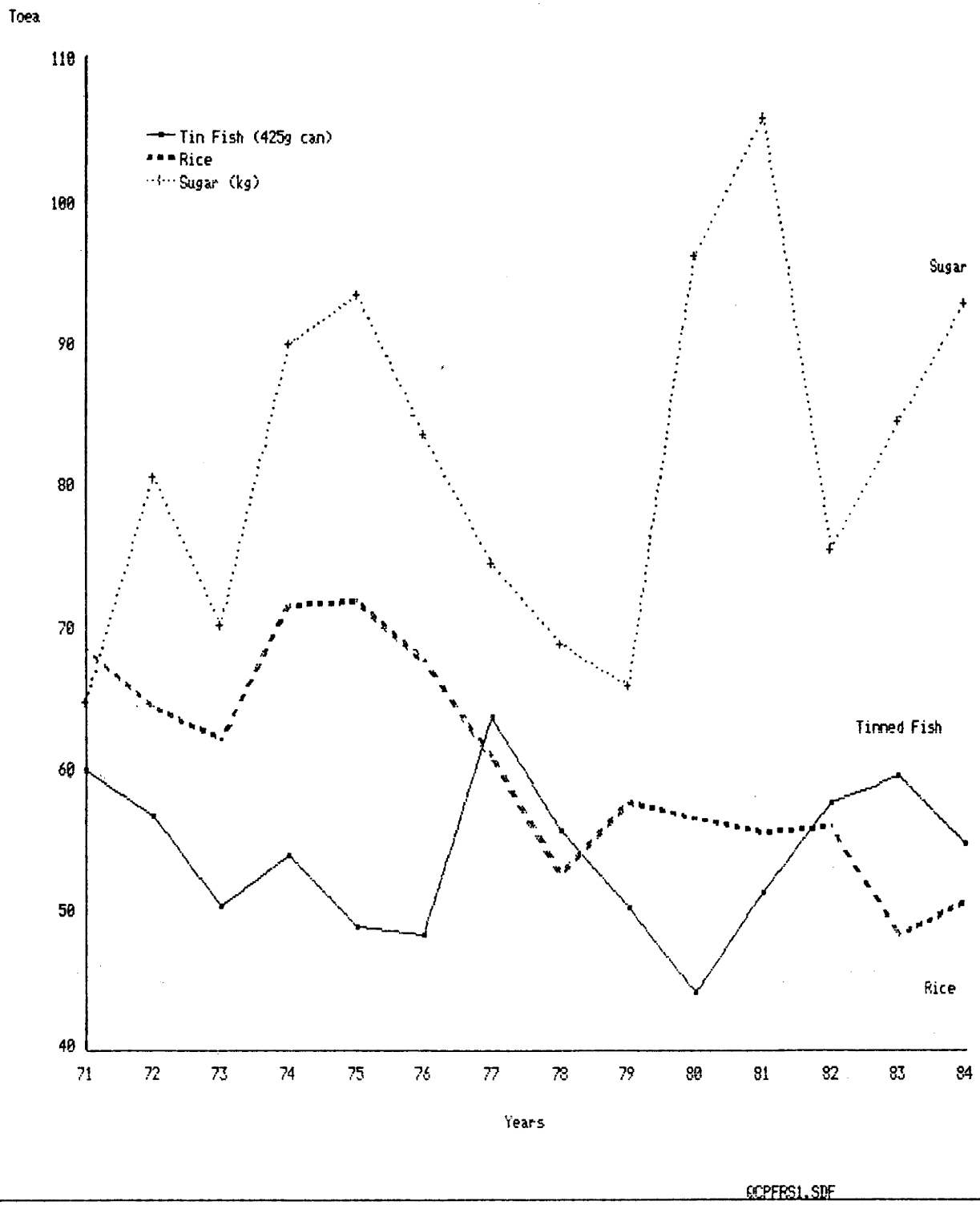


Fig 7. AV.PRICES: FOOD 2 (1971-84)

Constant 1984 Toea (Five Markets)

