A SURVEY OF FOOD GARDENS IN THE HOSKINS OIL PALM SCHEME

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ABSTRACT

During the period August to October, 1975 a survey of food gardens attached to settler blocks on the Hoskins Oil Palm Scheme (see Figure 1) was conducted. Block ownership was stratified by ethnic origin and 140 food gardens randomly selected for survey. Principal enquiries included total and average garden area by strata, principal crops grown and available fallow periods.

The survey indicated a total planted garden area of 605 hectares on the total of 1,439 blocks or .420 hectares per block. Of this average planted garden area, .402 hectares were traditionally located in the "back blocks" and .018 hectares in "roadside" ancillary blocks (see Figure 2). Areas planted to food gardens suggest the possibility of 6 to 9 year rotation periods for larger blocks and 4 to 6 years for smaller blocks.

Food production is for both home consumption and market, and some correlation is discernible between garden size and family size and between garden size and marketable surplus. It is concluded that this trend toward marketed produce will continue and that further cash cropping can occur on the larger garden blocks but not on the smaller blocks without adversely affecting yields. The lower estimate of average fallow period suggested that taro (Colocasia esculenta) will decline in importance because the fallow is too short to maintain high yields. The areas of the various staples grown by the different ethnic groups reflect their traditional preferences.

INTRODUCTION

The first commercially grown oil palm in Papua New Guinea (*Elaeis guineensis*) was sown on the fertile volcanic soils of the Hoskins area of West New Britain in 1966. The rainfall in the area is approximatelv 3,750 mm/annum of which two thirds falls in January, February and March. Based on a nucleus estate arrangement there were at the time of the survey some 10,000 settlers on 1,439 smallholder blocks in 7 subdivisions around the nucleus estate of 2,497 hectares and processing facility at Mosa (see *Figure 1*).

Several ethnic groups are represented among the smallholders; the major groups being Chimbu, Tolai and Sepik peoples. Minor groups are Morobe, Papuan, West New Britain, New Ireland, North Solomon and Irian Jaya people. Each settler has approximately 6.07 ha of land in his block. In the earlier planted subdivisions, Kapore, Tamba, Sarakolok, Buvussi and Galai, each settler has 3.24 ha (8 acres) of oil palm and approximately 2.83 ha of arable land available for subsistence or market gardens. In the later subdivisions, Kavui and Kavugara, these "back blocks" are only 2.02 ha as the area planted to oil palm has been increased to 4.05 ha (10 acres) (see *Figure 2*). Roadside gardens have been established from the earliest inception of the scheme and are still used because the land has been previously cleared and is close to the home.

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JUSTIFICATION FOR SURVEY

Despite the generation of regular income from a perennial cash crop, scheme settlers continue to place a high degree of importance on the provision of subsistence foods from their own blocks. Unlike the normal village situation where land for subsistence cropping is generally available and fallow periods are extended, scheme settlers must garden in a fixed area of land of 2 to 2.8 ha. Not only has this meant a change in some traditional cropping patterns but it could mean future food production will be limited by soil and plant fertility and the length of crop rotation available.

As a result, concern has been expressed at the lack of definitive knowledge on cropping patterns, food garden areas and rotations on

