

THE SUBSISTENCE COMPONENT IN NATIONAL INCOME ACCOUNTS

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THE PURPOSE of this article is to emphasize the need for more comprehensive coverage of the subsistence or non-market component in estimates of national income, and to suggest ways in which the most commonly used approaches to the problem around the world can be amended and approved. The emphasis is on the problems and conditions of the Pacific region, and examples will be drawn in particular from Papua New Guinea and from the developments in the subsistence sector accounts there with which the writer has been closely associated over the years.

I. THE NEED FOR COMPREHENSIVE ACCOUNTS OF SUBSISTENCE OR NON-MARKET TRANSACTIONS

In extensive areas of the Pacific, as well as in many other parts of the world, large parts of the indigenous population lived, until recently, almost entirely outside the monetary exchange system as pure subsistence producers. Three decades ago, this was still the case with the majority of the population in Papua New Guinea and the Solomon Islands. By the 1970s, the operations of the monetary sector had extended so far in most developing countries, including those in the Pacific region, that this is no longer the case, and most households now take some part in monetary transactions—even though it may for some be a small and relatively infrequent one. Very few households are now entirely outside the market sector.

However, very large numbers of households in very many countries around the world still produce and consume a large part of their goods and services on a self-subsistent basis, outside the market. What has happened with the expansion of the monetary sector is not that most households have converted wholly from subsistence to monetary transactions, but simply that most households now operate to some extent in both. The subsistence sector, considered as a set of people living wholly outside the market economy, is no longer a widely applicable concept, but we still need to take account of the very large activities undertaken by people who also have some monetary activities.

This does not mean that the subsistence transactions have reduced in importance, or even in size. The first market transactions of a subsistence group

The author wishes to express his thanks to Mr. Ron Fergie, Government Statistician, Papua New Guinea, for many helpful comments on an earlier draft of this article.

are often taken to supplement, rather than to supplant, subsistence production—which may continue to grow for some time with population increase even after market participation commences. In many ways the importance of understanding and measuring non-monetary economic transactions is greater in this transitional stage than it was when the interaction between the subsistence producers and the market was much less.

Most countries in which non-market production is still quantitatively important are seriously concerned with economic growth and with planning to achieve it. Economic growth is a process which must take place mainly in the monetary sector, for it involves raising the productivity of land and labor through the development of specialization, division of labor, and the formation and use of sophisticated forms of capital.¹ These processes can hardly take place outside a monetary sector of a monetary exchange system. For this reason, the process of extending the monetary sector of an economy, and of effecting the transfer of land and labor to the market sector, is for many countries an important part of the wider process of development. For these countries the observation and measurement of this process is necessary for effective planning.

It is therefore desirable to observe and to measure not only the growth of production in the market sector, and the progress of transfer to that sector, but also the total effect on the pattern, level, and distribution of production in the economy as a whole. This is because development is concerned not simply with the growth of the monetary sector and its product, but ultimately with the effect on human welfare. For this purpose the gross monetary product can be a misleading indicator. One fairly obvious reason, too frequently overlooked, is that the transfer of land or labor from subsistence to market production is liable to reduce production in the subsistence sector, and this loss needs to be offset against gains in productivity in the monetary sector. Another reason is that the process often effects a redistribution of the resultant total product in a manner that spreads the benefits narrowly and the costs widely.

In addition, an assessment of the volume and value of non-market production and consumption is necessary, not only for assessment of the resources available for development and the probable costs of their transfer to marketed production, but also for observing the effectiveness of the measures taken on the production and consumption levels of the economy as a whole (which of course includes production and consumption outside the market).

The methods of estimation of these non-market components in national income accounting throughout most of the world are generally quite inadequate for these purposes. This is because these methods mostly undervalue the contribution of non-market transactions, with the result that:

¹ Peter Ady has suggested that non-market transactions should be ignored in national accounting on the grounds that (a) they are irrelevant for growth and (b) small in value. However, (a) ignores the importance of transfer of factors from subsistence to market production as a prerequisite of growth and (b) is based on the underestimation we seek here to correct [1].

(1) Economic growth is measured in terms that undervalue the cost accruing from reduction of the non-market product, and consequently exaggerate the net growth in the economy as a whole.

(2) Similarly the relative contribution of market and non-market transactions to the welfare of the country is wrongly assessed, in that the importance of market transactions is exaggerated, and that of non-market transactions undervalued.

(3) As a result, both the productivity and the rewards to labor in non-market transactions are underestimated, and the relative advantages of labor transfer to monetary employment exaggerated. This can lead to planning that underestimates the wage rate and other inducements necessary to produce a committed monetary labor force in which rising levels of skill, productivity, and earning power can be expected.

(4) Similarly, the relative productivity of land in production for the market as compared with subsistence production can be exaggerated, with a consequent tendency towards a mis-allocation of this resource also.

(5) The social accounts tend to exaggerate rural versus urban poverty, particularly (though by no means solely) in conditions of subsistence affluence.

The underestimation of the non-market contribution stems from several features of the methods of estimation most commonly used round the world, that introduce a bias into the figures. This bias makes them unsuitable for use in the measurement of relative poverty between countries and between sectors, but also for planning the more productive distribution of resource use between types of activity. There are three main elements in this bias. First, there are serious omissions from the goods and services counted in subsistence or non-market household consumption. In most countries, the urban wage earner has to pay for many goods and services, other than food, which may have no money cost to the subsistence producer. These include housing, heating, light clothing, waste disposal, even water. Many national income statistics ignore non-market transactions of these items, and even where some provision is made for some part of this (as is sometimes done for housing), the provision is usually quite inadequate. Second, there are substantial items of public, and even some private, investment which are almost entirely omitted from most national accounts. These can be very large omissions indeed, as will be shown below. Third, the use of so-called farm gate prices, or "producers" prices, for the valuation of goods and services produced for own consumption is widely advocated. This has the effect of valuing these goods and services at the opportunity cost to the market sector, which is useful for some purposes. However, for many of the purposes discussed above, and in particular for the measurement and comparison of levels of wealth and poverty, this is irrelevant and misleading. For these purposes market prices would be a more appropriate basis for valuation.

In seeking means of improving the subsistence or non-market estimates in social accounts it is perhaps best to recognize from the beginning the limitations to which such improvement will be subject. First, we are attempting to quantify goods and services of which a large proportion do not come under observation

outside the individual rural households in which they take place. Second, we are attempting to aggregate unlike goods and services on the basis of the material welfare derived from their consumption, and then to provide a basis for comparing this level of material welfare with that of a money income in the monetary sector. Third, we end up by converting these aggregates into money values by the use of a set of imputed prices derived from the exchange value of goods and services in markets where the particular goods concerned were in fact not exchanged, and which would in all probability have had quite different prices had they been so exchanged there. These difficulties remain with us. They cannot be removed or avoided—but they *can* be mitigated, and this is what will now be attempted.

The problem of estimating the non-market product falls basically into three parts: (1) What non-market production should we attempt to include in the estimates? (2) How can the quantity of these goods and services be estimated? (3) What money values should be placed on them for inclusion in the money tables of the social accounts? Let us now take these three questions in turn.

II. WHAT TO INCLUDE

If we start from the point which subsistence sector estimates have reached in most of the world, we start from relatively little. Most such accounts, if they make provision for subsistence production at all, confine it to an estimate of subsistence foods consumed, with occasionally some additional item such as firewood and certain house-building materials. For our purposes there are vastly wider fields of non-marketed production yet to be accounted for. In what follows I mention twelve separate categories. These could be expanded further by including items such as household services rendered by wives and other relatives, and by attempting to take into account the higher consumption of leisure commonly found in an affluent subsistence economy. However, for present purposes I shall content myself with twelve categories, and after briefly discussing each, will omit from my final list those which seem too difficult to estimate with our present capabilities.