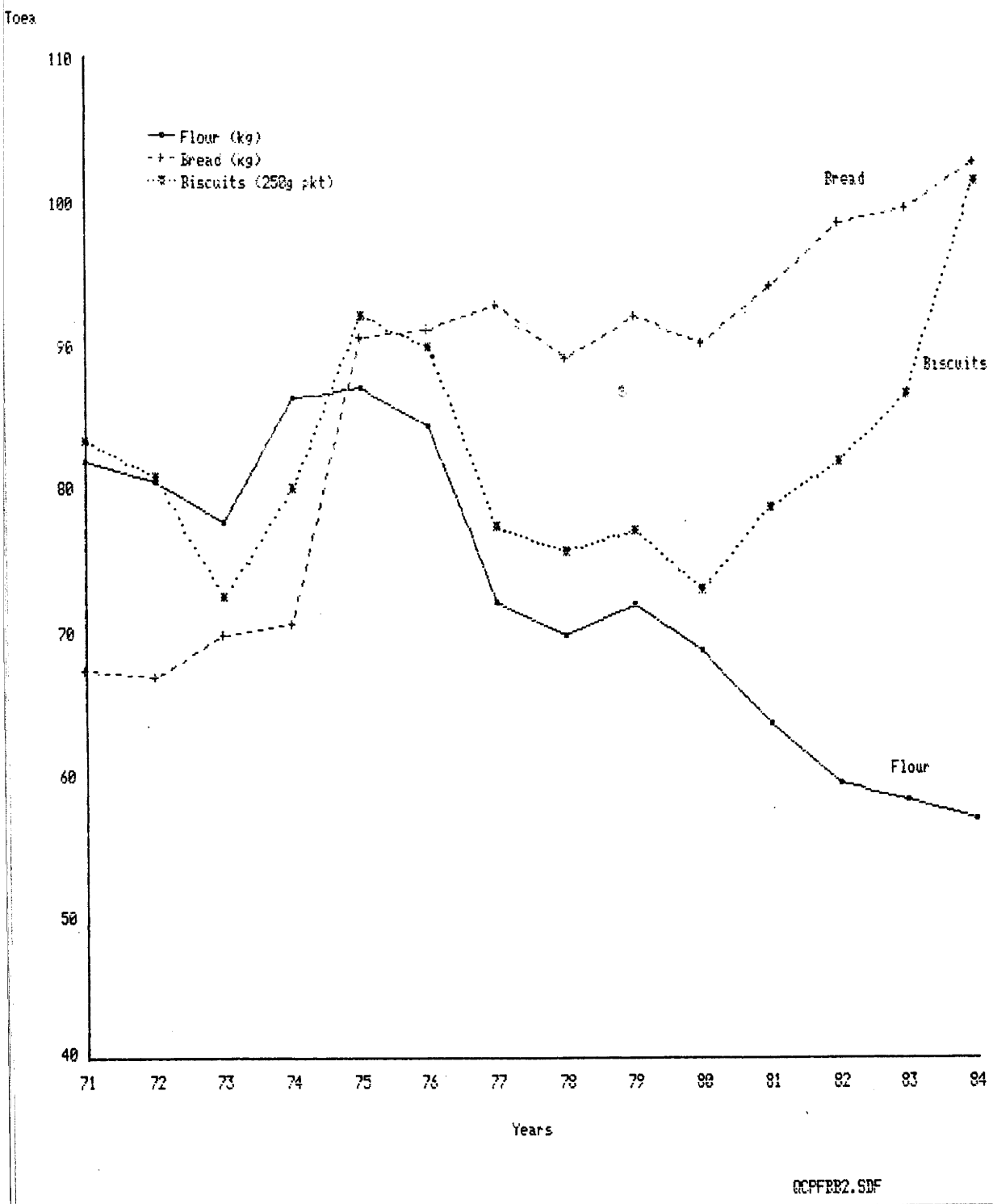


Fig 8. AV.PRICES: FOOD 3 (1971-84)

Constant 1984 Toea (Five Markets)

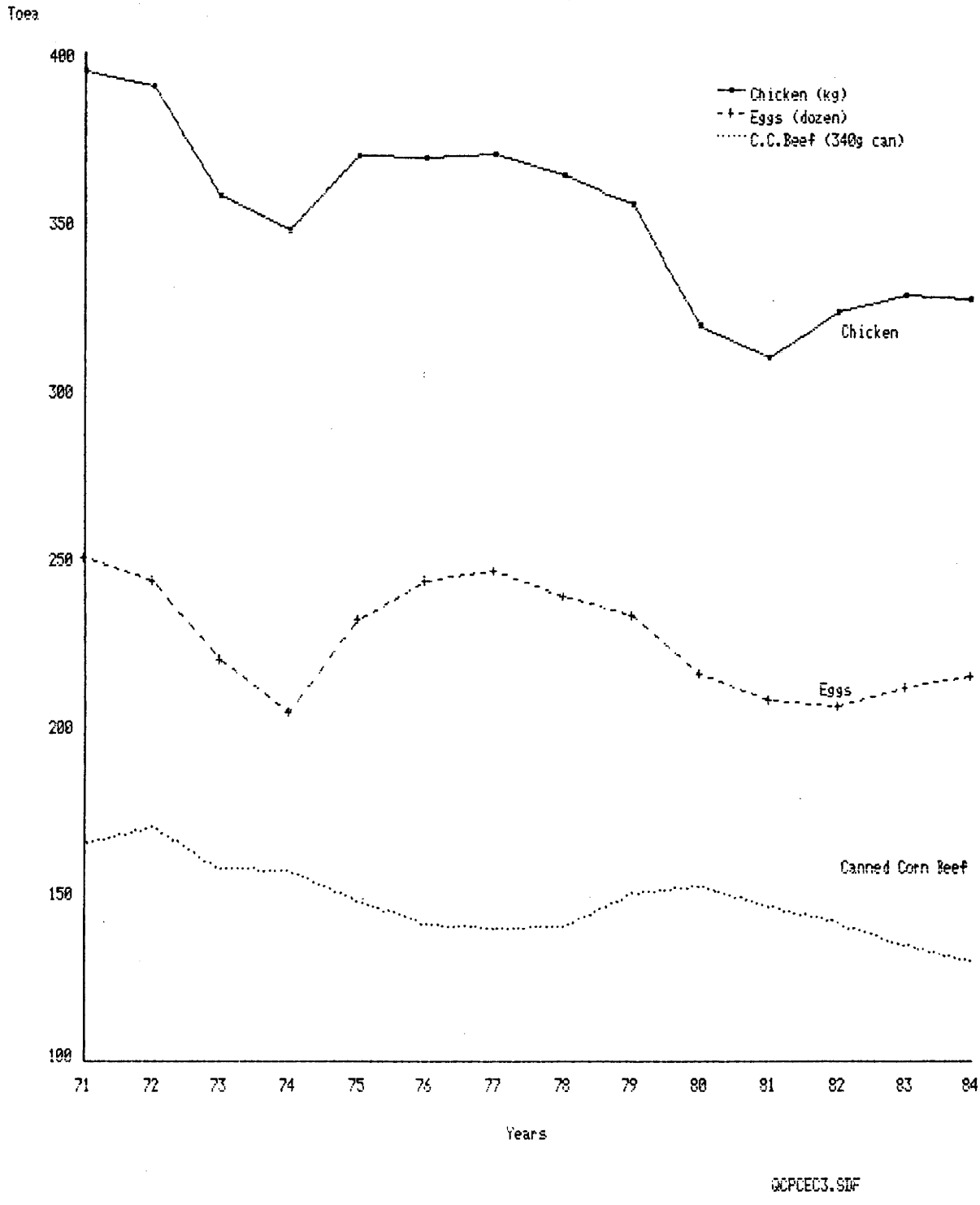


Fig 9. AV.PRICES: STIMULANTS (1971-84)

Constant 1984 Toea (Five Markets)