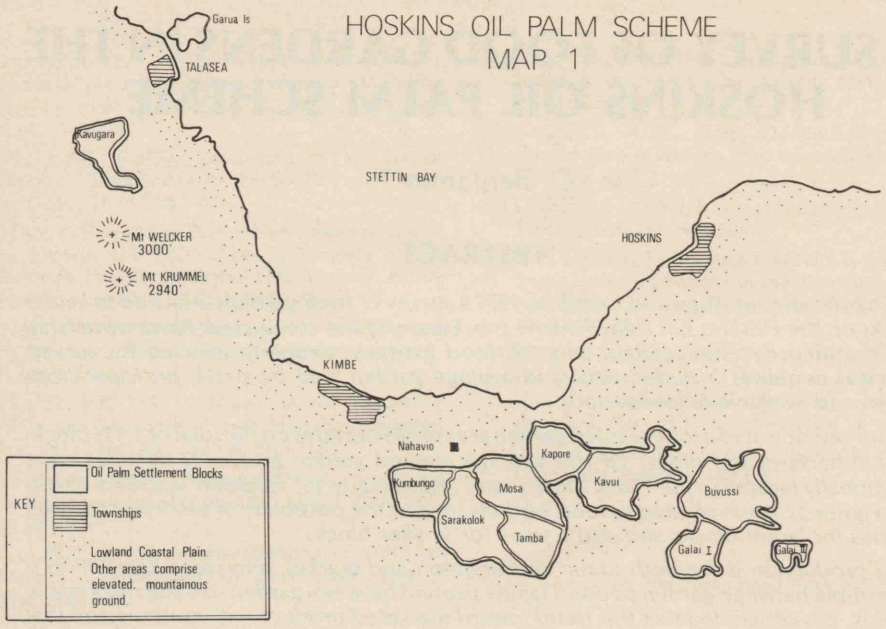

Figure 1.— Hoskins Oil Palm Scheme

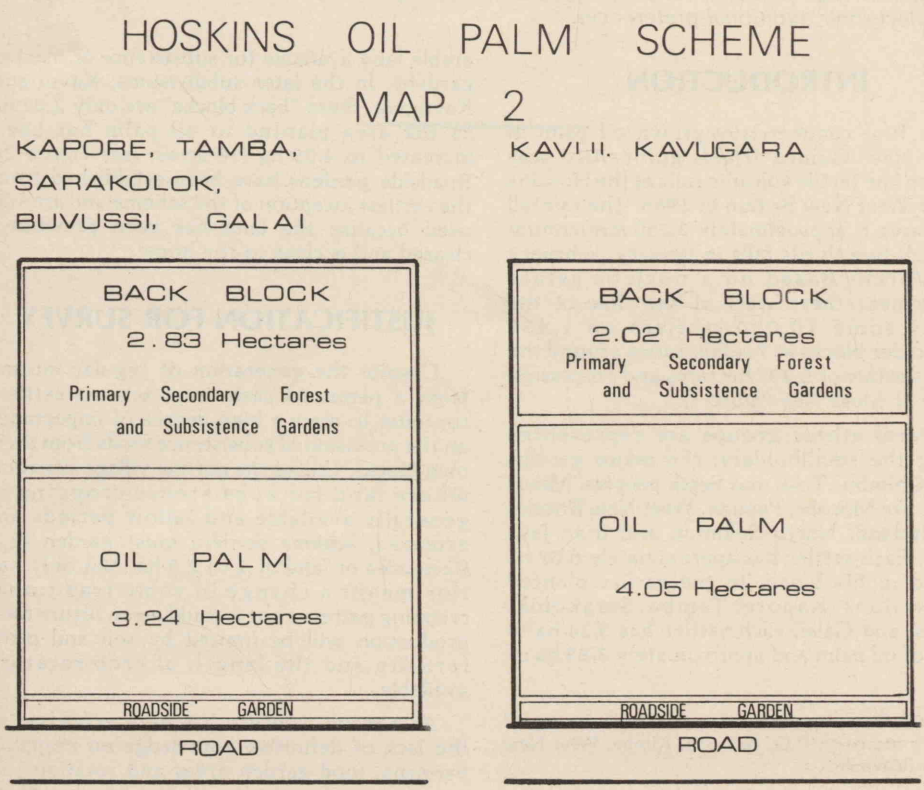

Figure 2.— Hoskins Oil Palm Scheme - block detail

the back blocks. This survey was designed to assist the formulation of recommendations for future land use policies for the back blocks and, in association with a proposed market survey in the area, to assess long-term trends in food production, disposal and consumption patterns.

In 1972 Mr R.M. Bourke conducted a food garden survey in the Hoskins - Talasea area including gardens on the oil palm scheme (Bourke, 1972). The author conducted a survey of gardens on the oil palm scheme in 1974 (Kemp, 1974).