(1) *Food*, apart from being the item most widely included, in some form or other, in existing estimates, is also usually the largest and most important individual item in non-market production. In this category I include beverages. In the Pacific region, subsistence beverages do not widely include much more than coconut liquid and *kava* or *yagona*.² However, in many countries subsistence sector production includes also alcoholic beverages such as toddy, palm wine, and spirits, whose equivalent in the market sector may be particularly expensive.

(2) *Housing* is also an item of considerable importance, for not only does it tend to be a relatively expensive item in many monetary employments, particularly in the urban areas, but standards of housing vary widely, and the material welfare resulting from different housing provisions are an important component in the aggregates we are here seeking to measure.

² *Kava* is an infusion of Piper Methysticum.

(3) *Clothing and craft products* vary in importance with the culture and the climate concerned. In cold climates, clothing can be a very important item of material welfare, and considerable resources and effort will be put into its production. Similarly, in some cultures decoration and the possession of certain scarce feathers, shells, and other items can be important and require considerable time and effort in production. These items are just as much a valid item of production, and of material welfare, in those societies, as diamonds and pearls are in Europe and America. Items such as mosquito nets, sheets, and blankets should also be included under this category, where they are the result of non-market productive activity. Articles made from *tapa*³ cloth would be examples in many Pacific countries, as would Bird of Paradise feathers in Papua New Guinea. Some of these items, however, are so difficult to quantify, and to value, that their effective inclusion in the account will be impractical.

(4) *Heating fuel* is important everywhere for cooking, and in the cooler climates (such as the New Guinea Highlands) for general house conditioning, etc. Lighting could also be included in this category, though with the prevalence of kerosene and other more modern forms of lighting this is now hardly significant as a subsistence or non-market item. I would propose confining attention in this category to firewood and other subsistence fuels, such as coconut husks where these are used from the user's own production. However, where they are used in the production of marketed goods such as copra, they are in effect an intermediate good and should not be separately included.

(5) *Water* is an item that can usually be ignored, except where piped and/or treated water is provided to households in a form comparable to that which an urban household would have to pay. This is not uncommon in some parts of Southeast Asia, where a large part of the construction of the supply system may be provided by free labor from the villages concerned. In these estimates I propose to exclude this item as a separate category, and to take into account the village non-monetary contribution of labor under the category "public investment—village level."

(6) *Household and village services*. These are manifold in any village situation, and include such items as cooking, cleaning, decoration of household and of village, provision and care of village surrounds, play areas, paths, communal buildings, care of the sick, and many other communal or cooperative activities. These I propose to exclude as too difficult to assess, except for such activities and works as can be subsumed under the category "public investment" at the village level.

(7) *Entertainment, sport, and social occasions*. This is a very important nexus of activity in many societies where non-monetary production is high. For example, Waddell and Krinks observed 3.7 and 4.7 hours per man week respectively being occupied with such activities in their careful study of the villages of Sivepe and Inonda in the Northern District of Papua [5]. However, it is difficult to fill this particular box meaningfully in the preparation of social ac-

³ *Tapa* is a cloth made by beating the bark of the paper mulberry tree.

counts because we are really mainly concerned with including components that would be paid for, and thus included in the monetary sector accounts, if the activity were transacted through the market. In the urban areas, a wage earner may pay to go to the pictures, or to some major sporting event, but many of the more usual forms of amusement are free, except for concomitant consumption of food and beverages, etc. In the subsistence sector, there is little that can be compared with the urban amusements for which direct charges are levied, whilst other items such as feasting can be included under the food account. I therefore propose to exclude this category also.

(8) *Other status activities.* In the pure subsistence society, once the essentials of life have been found, economic and other activity is very often largely concerned with the acquisition of status, both for individuals and for the groups of which the society is made up. Important in this category is feasting and other forms of conspicuous consumption, and in most of the Pacific region the pig plays a central part. This presents some difficulties for some of the methods of estimating food consumption used hereafter, because these are based on nutritional levels achieved, and the pattern of consumption of pig meat, being mainly confined to rare special occasions on which large quantities of pig meat are consumed all at once, makes very little effective contribution to nutrition. For this reason, although pigs are recommended to be included under the food category estimates, it would really be preferable to estimate them separately from other items of food, and to use a method of estimation that does not depend on nutritional levels.

There are occasionally found other forms of conspicuous consumption which do not fit into the methods recommended for estimating food consumption, where food in large quantities is wasted—as with yams stored into yam houses for display in some societies where status is achieved by allowing them to rot in large quantities. This is undoubtedly quite a substantial item of consumption in some societies, and deserves to be included in the national accounts just as much as the consumption of fireworks and incense, for example, in more monetized societies. However, I have been unable to devise an adequate method for estimating either the quantity or the value of this consumption, and must reluctantly leave it out for the time being.

(9) *Public investment.* This item, almost invariably ignored in existing social accounting, is very large in many countries with significant non-market components, both as a source of welfare to the village people and as an end use for considerable non-market resources. As late as the 1960s most adult males in the rural areas of Papua New Guinea were required to work for government one day a week, for which they received no pay, or at most one free meal. In this way, roads, tracks, airfields, rest houses, and other public works were constructed, replaced, and maintained at a cost which appeared in the public accounts only to the extent that materials such as culvert pipes, and machinery such as graders were used to supplement the local labor input, plus the small amounts paid for meals and other minor inducements where these were sup-

plied. Thus, the cost of this public capital formation, together with its maintenance and depreciation, appears in the monetary accounts at a small fraction of its real cost, and in marked contrast to the accounting for urban and other public works where this free labor contribution is not made. This type of contribution, though not always on this scale, is made in many countries with large non-market components in their economies. Similarly many village and local government works are undertaken in this way, or with a payment being made to the labor that is much below the normal market rate. These contributions operate in much the same way as money contributions to government or to local authorities, and they add to the stock of public capital and to the flow of material welfare to the people. Moreover, as the monetization of the economy expands, this type of contribution to public capital and services becomes less common and eventually disappears, being replaced by wholly monetized expenditure financed from rates and taxes or other sources of public revenue. When this happens, the volume of monetary transactions is increased by this amount, and should be offset by a deduction for the non-monetary contributions no longer made.

(10) *Private investment.* This is another large but neglected field of non-market economic activity. Economists are so accustomed to reckoning savings and investment in money terms that they tend at times to overlook that money is the measure, and not the essence of investment. Non-monetary investment takes place on a very considerable scale in the private as well as in the public sector, largely in the form of the application of labor to a task where the fruits of the labor in terms of consumable income are deferred, sometimes for years, and are spread over a long period. Very important in this respect is the preparation of land for cash cropping and the planting and care of the crops till they come into bearing. With many tropical tree crops, this involves the investment of very considerable quantities of labor for a number of years before a return is achieved, and is investment activity of quite a sophisticated kind, yet where the labor supplied is unpaid family labor, the extent of this investment very often escapes inclusion in the national accounts. Some items of productive capital, such as canoes and fish traps, animal traps, tools and utensils produced and used in non-market economic activity need to be included somewhere in the accounts. Finally there are in many areas very large non-monetary contributions made to churches and missions, and to institutional services such as schools, hospitals, and clinics provided by them. The scale of this contribution is sometimes not appreciated even by some of the church administrators themselves.⁴

⁴ I remember well one occasion at a seminar in Australia a senior member of one church group deplored the small local contribution to the church in Papua New Guinea. In the early 1960s this was still, in cash donated, only a small fraction of the \$800,000 contributed annually from outside the country. He was considerably taken aback when I pointed out that the estimated value of free labor provided to the church in 1962 was \$2,800,000, to say nothing of the value of partly paid-for food contributed by the local people to mission schools and hospitals.