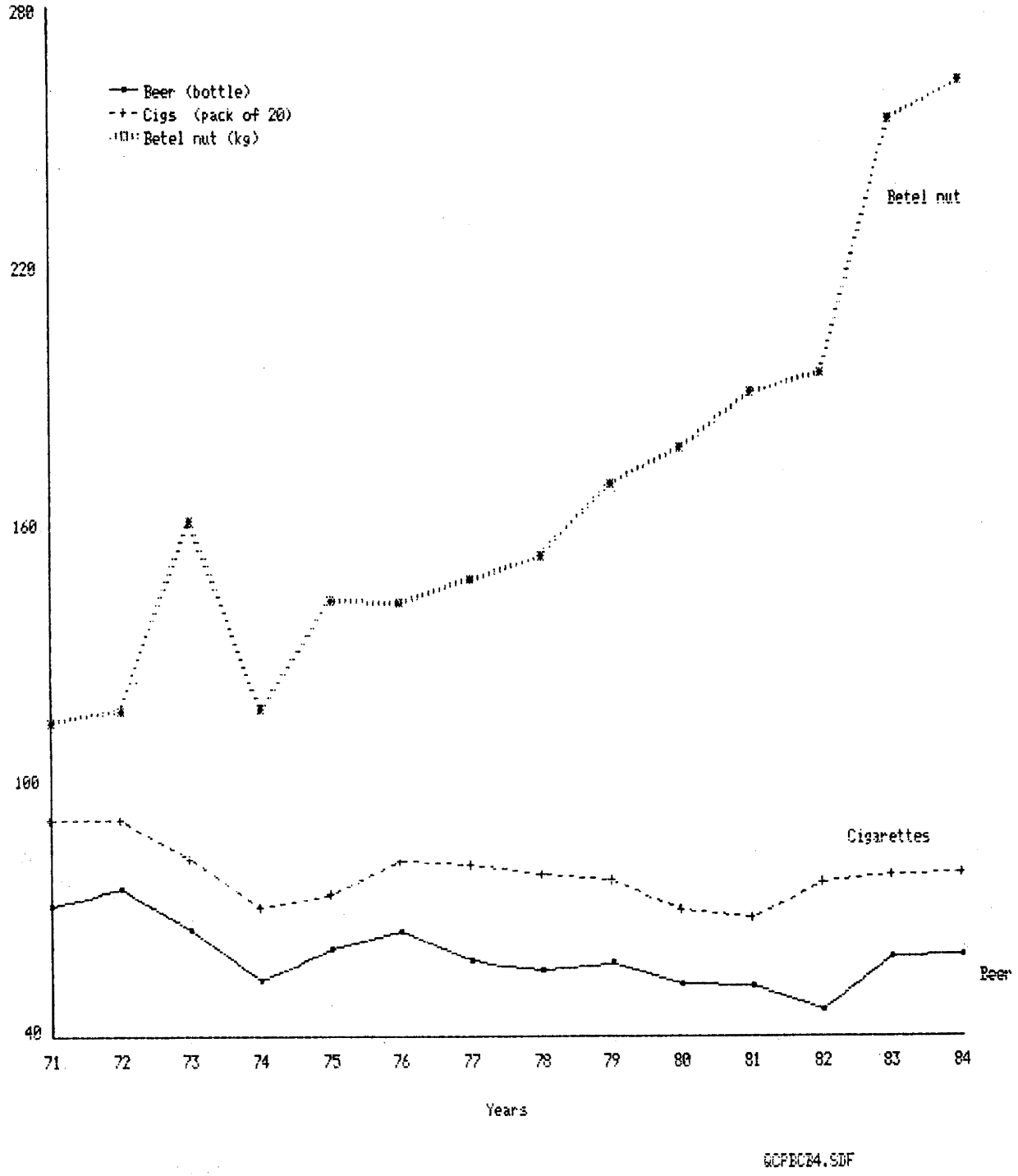


Fig 10. AV.PRICES: BETEL NUT (1971-84)