SAMPLING PROCEDURE AND ENQUIRY

The survey was confined to the 1,439 smallholder settler blocks included in the oil palm scheme in January 1975. A further 180 village blocks were excluded from the sample frame as the villagers' gardens were not subjected to the same area restriction as the settlers' gardens. The sampling procedure chosen was a proportional stratified cluster sample resulting in 140 blocks being included in the survey. The distribution of food gardens included in the sample can be seen in *Table 1*. Approximately 10 percent of all blocks in each subdivision were randomly selected and those sub-samples stratified by ethnic origin of the settlers. Again, the results appear in *Table 1*. The primary sampling units were generated by a randon selection of blocks in each subdivision and a second-stage cluster sampling of randomly selected adjacent blocks. These were then visited and surveyed and stratified into ethnic groups. The group entitled "Others" is a mixture of West New Britain, Papuan, North Solomon and New Ireland people.

The number of people resident on the surveyed blocks is recorded and reflects the blockholder, his immediate family and any others, usually relatives or clansmen, who had been living on the block for longer than 3 months and thus could be considered semi-permanent or permanent residents. As *Table 1* indicates, the average number of residents per block was approximately 7.

The prime aim of the survey was to establish the garden area in production at that time and the area planted but not in production in both back block and roadside plots. Physical measurements were taken of garden areas. In addition, several major crops were individually measured for planted area. Plantings of sweet potato (*Ipomoea batatas*) and peanuts (*Arachis hypogea*) were measured accurately, and reliable estimates were obtained. Approximate areas were determined by pacing, for taro (*Colocasia* Spp.), Chinese taro, (*Xanthosoma* Spp.) and yams and mami (*Dioscorea* Spp.). Although these later results are reproduced in *Table 9* and *Figure 6* it is felt that they should be accepted as indicative guides only.

All data presented in *Tables 2* to 9 and *Figures* 3 to 6 are total estimates for the Hoskins Oil Palm Scheme. As additional blocks have been occupied since January, 1975 (1,566 blocks were occupied in November 1976) these results now underestimate total food garden areas on the scheme.

RESULTS AND ANALYSIS

Of the 140 blocks surveyed only 2 settlers had completely abandoned food gardening. All other settlers were engaged to varying degrees of activity, but average garden life from planting to abandonment was consistently recorded as from 1 to 1½ years.

Cropping patterns varied between ethnic groups. Most gardens followed a primary bush fallow rotation. Sweet potato was commonly alternated with peanuts on the same piece of ground before the land was fallowed. Interplanting of crops in gardens of all ethnic groups was common practice. For example, in Chimbu gardens, sweet potato and corn were commonly interplanted as were peanuts and corn; in Sepik gardens, yams and mami were commonly interplanted with taro and/or Chinese taro. Other vegetables commonly recorded in gardens included aibika (*Hibiscus manihot*), tomatoes (*Lycopersicum* spp.), aupa (*Amaranthus tricolor*), karakap (*Solanum nigrum*), pit pit (*Saccharum edule*), pumpkin (*Cucurbita maxima*) and varieties of cabbage (*Brassica* spp.). Some roadside gardens were planted on a grassland fallow or on old abandoned gardens, and the planting of peanuts was common.

For purposes of comparison, total garden area in the back blocks alone has been separated out in *Table 2* and is presented by sub-divisions and ethnic origin of settlers. Of the total back block area of 3,813 ha available for food gardens, 580 ha or 15.2 percent of that area was under crop at the time of the survey. Total roadside garden area available was not measured but actual roadside plantings amounted to 26 ha, an average of 181 sq. metres per block. Total garden areas are given in *Table 3*. *Figure 1* shows total areas under food gardens for back block garden area and roadside garden area. Average garden area sown per year in back blocks and in total, and average garden area sown per person (resident) per block per year are given in *Tables 4* to 6 and Figures 4 and 5. In *Tables 7* to 9 and *Figure 6* measured areas of