(11) *Saving in various forms.* Non-monetary saving mainly takes the form of immediate investment activity and is recorded mainly under the preceding two categories, but there are other types of saving activity that are too difficult to include. They are, however, of sufficient interest to warrant a brief mention of one example. The deficiency in the system of saving by immediate investment is that the saver needs to know exactly what and where he will want the capital investment good before he can start his saving activity. In many societies this problem is partially solved by accumulating personal obligations. This may be done in the simple and relatively minor form of kindly neighborly acts in times of difficulty or sickness, and in the sharing out of occasional windfall gains or surpluses. On the other hand, it may take the more sophisticated form of a long period of free contribution of labor by a young man to a chief, in the expectation that some years later, when the young man wishes to marry and erect a house, substantial help to do so will be given by the chief in return.

(12) *Insurance type activities.* This item will not be included in the proposed set of accounts, because although such activity is quite important as a part of subsistence economic activity, it does not take a form that is readily comparable with any final item of the monetary accounts not already covered. However, it is mentioned because it affects quite seriously our definition of food production.

In the monetary sector, insurance and assurance activities are either a matter of saving, or of sharing risks over large numbers of people and over time. In subsistence activity, some limited saving of the particular type, mentioned in (11) above, covers the sharing of risks within the community, but as the effective communal unit is usually small, the effectiveness of this does not cover widespread risks such as that of a bad season, nor can it fully cover risks involving some personal obligations such as the need to contribute to a feast at the time of certain life crises. Precautions against these types of needs are taken rather by clearing and planting more land than would be necessary to provide for the simple subsistence needs of the group in a normal year. There will therefore in most years be produced a surplus of food, and as most Pacific staples keep better in the ground than after harvesting (but even then only for a limited period) this surplus is often unharvested by the family concerned, and left to be grazed by pigs, or wasted. This is an effective form of insurance for the purpose, but it renders it difficult to deduce consumption from the area under crop, and for income purposes it is fairly clear that production must be taken to be what is produced and harvested, and must exclude what is left in the ground.

This brings us to the end of this review of the categories of subsistence or non-market production, and to the conclusion that six of the categories are either too difficult, or too insignificant, to warrant the attempt to estimate their quantity and value. This leaves us with five for certain inclusion, and one other to be included in those countries where non-monetary production in that category is significant in volume and sufficiently observable to be estimated. These

are (1) food and beverages, (2) housing, (4) heating and fuel, (9) public investment, (10) private investment; and where of significant volume and observable (3) clothing, craft products, etc.

III. ESTIMATING THE QUANTITIES

The next step is to consider how the physical quantities of these goods and services produced and consumed outside the market may be estimated. As the methods vary for the different categories, it will be necessary to consider them separately.

A. *Food and Beverages*

These form the largest subsistence item in most economies in which non-market production is significant. There are basically two ways of approaching the estimation of this component, from the production angle, or from the consumption angle. Both have their difficulties.

Let us first examine the production approach. Here the method is to measure the total production of subsistence type foods, and then to see what happens to it and treat it according to its end use. The first difficulty is, of course, to define production. As defined for traditional garden crops in [2], for example, it is in effect the total product that can be harvested from the garden when everything is carefully collected. But this rate of harvesting is almost never undertaken for reasons already explained, in a normal year. If we adopt this definition of production, it becomes necessary to divide total product into three sub-categories, viz.:

Harvested by man. Call this a .

Harvested by pigs. Call this b .

Wasted. Call this c .

Then total product (by this definition) $P = a + b + c$.

For estimating the subsistence or non-market product we must omit c . We can treat pig production as a product in its own right, and measure it when the pigs are killed and consumed, or when they are sold, so that b is an intermediate product. We are therefore only concerned at this point with a from which we can deduct the quantities that go onto the market and become monetary product, leaving the remainder as subsistence or non-market product. The assumption would then be that this remaining product is consumed, either by being eaten, or destroyed in preparation and cooking, or used for display and as a means of sating the hunger for status and admiration. However, before we can calculate a several difficulties have to be overcome.

First, the total quantity P so produced is unrecorded, and is unobserved even by members of the production household. It is, of course, possible to observe it on a sample basis, as was done with the Papua New Guinea Survey mentioned above, but this is an exceedingly complex and expensive operation that can only be carried out very rarely, and certainly not every year or every five years.

Secondly, when this is done, it is virtually impossible to observe fully the cropping process, and so to measure even on a sample basis what is cropped, because a garden may remain in production for well over a year, and be harvested on hundreds of separate occasions during that period and at various times of the day. Direct observation of a is therefore impracticable. Consequently, even if we know P by sophisticated agricultural sampling, we cannot derive a from it without knowing b and c , which certainly we cannot know. In other words, the total production of these foods in the ground will vary from year to year with the seasonal conditions and other factors. In good seasons more will be produced in the ground, and after harvesting what is required for household needs, more will be left for pigs and to waste. In poor years, less will be produced, and after household needs are met, less will be left for pigs and waste. Even if the amount harvested for household consumption were affected/unaffected by major variations due to life crises and other social obligations, and were to vary relatively little from year to year in the short term, even so the proportion of P harvested by man would vary almost as much as the seasonal conditions cause P to vary. There is therefore no means of deriving a from P . For this reason, it appears to me that the production approach does not provide a practicable means of estimating subsistence food quantities for our present purpose.⁵

The alternative is, therefore, to attempt the consumption approach. The objective is to estimate the quantities and types of subsistence food consumed from non-market sources in the economy concerned, bearing in mind that a considerable proportion of the people may consume marketed goods and non-marketed goods together, even at the same meal.

The basis of this approach is again a simple arithmetical equation, but this time one that in many cases can be solved. The method in effect sets out to calculate the consumption of subsistence foodstuffs as a residual, on the basis that if it is possible to calculate the total food consumption in the economy, and the quantity marketed is calculated through the monetary sector accounts, the difference between the two will be non-market consumption. In other words, if total food consumption can be calculated, and marketed food consumption is known, the subsistence residual is readily calculable. The trick is, of course, to calculate total food consumption.

In most economies with a sizable non-market component in the economy, very little direct observation of non-market consumption can be hoped for, because most of it goes direct from production to consumption within the household concerned. Moreover, the types and quantities of subsistence foods concerned vary not only with individual taste, but with seasonal conditions, climatic and soil variations, altitude, access to the sea or to rivers and lakes, ethnic preference, and many other factors. In some areas taro will be the main staple,

⁵ This is not to suggest that accurate and detailed estimates of total production in the ground are not of great value. As will be seen, they make possible a great improvement to the consumption approach if they are available.

in other areas, sweet potato, sago, or yams. At one time of the year, breadfruit is unobtainable, at another time of the year it becomes a main staple. Under these circumstances, a sample survey designed to observe a representative sample of households would not only need to cover quite large numbers of households in order to include a significant sample of each type of consumption pattern, but it would need to cover all the seasonal conditions normally encountered during the year, and would therefore have to extend over a considerable period of time. Collection of consumption data under these conditions is particularly difficult and costly, and is hardly practicable on a national scale except perhaps for small and relatively homogeneous countries like Nieuwe.

However, quite a lot is known about nutrition, both in general, and indeed about individual sets of people in many Pacific countries. Quite a lot is known also about the normal preferred diets in most areas, and where this is not known, it is not exceedingly difficult to find out. In Papua New Guinea a very substantial range of studies have been made since World War II of nutritional intake in many areas, both rural and urban, highland and coastal, recently contacted and long contacted. From these studies it was possible to make estimates of a general average level of nutrition, in terms of calorific intake, for various components of the indigenous population. Moreover, in the 1966 census of population questions had been added to distinguish between indigenous people whose occupation was wholly or mainly subsistence. Where this type of information is available, or can be obtained, it is possible to make quite reasonable estimates of total consumption of foods by the following general method. This method was devised in 1973 to meet the need for revision of the national income estimates of Papua New Guinea in the absence of any direct consumption data for non-market production or consumption, and in the absence of any survey of indigenous agriculture since 1962. In Papua New Guinea, the wide range of variations in geographical and climatic conditions and the complex ethnic and cultural composition of the population made it necessary to make certain rather broad assumptions about the nutritional characteristics of "average" sections of the population. These would be less necessary, and the whole process easier, in the smaller and less variable countries of the region.