Constant 1984 Toea

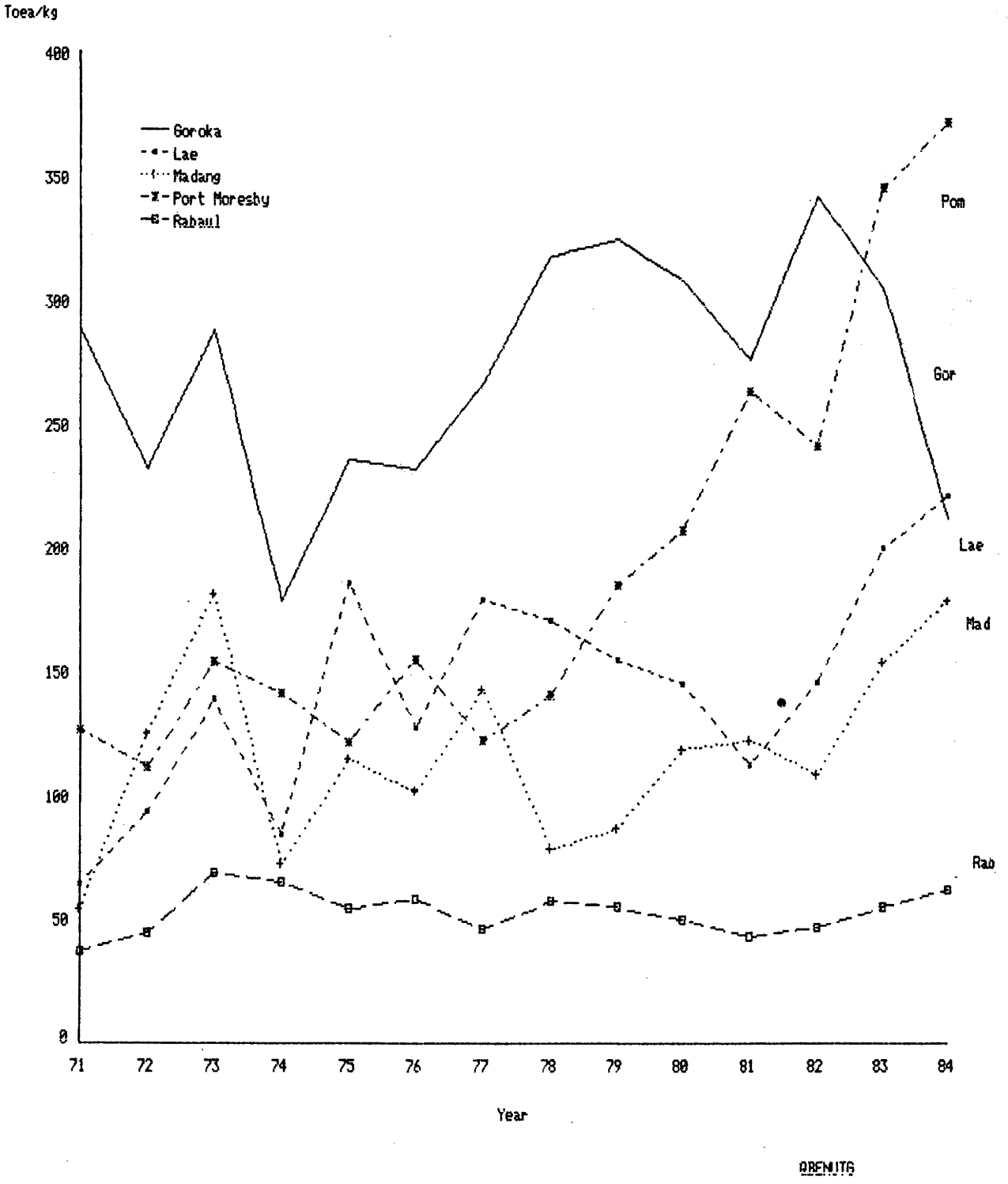


Fig 11. AV.PRICES: BASKET OF FOOD CROPS

Constant 1984 Toea/kg

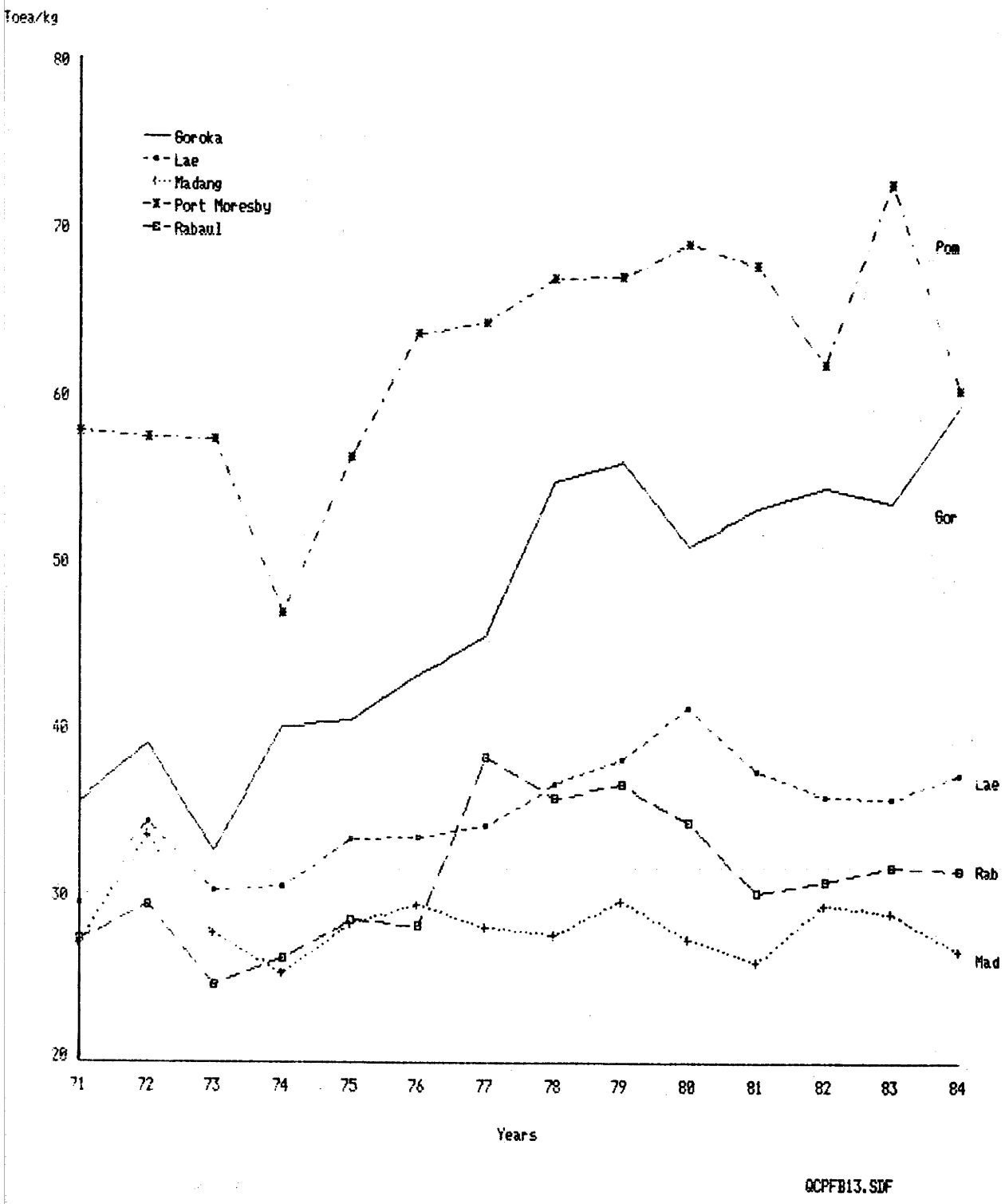


Fig 12. AV.PRICES: MANUF FOODS BASKET

Constant 1984 Toea