TABLE 1. — **SETTLEMENT BLOCKS SURVEYED**

Sub-Division	Date of establish-ment	Total No. of blocks occupied Jan. '75	Total No. of blocks in survey	% Blocks survey	Total No. of people in survey	Total No. of Chimbu blocks	Total No. of Sepik blocks	Total No. of Tolai blocks	Total No. of Morobe blocks	Total No. of "other" blocks
KAPORE	1968	133	14	10.5	114	3	5	5	NIL	1
TAMBA	1968	200	20	10	133	2	7	6	1	4
SARAKOLOK	1969	250	24	9.6	157	4	8	4	5	3
BUVUSSI	1970	366	35	9.6	279	9	20	4	1	1
GALAI	1971	170	15	8.8	105	NIL	7	2	5	1
KAVUI	1972	210	21	10	147	9	4	4	1	3
KAVUGARA	1972	110	11	10	74	6	2	1	1	1
TOTALS		1,439	140	9.7	1,009	33	53	26	14	14

TABLE 2. — **TOTAL GARDEN AREA IN BACK BLOCKS (HECTARES)**

SUB-DIVISION	ETHNIC GROUP					SUB-DIVISION TOTALS
	CHIMBU	SEPIK	TOLAI	MOROBE	OTHERS	
KAPORE	9.38	21.7	20.2	NIL	14.8	66.1
TAMBA	10.5	30.3	26.1	6.3	7.9	81.1
SARAKOLOK	26.1	39.8	10.4	12.8	12.9	102
BUVUSSI	43.7	76.6	7.1	.8	3	131.2
GALAI	NIL	21.1	7.4	30	3.2	61.7
KAVUI	46.9	17.7	12.6	4.5	8.4	90.1
KAVUGARA	22.3	12.4	1.0	8.4	3.3	47.4
TOTALS	158.9	219.6	84.8	62.8	53.5	579.6

TABLE 3. — **TOTAL GARDEN AREA OF BACK BLOCK & ROADSIDE GARDENS (HECTARES)**

SUB-DIVISIONS	ETHNIC GROUP					SUB-DIVISION TOTALS
	CHIMBU	SEPIK	TOLAI	MOROBE	OTHERS	
KAPORE	12.1	22.3	20.2	NIL	14.8	69.4
TAMBA	10.5	30.3	26	6.3	7.9	81
SARAKOLOK	26.1	40	10.6	12.8	15.2	104.7
BUVUSSI	45.6	77.2	7.1	.8	3	133.7
GALAI	NIL	22.6	7.4	32	3.2	65.2
KAVUI	48.1	17.9	14	5.8	10.2	96
KAVUGARA	28.1	12.4	2.6	9	3.3	55.4
TOTALS	170.5	222.7	87.9	66.7	57.6	605.4

TABLE 4. — **AVERAGE GARDEN AREA IN BACK BLOCKS (HECTARES)**

SUB-DIVISION	ETHNIC GROUP					SUB-DIVISION
	CHIMBU	SEPIK	TOLAI	MOROBE	OTHERS	AVERAGE
KAPORE	.304	.421	.392	NIL	1.436	.458
TAMBA	.509	.420	.422	.611	.192	.393
SARAKOLOK	.633	.483	.252	.248	.417	.412
BUVUSSI	.471	.372	.172	.078	.291	.364
GALAI	NIL	.292	.359	.582	.310	.399
KAVUI	.505	.429	.306	.437	.272	.416
KAVUGARA	.361	.601	.097	.815	.320	.418
AVERAGE	.467	.402	.316	.435	.371	.402

TABLE 5. — **AVERAGE OF TOTAL GARDEN AREAS (HECTARES)**

SUB-DIVISION	ETHNIC GROUP					SUB-DIVISION AVERAGE
	CHIMBU	SEPIK	TOLAI	MOROBE	OTHERS	
KAPORE	.391	.433	.392	NIL	1.436	.481
TAMBA	.509	.420	.420	.611	.192	.393
SARAKOLOK	.633	.485	.257	.248	.491	.423
BUVUSSI	.491	.374	.172	.078	.291	.371
GALAI	NIL	.313	.359	.621	.310	.422
KAVUI	.518	.435	.340	.563	.330	.443
KAVUGARA	.454	.602	.252	.873	.320	.489
AVERAGE	.501	.408	.328	.462	.399	.420