The method operates as follows:

- (1) First, identify the section of the population (if there is one) for which non-monetary income and production is not significant for national accounting purposes. In Papua New Guinea this was taken to be the total non-indigenous population, including local born Chinese and Europeans. This component of the population is presumed to secure all its food through the market.

- (2) A list is then made of the foods used in the country concerned that are either commonly produced on a non-market or subsistence basis, or which are commonly used by the indigenous populations as substitutes for subsistence foods. The former will include yam, taro, sweet potato, bananas, and local type vegetables, for example, plus sago, coconuts, fresh fish, and the like, while the latter

will include rice, bread, cheap lines of tinned meat and fish, sugar, and a few other items. (See Tables I and II.)

TABLE I
CALORIFIC CONTENT OF SUBSISTENCE-TYPE FOODSTUFFS

Food Item	Calories per lb Edible Portion	Portion Normally Consumed (%)	Calories per lb Harvested or Marketed Weight	Quantity Produced in 1961/62 (tons)	Calorific Equivalent of 1961/62 Production (mill. cal.)	Proportion of Total Calorific Equivalent (%)
(1)	(2)	(3)	(4) = $\frac{(2) \times (3)}{100}$	(5)	(6) = (5) × (4) × 2,240	(7) = $\frac{100 \times (6)}{\text{Total of (6)}}$
Yams	430	75	322.5	233,000	168,319	6.9
Taro col.	430	75	322.5	312,000	225,389	9.2
Sweet potato	520	75	390.0	1,201,000	1,049,194	42.7
Bananas	272	70	190.4	610,000	260,163	10.6
Taro xan.	430	65	279.5	146,000	91,408	3.7
Tapioca	595	80	476.0	52,000	55,444	2.3
Beans	440	95	418.0	2,700	2,528	0.1
Misc. greens	218	95	207.1	3,000	1,392	0.1
Pit pit	104	40	41.6	19,000	1,770	0.1
Corn	463	29	134.3	61,000	18,351	0.7
Sugar cane	263	30	78.9	307,000	54,258	2.2
Pineapple	126	85	107.1	5,000	1,200	0.0
Paw paw	147	85	125.0	n.a.	..	0.0
Sago	1,575	90	1,417.5	115,000	365,148	14.9
Nuts (not peanuts)	2,540	85	2,159.0	n.a.	..	0.0
Crocodile	1,100	80	880.0	2,484	4,896	0.2
Freshwater fish	1,100	60	660.0	3,033	4,484	0.2
Saltwater fish	1,100	60	660.0	4,829	7,139	0.3
Other marine produce	1,100	60	660.0	2,426	3,587	0.1
Pig	1,318	50	659.0	21,518	31,764	1.3
Poultry	1,100	60	660.0	311	460	0.0
Eggs (per egg)	80	—	—	13.9m. eggs	1,112	0.0
Goat	1,100	60	660.0	0.0
Game	1,100	60	660.0	6,761	9,995	0.4
Grubs and insects	n.a.	n.a.	n.a.	n.a.	..	0.0
Coconuts (per nut)	1,280	—	—	64m. nuts	81,920	3.3
Peanuts	2,540	85	2,159.0	3,000	14,508	0.6
Total					2,454,429	100.0

Note: Tables I to VI are attached illustrating the way this method was applied in calculating the latest revised estimates for Papua New Guinea. I am grateful to Paul Baxter, till recently on the staff of the Bureau of Statistics, Papua New Guinea, for the supply of these tables, in which he has adapted, extended, and greatly improved my original draft tables.

n.a.=not available; —=not applicable; ..=not significant.

TABLE II
CALORIFIC CONTENT OF NON-SUBSISTENCE-TYPE FOODSTUFFS IN INDIGENOUS DIETS
(Fiscal year beginning July 1)

Food Item	Quantity Imported or Locally Produced (lbs)	Estimated Non-indigenous Consumption per Head per Annum (lbs)	Estimated Non-indigenous Consumption (lbs)	Indigenous Consumption (mill. lbs)	Calories (per lb)	Calorific Equivalent of Indigenous Consumption (mill. cal)
(1)	(2)	(3)	(4)=(3)×(1) in Table III	(5)=(2)-(4)	(6)	(7)=(5)×(6)
Beef or veal in airtight containers		25			1,034	
Fish, etc. in airtight containers		25			919	
Rice:						
Brown (imported)		—	—	—	—	—
White (imported)		—	—	—	—	—
Locally produced		—	—	—	—	—
Total		100			1,600	
Sugar		111			820	
Flour:						
Plain		—	—	—	—	—
Self-raising		—	—	—	—	—
Biscuits		—	—	—	—	—
Flour and biscuits (total)		173			1,650	
Total						

(3) From market sources, estimates are made of the total quantities of these foods which are marketed during the year. This was not too difficult to do in Papua New Guinea, and should be easier in a smaller and more homogeneous society. It would in any case be a normal part of the preparation of monetary sector estimates.

(4) An estimate is then made of the amount of these foods consumed per capita by the special wholly monetized (and usually mainly non-indigenous) population identified in (1) above. This is normally not a difficult operation, because consumption patterns of this group are usually well established for such foods, relatively easy to research (most housewives of this group could give from memory or records a very fair estimate of their weekly or monthly consumption of sugar, bread, flour, and green vegetables, etc.) and the level of consumption of these goods is usually quite modest. The resultant consumption figures per capita are then multiplied by the population of that group, and the result deducted from the marketed quantities of the foods in (3). This excludes the wholly monetized section of the population from the rest of the exercise.

(5) The balance of the population is then divided into groups with different general levels of nutrition in terms of calorific intake. This is not as difficult as it sounds, for the limits to average consumption are not particularly wide.

For short periods wide variations can be sustained, but if the long-term average caloric intake for adults falls below one level the population starves. If it exceeds another level the population becomes obese. Within these limits the level of consumption is determined by the quantity of food available only up to the point where there is a sufficiency, and thereafter by custom, habit, and the range and variety of foods available. For most of the indigenous Pacific peoples, food is generally sufficient in quantity, whilst custom and habit change only slowly, so that the range and variety of foods available tends to be the important variable, and this, in any one community, tends in the long term to be fairly constant from non-monetary sources. Variety thus tends to be a function of market activity and the level of cash income.

If there are other components of the population not already excluded from our calculations under (4) above, but having quite distinct consumption patterns, much the same will apply, though levels of consumption may differ for any given level of cash income. The Indian rural population in Fiji is an example, and although a separate estimate may have to be made for them, the principles above will still apply. The only problem area is likely to be with the very poor section of the Indian urban population, where the assumption of a basic sufficiency of food in quantity will not hold. For this group, a separate and lower level of consumption, at or near the lower limit of sustenance, may have to be assumed.