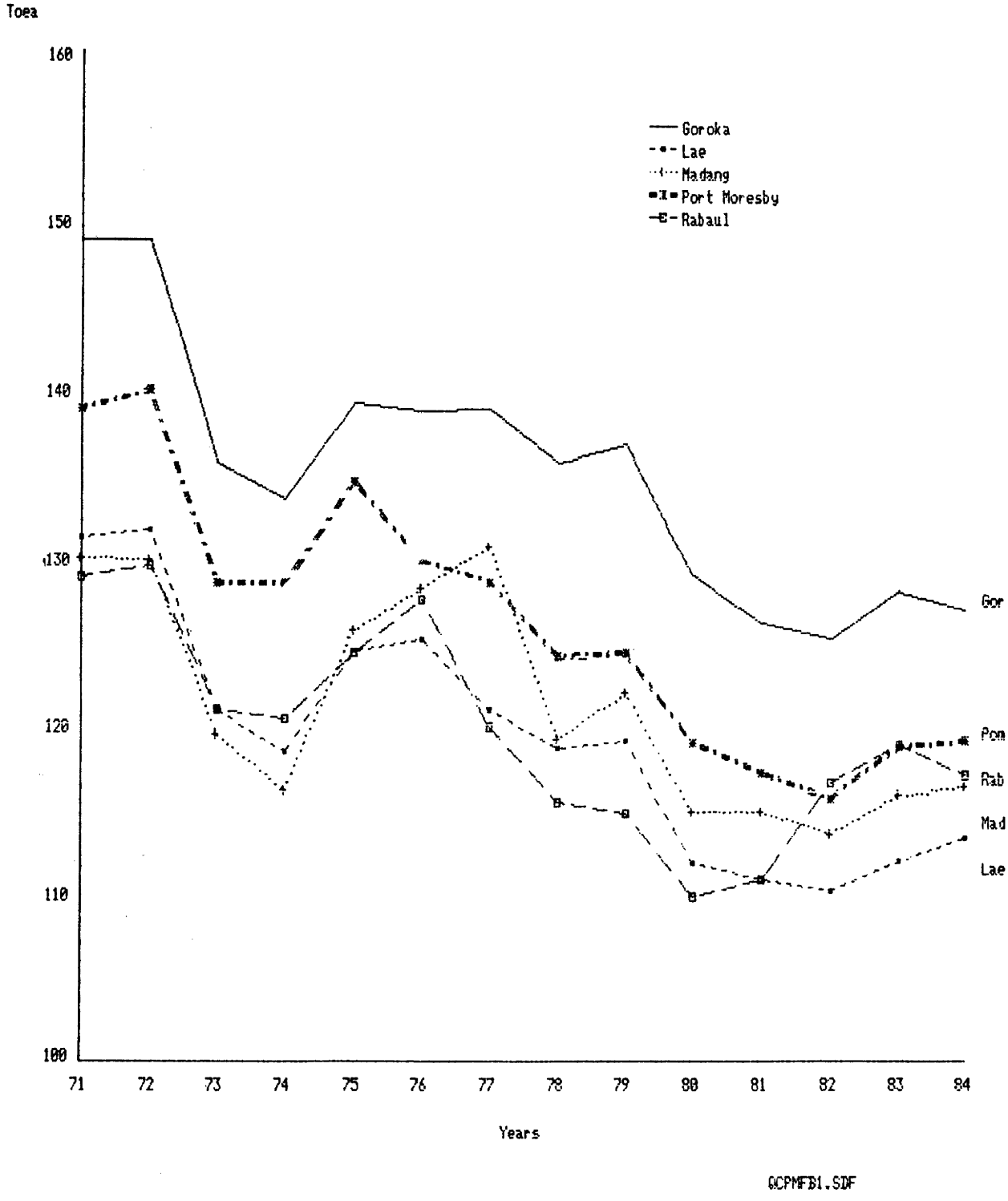


Fig 13. AV.PRICES: IMPORTED FOODS

Constant 1984 Toea

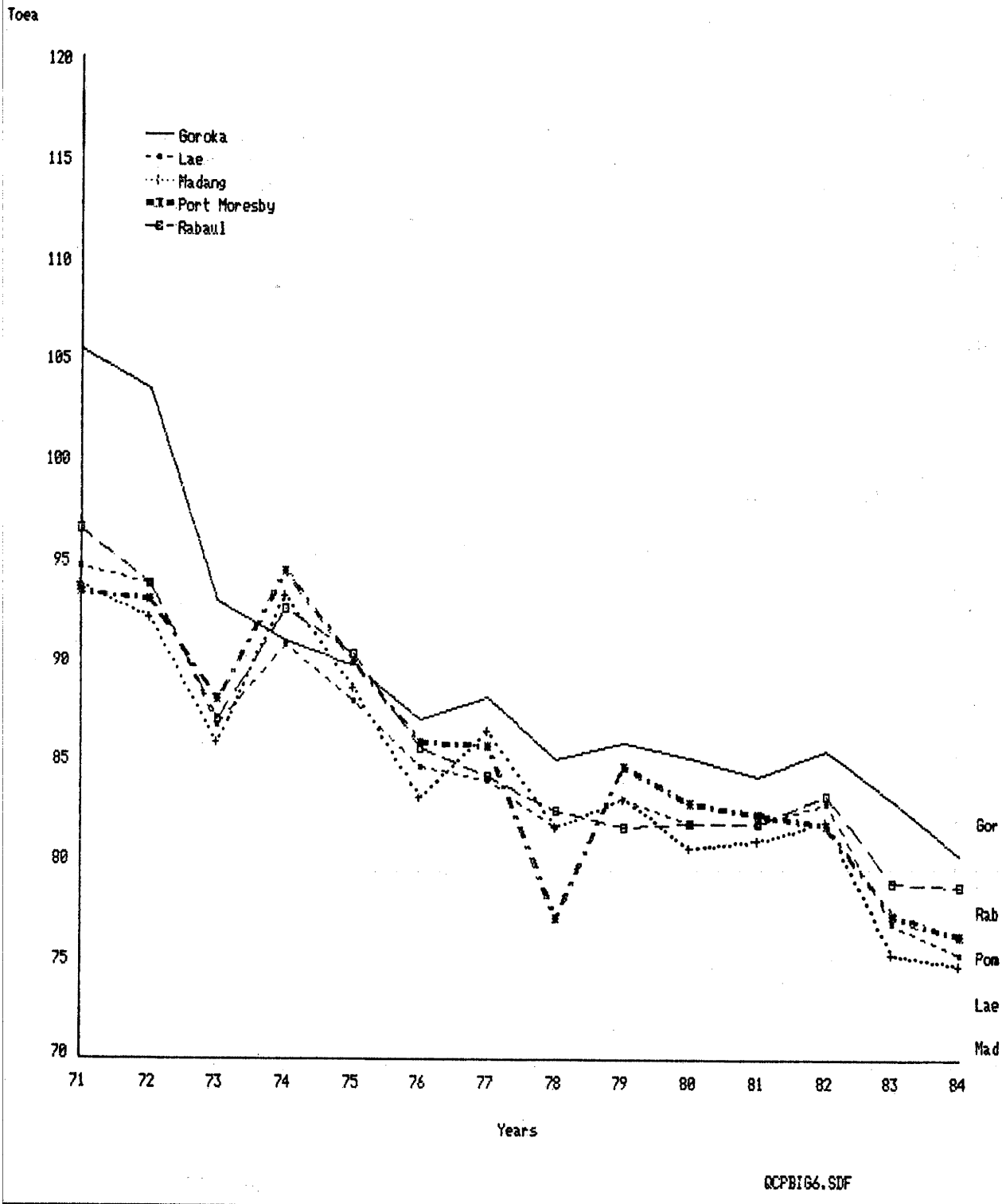


Fig 14. AV.PRICES: FOOD BASKETS 1971-84

Constant 1984 Toea (Five Markets)