TABLE 6. — **AVERAGE GARDEN AREA/PERSON (HECTARES)**

SUB-DIVISION	ETHNIC GROUP					SUB-DIVISION AVERAGE
	CHIMBU	SEPIK	TOLAI	MOROBE	OTHERS	
KAPORE	.058	.045	.052	NIL	.180	.059
TAMBA	.102	.067	.066	.076	.023	.059
SARAKOLOK	.105	.073	.040	.037	.074	.065
BUVUSSI	.054	.049	.029	.026	.017	.047
GALAI	NIL	.047	.038	.094	.039	.060
KAVUI	.081	.072	.045	.043	.052	.063
KAVUGARA	.065	.109	.036	.146	.040	.073
AVERAGE	.070	.056	.047	.069	.050	.058

TABLE 7. — **AREA OF PEANUTS (HECTARES)**

SUB-DIVISION	ETHNIC GROUP					SUB-DIVISION TOTAL
	CHIMBU	SEPIK	TOLAI	MOROBE	OTHERS	
KAPORE	6.3	.1	9.5	NIL	.3	16.2
TAMBA	2.8	.8	.8	NIL	.1	4.5
SARAKOLOK	7.2	.4	2	.1	1.8	11.5
BUVUSSI	13.5	.9	1.1	NIL	NIL	15.5
GALAI	NIL	.9	1.2	.1	NIL	2.2
KAVUI	16.9	.1	.2	1.2	.1	18.5
KAVUGARA	11.2	NIL	.1	NIL	.1	11.4
TOTALS	57.9	3.2	14.9	1.4	2.4	79.8
Average Area (hectares/block)	.17	.006	.056	.010	.016	.055

TABLE 8. — **AREA OF SWEET POTATO (HECTARES)**

SUB-DIVISION	ETHNIC GROUP					SUB-DIVISION TOTAL
	CHIMBU	SEPIK	TOLAI	MOROBE	OTHERS	
KAPORE	2.8	4.7	3.4	NIL	1.1	12
TAMBA	7.2	1.3	.6	1.8	.7	11.6
SARAKOLOK	4.3	2	.7	6.1	9	22.1
BUVUSSI	31.3	12.3	1.8	.4	1.1	46.9
GALAI	NIL	3.2	.7	14.7	.7	19.3
KAVUI	22.2	2	8.1	NIL	5.4	37.7
KAVUGARA	18.0	2.3	NIL	6.2	1.2	27.7
TOTAL	85.8	27.8	15.3	29.2	19.2	177.3
Average Area (hectares/block)	.252	.051	.057	.202	.133	.123

TABLE 9. — **APPROXIMATE AREAS OF CHINESE TARO, TARO AND YAMS/MAMI (HECTARES)**

TYPE OF CROP	ETHNIC GROUP					SUB-DIVISION TOTAL
	CHIMBU	SEPIK	TOLAI	MOROBE	OTHERS	
CHINESE TARO	10.6	58	28.9	12.5	14	124
TARO	4.0	49	11	12.8	10.2	87
YAMS AND MAMI	.15	57	NIL	8.8	3.6	69.6
APPROXIMATE AVERAGE AREAS OF CHINESE TARO, TARO AND YAMS/MAMI (HECTARES/BLOCK)						
CHINESE TARO	.031	.106	.108	.087	.097	.086
TARO	.012	.090	.004	.089	.071	.060
YAMS AND MAMI	.0004	.104	NIL	.061	.025	.048