Ignoring for the moment racial differences, and assuming a reasonable degree of ethnic and cultural homogeneity in the remaining population, it can be as-

TABLE III
POPULATION AND WORK FORCE CHARACTERISTICS

Item	(Fiscal year beginning July 1)						
	1966	1967	1968	1969	1970	1971	1972
1. Non-indigenous population (1,000)	36	39	41	46	52	53	48
2. Indigenous male work force (1,000)	652	656	661	666	670	676	680
3. Indigenous males aged 10 years or more (1,000)	766	778	790	802	814	826	838
4. Indigenous males aged 10 years or more per indigenous male worker= $(3)/(2)$	1.175	1.186	1.195	1.204	1.215	1.222	1.232
5. Indigenous females aged 10 years or more (1,000)	705	719	734	748	762	776	790
6. Indigenous females aged 10 years or more per indigenous male worker= $(5)/(2)$	1.081	1.096	1.110	1.123	1.137	1.148	1.162
7. Indigenous children under 10 years (1,000)	708	738	769	800	830	862	892
8. Indigenous children under 10 years per indigenous male worker= $(7)/(2)$	1.086	1.125	1.163	1.201	1.239	1.275	1.312
9. Indigenous male force:							
(a) Wholly or mainly money-raising (1,000)	194	201	206	213	226	230	225
(b) Wholly or mainly subsistence (1,000)	458	455	455	453	444	446	455

sumed that the portion of the indigenous population with the breadwinner "wholly or mainly money earning" will have a higher cash income, and thus a more attractive range and variety of foods, and thus a higher calorific intake, than the population in the "wholly or mainly subsistence" category. In Papua New Guinea quite extensive nutritional studies had been made, both of the urban and the rural populations, particularly in connection with major arbitration investigations of wage levels, and it was possible to use these to determine, with some confidence, average levels of calorific intake for the two groups of indigenous population. Elsewhere in the Pacific the extent of such nutritional studies may be less, but the estimates do not have to be very accurate to be useful, for the likely range is quite limited, and the consequences of any likely

TABLE IV
CALORIFIC INTAKE OF INDIGENOUS POPULATION

(Fiscal year beginning July 1)

1. Calorific intake per male worker of members of the wholly or mainly money-raising work force and their dependants:		
(a) Males aged 10 years or more =2,800×(4) in Table III	=	cals. per day
(b) Females aged 10 years or more =2,000×(6) in Table III	=	cals. per day
(c) Children under 10 years =1,700×(8) in Table III	=	cals. per day
(d) Total =(a)+(b)+(c)	=	cals. per day
2. Calorific intake per male worker of members of the wholly or mainly subsistence work force and their dependants:		
(a) Males aged 10 years or more =2,400×(4) in Table III	=	cals. per day
(b) Females aged 10 years or more =1,800×(6) in Table III	=	cals. per day
(c) Children under 10 years =1,400×(8) in Table III	=	cals. per day
(d) Total =(a)+(b)+(c)	=	cals. per day
3. Calorific intake of all males in the wholly or mainly money-raising work force and their dependants =(1) (d)×(9) (a) from Table III	=	cals. per day mill. cals. per yr.
4. Calorific intake of all males in the wholly or mainly subsistence work =(2) (d)×(9) (b) from Table III	=	cals. per day mill. cals. per yr.
5. Calorific intake of indigenous population =(3)+(4)	=	mill. cals. per yr.
6. Calorific equivalent of indigenous consumption of non-subsistence-type foodstuffs =total of column (7) in Table II	=	mill. cals. per yr.
7. Calorific intake of indigenous population from consumption of subsistence-type foodstuffs =(5)-(6)	=	mill. cals. per yr.

margins of error are relatively minor. Estimates made by a competent nutritionist who knows the population concerned, based on a detailed study of a relatively small sample, and expanded in accordance with what is known about the general physical size and condition of the population, should be adequate to form the basis of estimates that will be far superior to those used in national accounts in most parts of the world.

Having determined the average calorific intake for each group of the population, this is then multiplied by the population of each group, and the results

TABLE V
INDIGENOUS CONSUMPTION OF SUBSISTENCE-TYPE FOODSTUFFS
(Fiscal year beginning July 1)

Food Item	Proportion of Total Calorific Equivalent (%)	Calorific Intake (mill. cal.)	Calories per lb Harvested or Marketed Weight	Quantity Consumed (mill. lb)	Price (cents per lb)	Value of Consumption (\$ 1,000)
(1)	(2)=(7) in Table I	⁽³⁾ =[(2)×(7) in Table IV]/100	(4)=(4) in Table I	(5)=(3)/(4)	(6)	(7)=(5)×(6)
Yam	6.9		322.5			
Taro col.	9.2		322.5			
Sweet potato	42.7		390.0			
Bananas	10.6		190.4			
Taro xan.	3.7		279.5			
Tapioca	2.3		476.0			
Beans	0.1		418.0			
Misc. greens	0.1		207.1			
Pit pit	0.1		41.6			
Corn	0.7		134.3			
Sugar cane	2.2		78.9			
Pineapple	0.0	..	107.1	..	n.a.	..
Paw paw	0.0	..	125.0	..	n.a.	..
Sago	14.9		1,417.5			
Nuts (not peanuts)	0.0	..	2,159.0	..	n.a.	..
Crocodile	0.2		880.0			
Freshwater fish	0.2		660.0			
Saltwater fish	0.3		660.0			
Other marine produce	0.1		660.0			
Pig	1.3		659.0			
Poultry	0.0	..	660.0	..	n.a.	..
Eggs (per egg)	0.0	..	80.0	..	n.a.	..
Goat	0.0	..	660.0	..	n.a.	..
Game	0.4		660.0			
Grubs & insects	0.0	..	n.a.	..	n.a.	..
Coconuts (per nut)	3.3		1,280.0	*		
Peanuts	0.6		2,159.0			
Total	100.0					

Note: n.a.=not available; ..=not significant; *=mill. nuts.

added to give the total calorific intake of this population. We then have C_t , which is the total calories to be supplied from the foods listed in (2) above whether marketed or not, after deducting what is consumed by the special population excluded in (4) above.

(6) Next we take the calorific content of each of the foods in (2) that are marketed, multiply the quantities marketed (par. 3 above less deduction in par. 4), after deducting the proportion lost in preparation and cooking, by this figure, and add the results to give the total calorific intake to this population from marketed foods. Let us call this C_m . The balance of the calorific intake which we may call C_s will therefore come from subsistence or non-marketed foods. In other words:

$$C_t = C_m + C_s,$$

and as we know both C_t and C_m we can determine C_s ,

$$C_s = C_t - C_m.$$

(7) Having got this figure for C_s in millions of kilocalories per annum, it then remains to convert this into specific quantities of the various individual foods produced. To do this, it is necessary to have some indication of the proportion of the total calories contributed by each type of subsistence food. Here such production data as may be obtained, though inadequate (for reasons already stated) for the estimation of total consumption levels, are quite a reasonable guide to the relative availability of each food. The method used in Papua New Guinea was to take the production figures for each type of food from the agricultural census, and to assume that though actual consumption must have been considerably less than those figures, nevertheless consumption would still be roughly in accordance with the proportions of total production in the ground. Where the food was also a main cash crop, as with coconuts, some direct estimates of consumption levels of the food had to be made for producers of that crop. The same applied to non-market consumption of fish and game. Consumption of pig was based on the number of domestic pigs and an average rate of killing. The calculation is shown in Table I attached, leading in the last column thereof to a series of factors giving the relative proportion of total calories for which each individual food was responsible. Let us designate the factor for each food f_1, f_2, \dots, f_n for the total series of n specific subsistence foods, then if f_1 is the factor for yams, then the total consumption of yams C_1 will be given thus:

$$C_1 = \frac{C_s}{100} \cdot f_1 \cdot H_1 \text{ lbs per annum,}$$

where H_1 is the number of effective digested calories per lb harvested or marketed weight, taken from column (4) of Table I. Estimates of the total consumption in terms of harvested or marketed weight for each food on the list can then be calculated similarly using the values of f and H for the food concerned.