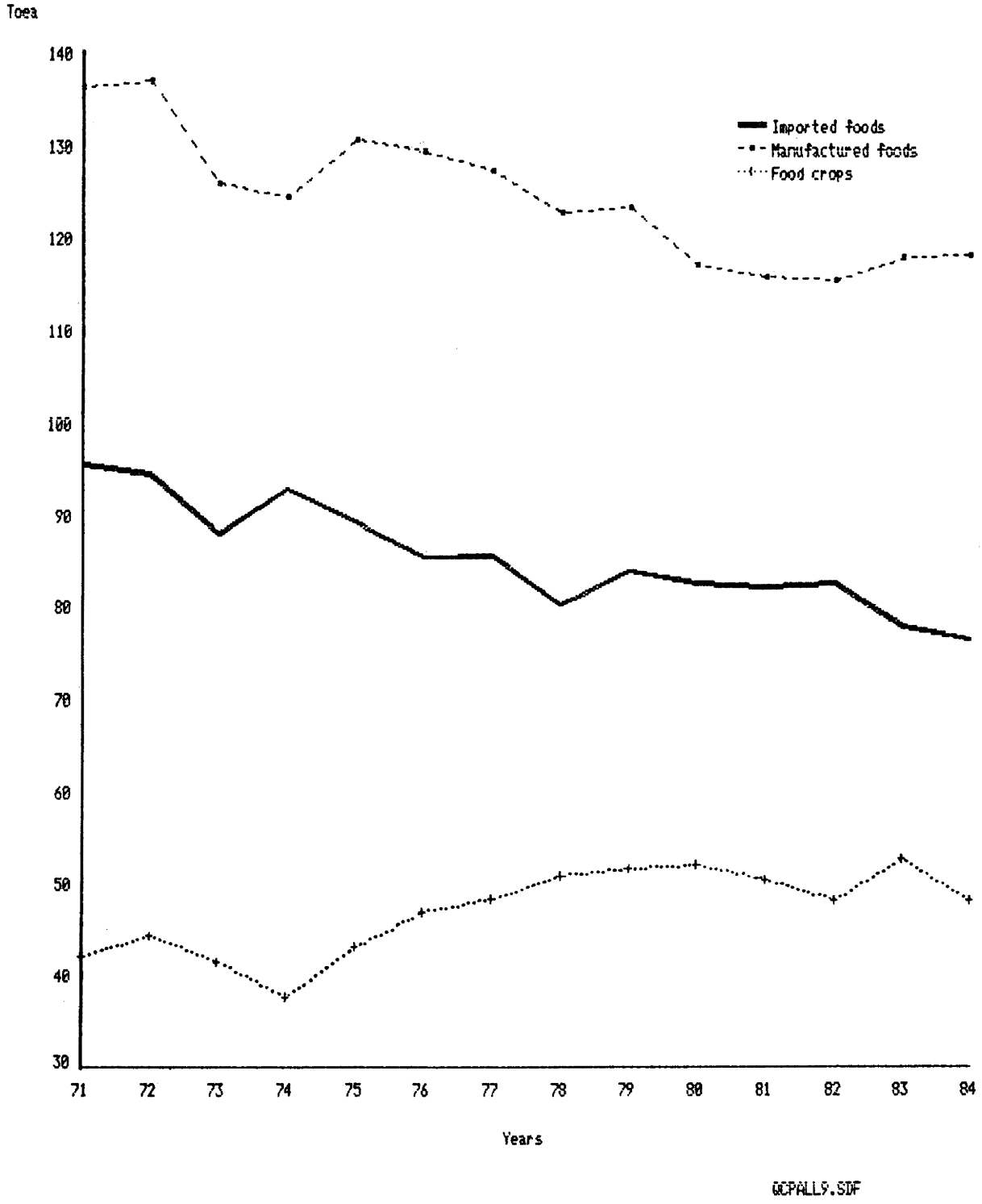


Fig 15. SELECTED FOODS - PRICE & IMPORTS

Constant 1984 Toea (Five Markets)