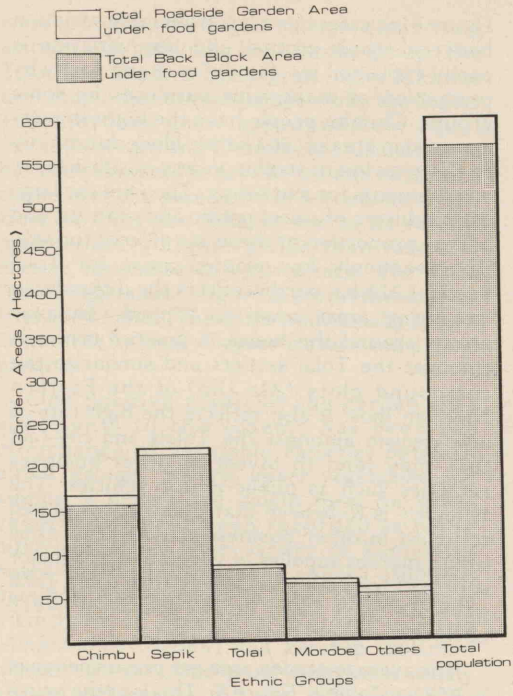

Figure 3.— Total areas under food gardens

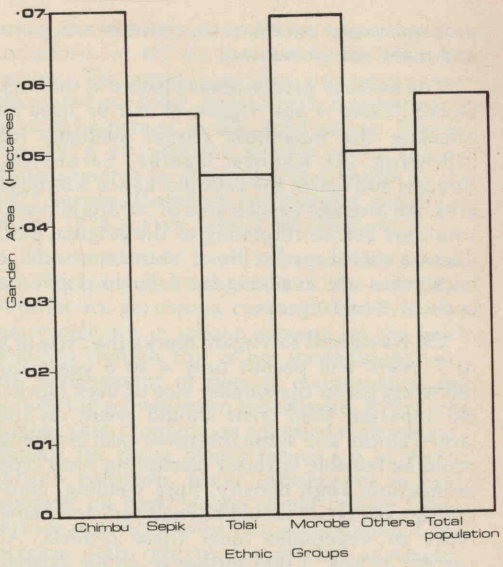

Figure 5.— Average garden area/person

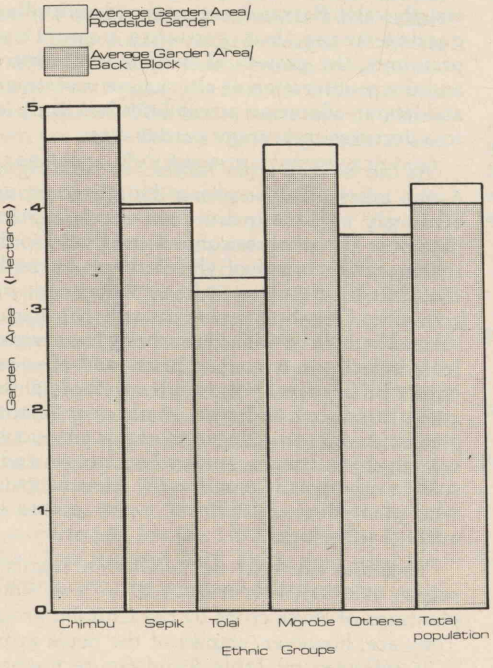

Figure 4.— Average garden area/block (hectares)

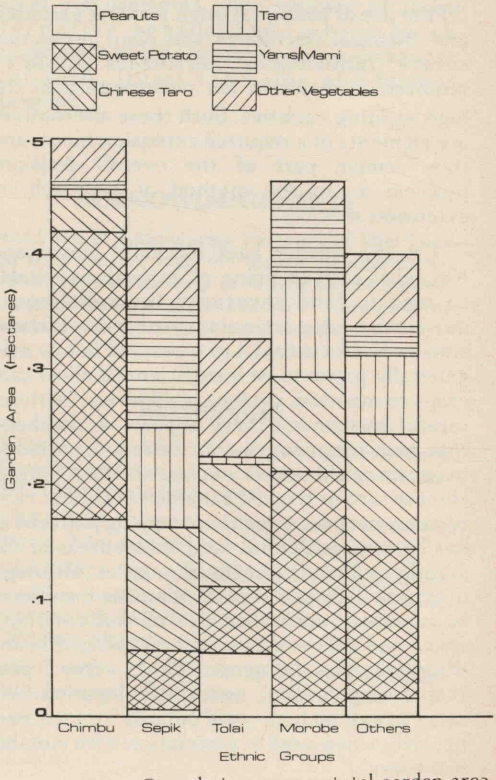

Figure 6.— Cumulative average total garden area by crop type and ethnic group

peanuts, sweet potato, taro, chinese taro, yams and mami are presented.