(8) An alternative step after the calculation of C_s , useful for some special purposes, is to use a typical non-subsistence diet comprising marketed foods

TABLE VI
INDIGENOUS CONSUMPTION OF SUBSISTENCE-TYPE FOODSTUFFS

	(\$1,000)						
Item	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67
(a) Total value of indig. consumption of traditional subsistence-type foodstuffs at average dist. <i>H/Q</i> prices	92,548	103,244	99,892	97,188	107,676	115,786	156,347
(b) Value of market consumption of traditional subsistence-type foodstuffs (at market prices)							
(i) Sales through urban markets	702	790	921	1,072	1,336	1,788	2,644
(ii) Own-account production outside rural villages and transfers from rural villages	9,044	9,821	10,524	11,147	11,823	13,034	14,121
(iii) Total	9,746	10,611	11,445	12,219	13,159	14,822	16,765
(c) Market proportion = (b)/(a)	.1053	.1028	.1146	.1257	.1222	.1280	.1072
(d) Non-market proportion = 1-(c)	.8947	.8972	.8854	.8743	.8778	.8720	.8928
(e) Total value of indig. consumption of traditional subsistence-type foodstuffs at prices in Table V	69,858	77,927	75,343	68,415	81,144	87,197	117,834
(f) Non-market component of indig. consumption of traditional subsistence-type foodstuffs = (d) × (e)	62,501	69,918	66,711	59,814	71,227	76,035	95,199

commonly purchased by lower income indigenous families operating in urban or estate type monetary employment, and calculate the quantities of these foods in those diet proportions that would provide C_s calories. This, converted to a per head, or per family basis, can be used to calculate the cost of providing a subsistence worker or his family with food entirely from the monetary sector to a level of calorific content not less than the average in subsistence agriculture. This will normally be a substantially higher value than that given by the previously described method, due to the higher prices usually applicable to the purely monetary sector diet, but it is sometimes of considerable relevance to the problem of determining wage levels necessary to secure that level of commitment to monetary sector employment necessary to develop a labor force of rising skills and productivity.

B. Housing

Comparison of rural and urban housing always presents difficulties because the flow of income enjoyed includes elements derived from the location and environment of the house, as well as from its size, type of construction, and facilities. On the other hand, it is not particularly difficult to estimate the

annual *cost* of the type of accommodation normally accepted by a family in a town and a village. For subsistence income purposes we are concerned mainly with owner-occupied houses in rural village conditions, and just as the occupant in an urban area will in most cases pay a rent, or its equivalent in depreciation and maintenance costs, etc., so a rural family will meet the cost of their village housing by providing labor for the collection of its materials, and for its construction and maintenance, plus the monetary cost of purchased materials and labor where this applies. The monetary costs, where there are any, will appear elsewhere in the monetary sector accounts. Therefore, all that is necessary is to provide for the unpaid labor⁶ used in the construction and maintenance of the house.

Estimation of this does not require a high level of prevision, and a reasonable approximation can be made by consultation with sample villagers and with experienced observers who have lived closely with villagers for some years. The labor input for any house will vary not only with the type and construction of the house, but also with the stage reached in the life of the house. Most village housing requires renewal after five or ten years (though there are certainly exceptions in the Pacific as elsewhere), so that the pattern of labor input will have peaks at such intervals. Similarly, a new house is liable to require less maintenance than a moderately old one, and so on. The labor input on any one house will therefore vary greatly from year to year, but taking a village of any size overall, the annual input of labor into housing can be expected to average out and a figure of an average number of days work per household on housing can be arrived at. Most such estimates that I have seen fall in the range of five to ten days per adult per annum.

This type of activity is not always confined to rural villages. Much low standard housing in and around urban areas is similarly built and maintained, at least in part. However, in most urban areas it is not difficult to extend the system of valuation on urban buildings generally to cover this housing, and it makes things much simpler if the labor input calculation is applied only to the non-urban population. It is also desirable, where possible, to eliminate from the non-monetary calculations housing in non-urban areas that is clearly accounted for in the monetary estimates, such as labor lines in estates and institutional housing provided for employees of government, large mining and industrial enterprises, and the like. Having made these exclusions, the calculation for subsistence housing is then made by multiplying the remaining rural adult population by the already determined number of days work per annum spent on housing. The resultant figure will be in man- (and woman-) days for the year concerned.

⁶ That is unpaid in money terms; much labor in house construction is undertaken on a reciprocal basis, or with some consideration given in the form of meals and perhaps gifts. For our purposes, however, this hardly affects the case, and a summation of the labor input *not* covered by money wage payments is the subsistence or non-monetary component in the cost.

The figure so arrived at will give in quantitative terms the non-monetary resources put into housing each year in the form of construction and maintenance, and while this corresponds well enough to the costs covered in the normal monthly money rent paid by an occupier of a building he does not own, it bears little relationship to the special concept of rent of owner occupied buildings used in the monetary section of national income accounts, which is *net* of depreciation and maintenance. What has been calculated is the depreciation and maintenance component of subsistence housing. It is questionable whether the equivalent of rent net of these factors—which is simply the profit component—can be empirically calculated here.

C. *Heating and Fuel*

The only important subsistence source of heating and fuel in Pacific countries is firewood, and except in some of the colder regions, such as the Highlands of New Guinea, the main use is for cooking. As firewood and waste materials such as coconut husks and shells are also used in commercial processes such as copra drying, where the value of the firewood input enters the monetary accounts through the end value of the product, care must be taken to include in the subsistence accounts only fuel used for direct consumption purposes such as household heating and cooking.

Unfortunately the estimation of this item is complicated by wide variation between households, in some regions household heating is unnecessary, in others it is an essential; in some areas firewood is scarce, elsewhere plentiful; in some regions kerosene and other monetary sector fuels are commonly replacing firewood for cooking, particularly where cash incomes are regular and substantial. Where these types of variations occur within a country, it is necessary to classify the population approximately between the types of variation, and to do some sample, or even some spot investigations to determine the approximate average level of use per household within each classification. It is not difficult to establish an approximate level of use of firewood for cooking in an average size household. Having done this, spot sample surveys of the proportion of households regularly using kerosene or gas or electricity for cooking are used to determine the residual number using wood or other subsistence type fuels. Then total consumption of firewood and equivalent can be calculated, and the quantities taken into the monetary sector estimates as marketed produce deducted to give the subsistence sector consumption in tons, or cords of wood. Where wood is also used for heating, a separate estimate needs to be made for that component, and this added to the total.

D. *Public Investment*

In many developing economies, a very substantial non-monetary contribution to national wealth is made through the provision of free or only partly paid labor for the construction, maintenance, and replacement of public works. In the monetary sector this type of work is included in the accounts at cost, which covers wages and other considerations paid, and on the other side of the accounts,

the source of this outlay appears as tax and other revenue, public loans, etc. Normally the value of unpaid labor fails to appear on either side of the national accounts.

This omission can be a serious deficiency, for it can be a large and important item on both sides. When we first introduced an empirical calculation of this component in the accounts for Papua New Guinea, which was for the year 1962, the calculated free labor so contributed for roads, airfields, rest houses, and other district works, plus local council works and village works came to 48,750,000 man-days, which when valued at the going rate for unskilled rural labor came to substantially more than the total of all wages and salaries paid to indigenous workers in the monetary sector for that year. Not only is that a very substantial addition to the total national produce, but it is a form of direct taxation, falling exclusively on the indigenous rural people, which is far too large to be overlooked. In that year, 1962, total direct taxation revenues (i.e., monetary sector only) in Papua New Guinea amounted to only £4,646,000, whereas the value of unpaid labor contributed to public works by the subsistence sector amounted to more than three times this, at £14,600,000. This is a healthy counter to the superficial view, sometimes expressed by people who should know better, that the people in the subsistence sector make no contribution to the cost of running or developing their country.

The problem of estimation is essentially a matter of determining the number of days labor so contributed, valuing this, and deducting the value of meals and other considerations or part payments made for the work done. Where local councils and public works departments keep records of laborer attendance, this is not difficult, but where, as is more usual, no detailed records are kept, estimates made by district officers or district engineers are valuable. Even where, as in Papua New Guinea, there is a legal obligation for all adults of a certain population to contribute one day a week to government work, an estimating process is to be preferred to a simple multiplication of that population by fifty-two, because such obligations are difficult to enforce and frequently evaded.

In making these estimates, it is preferable to do it in several parts, initially, in order to reduce the likelihood of overlooking significant components. Work done on major state works, such as main roads, is one component. Other district works, often organized locally, are a second, and include work on minor roads and tracks, rest houses, local schools and clinics, landing stages, airfields, etc. Some of these may be organized under a separate local government authority if one exists. Finally there are village works, which include village hygiene and cleaning patrols, waste disposal, construction and maintenance of wells and other water supplies, community centers and other village public buildings where they exist. The criterion for inclusion is that the good or service produced should be communally provided, and of a type that in an urban monetized area would be provided publically and paid for from taxes, rates, or other public contribution.