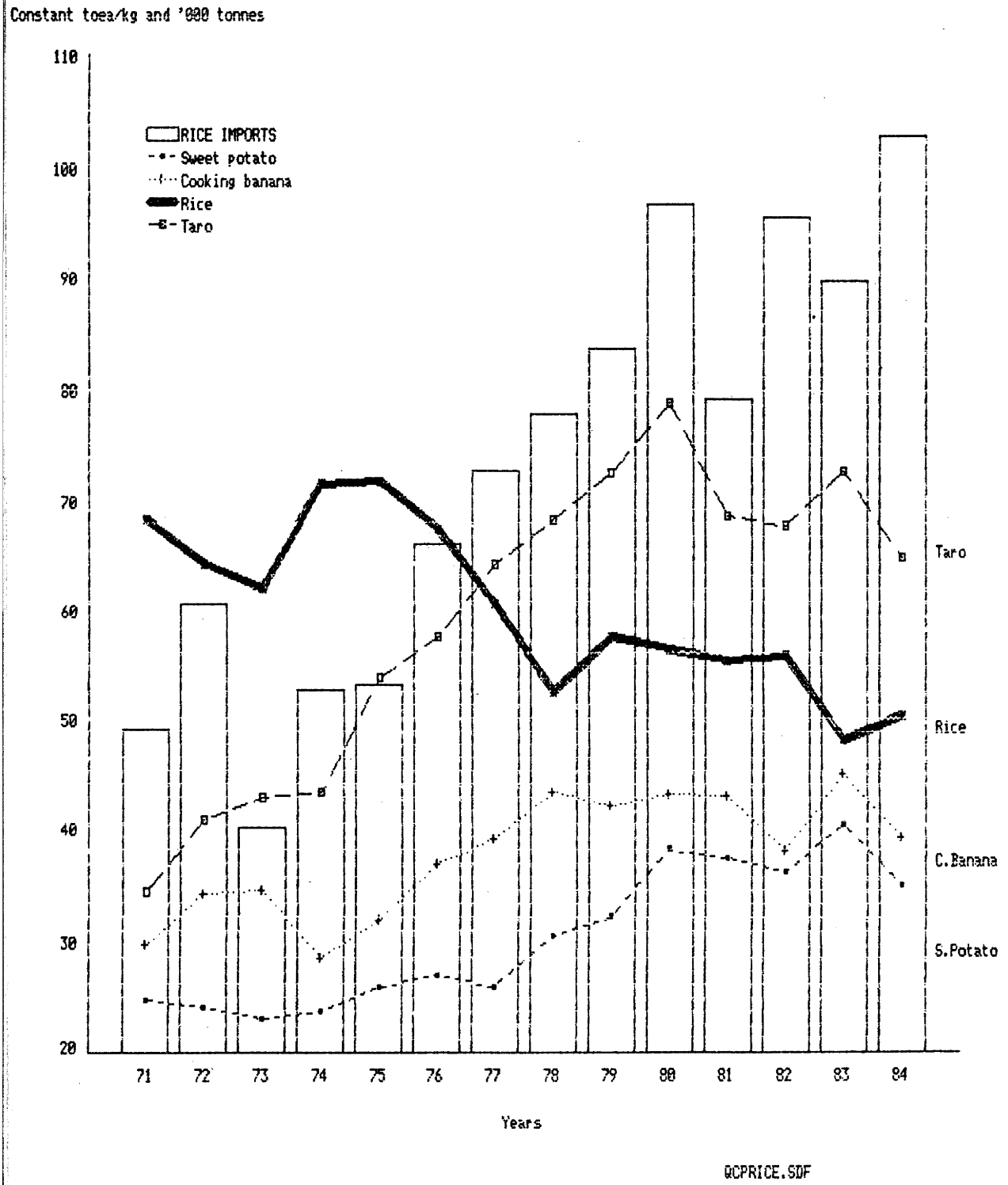
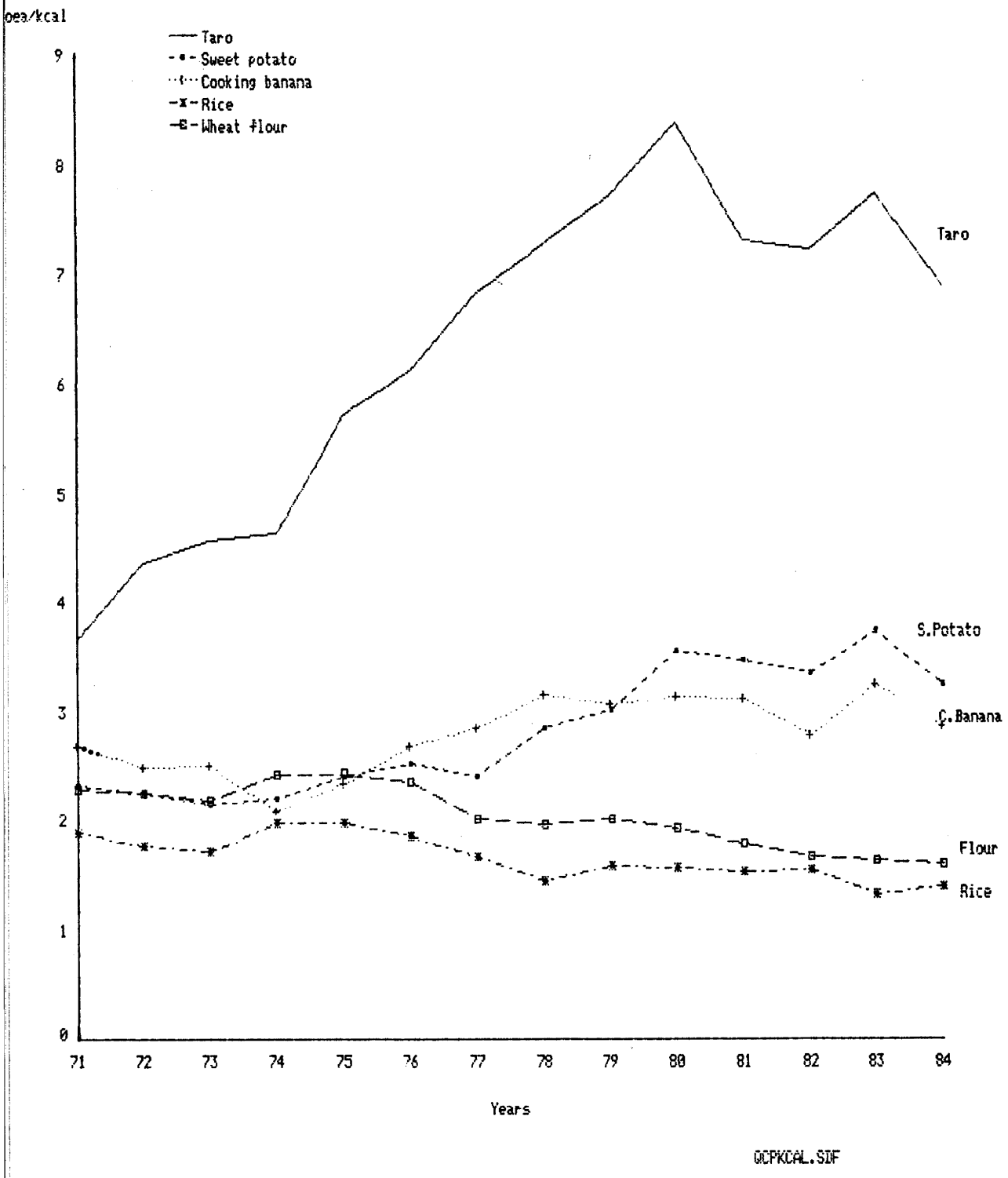


Fig 16. AV.PRICES: STAPLE FOODS 1971-84

Consumption weighting (Five Markets)

Fig 17. ENERGY VALUE OF MAJOR STAPLES

Constant 1984 Toea/kcal



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APPENDIX

1. Prices of fresh food are collected from the markets once a week for use in calculating the Consumer Price Index (CPI). This is done in Goroka on Saturday and in the other markets on Friday. Six lots of each item are selected (from different sellers) and weighed. There are some problems with this:

(i) The sample is small and may not deal adequately with the sometimes considerable inter-seller variation. In a spot check in the Rabaul market this variation was found to vary by as much as 85 per cent for sweet potatoes and 50 per cent for bananas. Bourke and Nema (1985) report 300 per cent variation for sweet potato in Kainantu market.

(ii) The produce is sold in bundles and these obviously vary in size somewhat. There is no account taken of the inter-bundle intra-seller variation as the officer selects only one bundle per seller, at his own discretion.

(iii) Quantities of produce moving through the market vary according to the two week business cycle. This probably has a bearing on prices and always sampling on the same day will miss this variation. Saturday is probably a particularly atypical day.