The average garden areas planted in the back blocks (*Table 4* and *Figure 4*) can be used to calculate the maximum period available for fallowing. At Kapore, Tamba, Sarakolok, Buvussi and Galai, the back blocks are 3.83 ha in area. An average garden area of .402 ha allows 7 rotations before returning to the original plot. Given a useful garden life of 12 to 18 months, 6 to 9 years are available for fallowing given a cycle of 7 to 10 years.

On Kavui and Kavugara blocks the cycle of 5 to 7 years will permit only 4 to 6 years for fallowing given the smaller size of back blocks. No apparent food crisis should result on the larger blocks and some intensive cash cropping could be feasible without disrupting food crop production. High density, high yielding, land-saving cash crops would be required, and many types of vegetables meet these criteria. At current prices, 1,000 birds-eye chillie bushes (*Capiscum frutescens*) occupying only about .10 ha would return a minimum of K120/annum. On the other hand, yields may suffer without either: (a) careful fallow-field management or (b) the use of biological (high yielding varieties) and chemical (fertilizers and plant protection sprays) innovations. Fertilizers would be required to maintain the performance of the high yielding varieties. Both these alternatives are elements of a required extension input, and they remain part of the overall decision-problem as to the method of approach by extension services.

On the smaller back blocks at Kavui and Kavugara cash cropping of any nature is liable to lead to land shortages for subsistence gardening. A particular problem of these smaller blocks is that 4 to 6 years of fallow may generally prove to be insufficient to allow taro crops to maintain current yield levels. Without careful husbandry there appears a likelihood that crops requiring a shorter fallow period to maintain yield levels such as sweet potato, chinese taro or triploid bananas (*Musa* spp.) will become more prominent in cropping patterns as has become evident in land deficit areas of the Gazelle Peninsula (see Bourke, 1976). Although over time it seems remote that this trend may be reversed, controlled use of soil enriching cover and fallow crops such as winged beans (*Psophocarpus tetragonolobus*), cow peas (*Vigna unguiculata*) and other legumes will serve to extend high-yield periods for taro, particularly when used in association with suitable fertilizers.

The average total garden area per block per year is .420 ha including roadside plots. As *Figure 6* indicates there is considerable variation between ethnic groups, and this variation is partly explained by "family" size and partly by production of marketable surpluses by some groups. Chimbu people have the highest average garden area of .501 ha per block due mainly to the growing of food in excess of subsistence requirements for marketing. They are the largest producers of sweet potato and peanuts, and a large proportion of these are offered for sale. The seemingly low planted areas for Tolai people (.328 ha) partly reflects the difficulty in measuring areas sown to triploid bananas grown around the house, a practice common amongst the Tolai settlers and similar to the compound plots (Ala Ulo) of the Eastern Nigerian Ibos. It also reflects the high rate of absenteeism amongst the Tolais and the fact that they tend to invest in other business activities such as public motor vehicles. The tendency is to believe that Tolais are prepared to invest in other business activities and thus utilise market supplies of vegetables as a major source of food supply. Despite this, some Tolai gardens were very large, and they were obviously cropping for a market.

The average garden area per person per year is .058 ha (*Table 6, Figure 5*). This is at the lower end of the range of garden area of .06 to .12 ha per person suggested by Barrau (1954) for this environment. The comparison, however, is not strictly valid. Barrau was concerned with village garden areas, but growing population pressures, the growth of fixed market centres and the proliferation of alternative investment and labour-allocation possibilities has likely led to a decrease in average garden size.