One special problem of this part of the estimates is that it is normally not possible to distinguish between work that provides new public capital, replaces

old public capital, or maintains and operates it. In the economies with which I have been concerned in this type of estimation, there has been a very large subsistence contribution to capital formation. In Papua New Guinea, for example, a large proportion of the road built to open up the country were initially built largely with free village labor, and many of them have been maintained in this way for many years. The same applies to many of the airfields. Whilst it is impossible to calculate approximately the amount of free labor contributed to this work as a whole, I have been unable to devise any empirical basis for determining how much of it was capital forming, and how much maintaining or replacing. This difficulty, however, is not peculiar to the subsistence sector.

E. *Private Investment*

The estimation of items under this category are best divided into several sub-headings, for which the estimation procedures may differ. At least four sub-headings are required in most cases, viz.: (1) investment in cash cropping, (2) expansion of subsistence-gardens, (3) construction of productive plant and equipment, (4) church and mission works.

Taking these in turn:

(1) *Investment in cash cropping* can itself take at least three forms, in which there are some intrinsic differences of importance. First, there is investment in tree crops, such as coconut, rubber, coffee, cocoa, and many fruits, for which there is a considerable maturation period between the start of preparatory work and the first cropping which may extend from three to seven years, and from which the income flows may continue for several decades. Second, there are shorter term crops such as rice, groundnuts and exotic vegetables, which are not part of normal traditional agriculture and require new materials and techniques. Finally, there is the expansion of production of traditional crops for marketing, in which additional subsistence type garden areas are cleared and planted for this purpose.

For tree crops, the cost of original new planting is sometimes greater than the cost of replacement, though this is by no means always so. It is, however, advisable to distinguish, as far as possible, between new planting, involving additions to the acreage under the crop, and replacement which does not. Most countries will have available, from their departments of agriculture, the means of making reasonable estimates of the rate of new planting, and of replacement planting, of tree crops. Moreover, most countries will have detailed estimates of the cost of such planting, including the labor inputs required at various stages. Where these are not available, and cannot readily be compiled, there is sufficient uniformity in these types of processes to make it practicable to take estimates prepared in another country with similar climatic and soil conditions as a rough guide. Papua New Guinea is one country which has a good selection of these types of estimates for individual crops. It is thus not particularly difficult to estimate the total labor input in the investment, and replacement of these types of crops, taken crop by crop, in the non-estate sector. All that then remains is to value this labor (see below) and deduct that portion for which wages or other

monetary allowances have been paid, and which appear in the monetary sector accounts. It is usually a fairly simple process to identify the components that have appeared elsewhere in the monetary sector accounts, for this will mostly be where development bank loans, replanting or new planting subsidies, and the like have been provided, and such payments will have specified how much, if any, is provided for purchase of planting materials, fertilizers, etc., and how much for labor.

More difficult is the case where a small planter supplements his family labor with some hired labor. Some such cases will not involve double counting, as the labor hire transactions are such as would have escaped the methods available for estimation of monetary sector wage employment. However, where the sophistication of the monetary sector accounting is such that much of this *would* have gained inclusion, those methods may also provide a basis for estimation of how much needs to be deducted from the subsistence component for this purpose.

For shorter term crops the investment component is usually smaller, and for our purposes can reasonably be confined to the cost of clearing and bringing into the agricultural cycle new land that otherwise would not have been used. In other words, if a subsistence farming group meets its normal subsistence needs by keeping about two acres of subsistence garden in production at any one time, on a five year fallow cycle, it will be using ten acres for the full cycle for its subsistence. If it then adds two acres of dry rice for sales, and intends to sustain its subsistence production at the same level, this will involve adding new land to the cycle, and the initial cost of clearing that land is an investment cost. The other short term costs of cultivating the crop are intermediate costs, and are covered in the value of the product.

Expansion of traditional crops in order to market the surplus are very similar in this respect, except for the fact that so many subsistence farm can do this in most years simply by cropping some of the surplus planted as a reserve against the contingency of a bad season, etc. When this happens, only the additional labor of cropping can be considered a cost of producing this surplus, and there is no investment element. For this reason, it is suggested that investment in the production of additional subsistence type crops for market should be ignored, except where it is known that specific additional areas have been brought into cultivation for the purpose, when estimated labor cost of adding that land to the cultivation cycle could be included.

When investment in tree crops and new clearing is added to the national product, there should be a depreciation item on the other side of the accounts. However, as this is not normally done for these particular items in monetary sector accounts, there is little point in attempting it here. As a result, however, it will be necessary to follow the monetary sector procedure of excluding from the total all investment in tree crop replacement. This statistics of investment in tree replacement is a very important one for planning purposes, and should be calculated with care, but it cannot, in the absence of a depreciation provision,

be included in the national income accounts.

(2) *Expansion of subsistence gardens* to meet increasing subsistence needs through increases in the population on subsistence production is particularly difficult to estimate, because, although one can say that for any subsistence population the area of gardens cultivated for pure subsistence purposes will probably vary broadly in proportion to changes in the size of that population, the fact that most families combine subsistence and monetary activities to some, but widely varying, extent, makes it difficult to define the subsistence population for this kind of calculation. Moreover, the degree of dependence on subsistence production is liable to vary with the prosperity or otherwise of the monetary sector and with seasonal conditions in the agricultural sector; it will therefore vary independently of population changes. Here again, the matter is not very important except for an understanding of internal operations of the subsistence sector, but if it is desired to make the calculation, there is an investment component in the cost of bringing additional land into the subsistence cycle, and this can be calculated roughly as a residual, by taking agricultural department estimates of total new land brought into cultivation (where these are available) and deducting that estimated for cash cropping. Then the cost in labor time of bringing that residual area into cultivable state can be calculated using standard estimates of the labor cost of clearing.

(3) *Construction of productive plant and equipment.* The majority of this type of capital good can be ignored in the non-market accounts, unless a sophisticated internal analysis of the sector is required. For most purposes of national accounting, it is sufficient to treat these goods simply as intermediate goods in the subsistence production process, adequately accounted for in the value of the final goods produced for consumption. It is thus better to ignore the fact that many tools, and small items of productive non-monetary capital last for more than one or two seasons. However, there are exceptions in some of the larger items, such as some fish traps, and fishing boats, whose considerable construction labor costs may lead to the production of income, subsistence or monetary, for many years, and durable goods that produce services that do not appear elsewhere in the accounts, as for example canoes used for personal transportation and pleasure. These can only be included if it is possible to ascertain their number and type, together with changes from year to year, and the labor cost of their construction. It will seldom be worthwhile undertaking special surveys or censuses for these purposes, but where the information has become available in connection with other investigations (as it did in Papua New Guinea) it is sometimes possible to make estimates of this item, based on the labor input for additions to the stock. As with tree crops, replacement should be calculated as a separate item, but not included in the national aggregates.

(4) *Church and mission works.* This is a particularly important item in some parts of the Pacific region, because of the wide range of secular services that have been undertaken by these institutions, many of which are provided to the public without charge, or at a fee that does not cover the full cost. The services

rendered in the field of education and health by churches and missions are very similar, from a national accounting point of view, to those provided by government. To take the non-monetary component into account, it is necessary to follow the procedure already recommended for public investment, and estimate the total amount of labor supplied to the church and mission sector, value this, and deduct the amount paid by church and mission institutions as wages or other inducements.

F. *Clothing, Craft Products, etc.*

This is a very difficult item to include, though it can be quite substantial in some cases. In the more sophisticated Pacific economies, such as that of Fiji, a large part of production under this category has been diverted to the monetary sector, whilst cheaper and more durable manufactured goods from the monetary sector have taken their place in general use in many villages and rural areas. Under these circumstances the subsistence component is not of great importance for national accounting purposes.