(iv) In Port Moresby, prices are collected from Koki market which is only one of several Council markets. This used to be the largest market in the Capital but for some time now Gordons market has had more trade. It is felt that prices in Koki are probably higher than at Gordons.

In addition it became clear during the extraction of the data that the quality of the collection work varied somewhat. 1983 seemed the nadir with numerous "not available" returns, the reasons given ranging from "raining " to "no vehicle". This data run is of great value and it is essential that it be maintained. We can report that, in 1984, returns were much better and that therefore supervision may have improved. It is also possible that the increased returns are merely the consequence of increased falsification and that the series of untypical prices for 1984, refered to in the text, bear no relation to reality. We must await the 1985 and 1986 data before concluding.

2. Urban weighting, as calculated for the CPI purposes, is as follows:

	% weight
Port Moresby	40.8
Goroka	11.4
Lae	22.0
Madang	11.0
Rabaul	10.0
Kieta/Arawa/Panguna	4.8
	100.0

This is based on the 1975/6 Household Expenditure Survey, with the weight for each area being proportional to the product of :-

(i) No of citizen households in each area [and related indicator areas (see below)]

and

(ii) Average purchases of goods and services per household for the area concerned.

The CPI designates related "indicator urban areas". They are as follows:

Port Moresby:	-
Goroka:	Mendi, Mt.Hagen, Kundiawa, Kainantu, Bulolo.
Lae:	Daru, Kerema, Alotau, Popondetta.
Madang:	Angoram, Wewak.
Kieta/Arawa/Panguna:	-

For the purposes of these calculations, the data series on Kieta/Arawa/Panguna was of insufficient length and has not been used. In the calculation of the PNG average urban price series the urban indexes have therefore been accordingly adjusted and are now as follows:

	% weight
Port Moresby	42.86
Goroka	11.98
Lae	23.11
Madang	11.55
Rabaul	10.50
	100.00

3. Food crops

3.1 Item weights are also based on those used in the CPI and are similarly calculated from the 1975/76 Household Expenditure Survey. This indicated no significant differences in relative expenditure on fruit and vegetables between the different urban areas. Accordingly the weights relating to the different items are the same for each area. In the CPI regimen they as follows:

	% weight
Food	40.89
Fresh fruit and vegetables	6.639
Cooking bananas	1.388
Sweet bananas	0.339
Pineapples	0.354
Coconuts	0.347
Peanuts	0.304
Sweet potatoes	1.058
Taro	0.765
English potatoes	0.332
Brown onions	0.147
Other vegetables including cassava, pumpkin tips, aibika, beans, chinese cabbage, corn (maize), and cucumber.	1.605

These figures, excluding those for english potatoes and onions, have been recalculated as a percentage of all fresh fruit and vegetables (excluding English potatoes and onions) and now read as follows:

	% weight
All fresh fruits and vegetables	100.00
Cooking bananas	22.53
Sweet bananas	5.50
Pineapples	5.75
Coconuts	5.63
Peanuts	4.94
Sweet potatoes	17.18
Taro	12.42
Other vegetables	26.05

This index has been used to calculate the food crops basket price used in Section 3.3.The price of "other vegetables" is obtained by averaging the price of all the items in the category, then multiplying by the weight.

3.2 Prices for coconut in Goroka in 1971 and 1972 and for cassava in Madang in 1980, 1981 and 1982 were unavailable. In order that the weighted average not be biased by missing data, representative prices were calculated by applying the average change in price in the other markets to the nearest year in which a price was available.

4. Non- Foodcrop items

Prices for non-foodcrop food baskets have been derived. One for all manufactured foods and one for imported foods. For some of these items the 1975/6 Household Expenditure Survey found some difference in relative expenditure between households in Port Moresby and Goroka on the one hand and Lae, Madang and Rabaul on the other. Accordingly, where appropriate, different weights have been used. The original CPI weights are as follows:-

	Goroka & Port Moresby	Madang & Rabaul
Total	100	100
Beer	5.935	8.885
Canned corned beef	3.597	3.597
Cigarettes	4.391	5.909
Rice	5.101	5.101
Sugar	1.666	1.666
Tinned Fish	2.921	2.921
Betel Nut	2.120	3.553
Sweet biscuit	0.287	0.287
Flour	0.688	0.688
Chicken Meat	4.885	4.885
Eggs	0.181	0.181
Bread	2.353	2.353

As with the food crop series these weights have been recalculated as a percentage of the total of each basket.

(i). Manufactured foods basket

	Port Moresby/Goroka		Lae/Madang/Rabaul	
Commodity	CPI	% weight	CPI	% weight
Beer	5.935	21.49	8.855	28.97
Biscuits	.287	1.04	.287	.94
Bread	2.353	8.52	2.353	7.70
Canned corn beef	3.597	13.03	3.597	11.77
Chicken	4.885	17.69	4.885	15.98
Eggs	.181	.66	.181	.59
Flour	.688	2.49	.688	2.25
Rice	5.101	18.47	5.101	16.69
Sugar	1.666	6.03	1.666	5.45
Tinned fish	2.921	10.58	2.921	9.56
Total	27.61	100.00	30.53	100.00

(ii). Basket of imported foods

Commodity	CPI (weight)	% (weight)
Biscuits	.287	2.42
Canned corn beef	3.597	30.21
Rice	5.101	42.84
Tinned fish	2.921	24.53
Total	11.906	100.00

5. Consumption weighted index

	Gor		Lae		Mad		Pom		Rab	
	CPI	%	CPI	%	CPI	%	CPI	%	CPI	%
Banana	2.18	3.42	10.98	20.81	15.03	42.71	11.71	64.95	11.80	34.64
Taro	1.26	1.98	9.38	17.78	6.97	19.81	1.96	10.87	8.63	25.34
S. Pot	60.25	94.60	32.41	61.42	13.19	37.48	4.36	24.18	13.63	40.02
Total	63.69	100.00	52.77	100.00	35.19	100.00	18.03	100.00	34.06	100.00

Source: Household Expenditure Survey 1975 (See Table 5)

6. 1980 Population Census

	Persons '000	%
Goroka	18.79	7.85
Lae	61.68	25.75
Madang	21.33	8.90
Pom	122.76	51.25
Rabaul	14.97	6.25
Total	239.53	100.00

Source: NSO