As can be seen from *Tables 7* to 9 and *Figure 6*, the areas of crops grown by ethnic groups strongly reflect individual consumption patterns. The total area of peanuts grown in the scheme at the time of the survey was 80 ha (*Table 7*). Of this area 58 ha or 73 per cent was grown by Chimbu people primarily for market sales. The bulk of Chimbu carbohydrates result from sweet potato consumption, and of a total of 177 ha of sweet potato grown (*Table 8*) this group produced 86 ha or 49 per cent of total plantings. A large proportion of this production remains as internal scheme consumption and is sold to others as is true for the Morobe group who planted over .2 ha of sweet potato on average per block.

Taro and yams are not traditional highland staples and this is reflected in the small plantings of these crops by the Chimbu group. They are, however, staples of the Sepik group as is reflected by *Table 9* and *Figure 6* where average values of .104 ha/block of yams and mami were recorded. Most yams and mami

were grown by the Sepiks though a surprising amount was grown by the Morobe group. The Tolai and Sepik settlers grew more Chinese taro than other ethnic groups while the Sepiks and Morobes grew approximately equal amounts of taro and Chinese taro. Chinese taro has been observed to have become an important staple over the past years of settlement in the Hoskins Oil Palm Scheme due to its ease of maintenance, higher yields than taro and disease resistance to virus attack. The Tolai "other vegetables" (*Figure 6*) are predominantly triploid bananas. The crops traditionally grown in the area by local villagers are taro and diploid bananas.

One positive result of the garden area allotments to the scheme has been the interchange of vegetable varieties between ethnic groups. Several lesser vegetables and kumus (a generalised pidgin term for green vegetables) have been recorded as being interchanged. A wide variety of kumu was noted in all ethnic groups. Aibika (*Hibiscus manihot*) was common to most blocks as was pumpkin (*Cucurbita maxima*), aupa (*Amaranthus tricolor*) and karakap (*Solanum nigrum*). Pit pit (*Saccharum edule*) was widely grown and groups did not differentiate by ethnic group between Chimbu pit pit and the larger lowland varieties. Other integrating patterns existed; all groups grew edible ferns of *Alsophila* Spp., and a traditional Tolai yellow leafed kumu, locally named valagur (*Polyscias grandifolia*), is now widely grown by all ethnic groups for house garden decoration and consumption. The main varieties of beans grown are snake beans (*Vigna unguiculata*) and winged beans (*Psophocarpus tetragonolobus*).

In January, 1976 a cross-check of the data collected above was completed as part of practical field-work requirements by women students of the Vudal Agricultural College, one of Papua New Guinea's tertiary agricultural training institutions. A similar approach was employed and 306 blocks of the oil palm scheme surveyed. The results gained were slightly higher than those of the 1975 survey. The total back block area planted to gardens on the 1,566 blocks in the scheme at that time amounted to 725 ha as compared to 580 ha for 1,439 blocks in the 1975 survey. The total garden area for the 1976 survey for 1,566 blocks was 764 ha as compared to 604 for the 1975 survey for 1,439 blocks. The average back block area used for gardening and the average total garden area came to .468 ha and .489 ha respectively as compared to .402 ha and .420 ha for the 1975 survey. The average garden area/person was calculated out to be .066 ha/person as compared to .058 ha/person in the 1975 survey. During the 1976 survey, 21 people were taking measurements as compared to 2 people in the 1975 survey; therefore enumerator variability of the 1976 survey cannot be overlooked.

The immediate implications of the survey for "back block management" are not clear. Subsistence gardening currently constitutes a major element in labour demand on the block holdings though this is not inconsistent with the achievement of regular maintenance and harvesting schedules on the oil palm. At present further cash cropping on a limited scale appears feasible for those blocks facing a 6 to 9 year garden rotation. Over indulgence in cash cropping on back blocks would reduce fallow periods and necessarily food garden output, but increase cash returns for market purchases. The efficiency of the marketing system will largely determine these trends particularly as local village production is mainly of taros and diploid bananas which do not fully satisfy all market requirements. The efficacy of these alternative approaches to back block management should become a major element in local agricultural extension and farmer education.

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