However, there are two main sets of circumstances where these items can be important in subsistence sector accounts. First, where high cost or lack of supply of monetary sector goods, or lack of money incomes, make it difficult for people to obtain pots, utensils, clothing, etc., from the monetary sector. Second, where the high cultural significance of certain subsistence goods renders them virtually irreplaceable by monetary sector alternatives, as with Bird of Paradise feathers in Papua New Guinea, or certain articles made of bark cloth required for marriage ceremonies elsewhere in the Pacific. For the latter I can think of no reasonable method of quantification or valuation, and can only suggest omission. For the former, however, problems of valuation (see below) of the traditional items in money terms are such that it is advisable rather to estimate the number of people so provided with clothing or utensils, and to estimate the quantity of roughly equivalent, low-priced items from the monetary sector, which in other areas similar people use to replace the subsistence products when they are able. One completes this exercise, therefore, with an estimate of quantities of a small inventory of household and personal replacement goods by type and quantity.

IV. THE PROBLEM OF VALUATION

Having estimated the quantities of subsistence production, we now come to the difficult and controversial problem of how to value these goods and services in money terms. This involves putting a price on things that strictly speaking have no price, and the problem of what price to use is a tricky one.

The established orthodoxy on this point is that "food and other items produced on own account and consumed [should be] valued at producers' values" [3, p. xiii]. "Producers' values" are defined as "Purchasers' values reduced by the trade and transport charges [margins] in delivering the items from the producers to the purchasers" [3, p. ix]. The reason for this is that the U.N. system

of accounts is designed primarily to measure the total value of goods and services produced, and it is argued that where the goods and services are consumed directly by the producing household, the services of trade and transport are not performed, and therefore their value should not appear in the total of goods and services produced. In a highly monetized economy, where own-account production and consumption are on a relatively small scale, where the choice between consumption or sale of the good or service concerned is deliberate and real, and where this is in any case the basis on which such items appear in income-tax and other accounts from which the national income statistics are derived, there is much to be said for this system of valuation.

Where any particular good or service is exchanged on the market, the price at which this is done does equate, in a quite real sense, the value to the consumer with the cost of the various factors that have gone into its production, marketing, and distribution, plus its scarcity value. However, this is peculiarly a market function, and where production and consumption take place independently of the market, the two aspects of price are not equated. Then, if one *must* impute a money value to such goods and services, there are in effect two valid prices, depending upon which way one looks at the item concerned. One would be the producers' price, as defined above, purporting to measure the value of the factor costs. The other would be the purchasers' price, which the United Nations defines as "the cost in the market of the goods and services on delivery to the purchaser" [3, p. ix] which measures, at least on the margin, what the consumer thinks the good or service is worth to him at that point in space and time.

These two prices will only be equated at the market place. The further the producer is from the market the lower will be the effective producers' price for him, for the costs of transport and marketing have to be deducted from the market price and accounted for separately. Similarly, but with opposite effect, the further the consumer is from the market, the higher will be the effective purchasers' price for him. Therefore, at a distance from the nearest market, and particularly where communications are poor, it makes a great difference whether one looks at the subsistence farmer as producer or as consumer in this way. This is one anomaly.

Another is that market prices vary considerably with the relative scarcity of the good or service concerned, and in countries where distances are great and communications difficult, these variations can be quite large between one market and another. Thus, there are numerous different prices that could be used as the basis for imputing a value to subsistence production and consumption, and there is no absolute sense in which it can be said that any one basis is the "right" one. The most appropriate basis in any one case will depend very largely upon the purpose for which the final estimates are to be used.

If household A is in a remote area and household B close to the city market, if the price of taro in the city market is four cents a lb. and transport from the remote area to the market costs three cents a lb., then (ignoring a small additional marketing margin) the producers' price would be four cents for household

B, and one cent for household A, even though neither may actually buy or sell through the market. To value their *consumption* at these different prices is to undervalue that of A relative to that of B for they both consume the same. On the other hand, to value the *production* of household A at four cents would be to overvalue it in relation to what they *could* get if they did decide to sell some—in other words, the opportunity cost of the decision to consume rather than to sell any one lb. of taro would be only one cent for A but four cents for B. For these reasons, any attempt to compromise with one set of valuations for all purposes in an economy with a large subsistence sector is almost certain to be unsatisfactory in one way or another.

There was one interesting proposal attributed to a group of experts working under the U.N. Economic Commission for Africa, reported by Van Arkadie and Frank in which it was “recommended that subsistence output be valued both at retail and at producer [ex-farm] prices and the difference in value between the two measures be assumed to reflect the value of the services [transportation, processing, etc.] performed on primary output by the household” [4, p. 176]. I personally agree with the suggestion of using these two valuations, though I am less impressed with the rationalizing assumption. It is clear that the valuation at retail prices will be the appropriate measure for the main purposes emphasized in Section I of this article, and I shall proceed on this basis for the rest of this paper. However, it is not asserted that this is necessarily the best measure for *all* national income purposes. There may be a need for estimates based on producers’ prices also; but where this is so, these should be presented in addition to, and not instead of, those based on market prices.

This does not yet provide an answer to the problem of which price from which market should be used for this purpose. In Port Moresby, the capital of Papua New Guinea, prices of subsistence type foods are normally substantially higher than in most other parts of the country. It is also the largest center of monetary employment. These two facts combine to produce a relatively high demand for traditional foods, for which local supply is limited. The high price thus reflects the relative local scarcity of the foods concerned, and makes the monetary cost of any given standard of living in the area higher than elsewhere. It is not uncommon to have a situation where the price of one popular subsistence food may be four cents in Port Moresby, three cents in other large rural centers, and two cents in some of the smaller rural centers, and five cents in some other small centers where that particular food is not widely produced.

In Papua New Guinea, after some considerable debate with myself and others, the statistician decided to use the prices from the smaller rural centers, and to ignore those from Port Moresby and the larger rural centers. He also, quite rightly, decided to ignore prices for any food in one center where that food was not a major item of regular consumption. In the above example, therefore, he would have taken the price of two cents and applied this to the non-market production of that food in total.

This method certainly undervalues the subsistence component relative to

monetary sector incomes in the main towns and larger rural centers. Moreover, as it is in these larger towns and centers that most wage employment takes place, it undervalues subsistence income relative to most wages. However, as local scarcity is so important a factor in producing these higher prices, it is probably even more accurate to say that monetary incomes and money wages have been overvalued in these larger towns and centers, and that the proper means of dealing with this is to apply a cost of living correction when comparing these with rural money wages as well as with subsistence incomes.

On balance, this is the preferred answer, and it is therefore recommended that "market prices" should be taken to be those most widely used throughout those areas of the country where the particular items concerned are commonly produced and consumed, after excluding major towns and centers where chronic shortages occur. This will provide the basis for valuing all the items under the categories *food* and *heating* and *fuel*.

For the categories, *housing*, *public investment*, *private investment*, the quantities have been determined in man-days of labor contributed. The valuation of these items is fairly simple and uncontroversial, and the minimum going money wage in the rural areas can reasonably be applied to all. In the category *housing*, the resultant figure will include the annual cost of depreciation and maintenance, and will not be strictly comparable with the rents of owner-occupied dwellings in the monetary sector accounts. This affects the proper description and placement of the non-market item in the accounts, about which there is room for discussion. There is, of course, no doubt that item should be included somewhere, even if it is added to the item non-monetary private investment. With *public investment*, although it is not possible to separate out the capital maintenance elements, the resultant should be treated, as it is in the monetary sector equivalent, as capital investment. With *private investment* only the value of additions to the capital stock should be included in the aggregate accounts for tree crops and productive plant and equipment, though the value of replacements should be calculated and given in a footnote. For church and mission works, the product of the wage rate and the total man-days contributed must be treated in the same way as *public investment* above.

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