

AUSTRALIAN AGENCY for INTERNATIONAL DEVELOPMENT

AGRICULTURAL SYSTEMS OF PAPUA NEW GUINEA

Working Paper No. 16

NORTHERN PROVINCE

TEXT SUMMARIES, MAPS, CODE LISTS AND VILLAGE IDENTIFICATION

B.J. Allen, T. Nen, R.L. Hide, R.M. Bourke, D. Fritsch,
R. Grau, P. Hobsbawn, S. Lyon and G. Sem

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THE AUSTRALIAN NATIONAL UNIVERSITY

PAPUA NEW GUINEA DEPARTMENT OF AGRICULTURE AND LIVESTOCK

UNIVERSITY OF PAPUA NEW GUINEA

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Cover Photograph:

The late Gore Gabriel clearing undergrowth from a pandanus nut grove in the Sinasina area, Simbu Province (R.L. Hide).

PREFACE

Acknowledgments

The following organisations have contributed financial support to this project: The Research School of Pacific and Asian Studies, The Australian National University; The Australian Agency for International Development; the Papua New Guinea-Australia Colloquium through the International Development Program of Australian Universities and Colleges and the Papua New Guinea National Research Institute; the Papua New Guinea Department of Agriculture and Livestock; the University of Papua New Guinea; and the National Geographic Society, Washington DC.

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Support and advice have been received from Geoff Humphreys and Harold Brookfield of the Land Management Project, and Gerard Ward (formerly Director), Research School of Pacific and Asian Studies, The Australian National University. Brookfield's (1971) study of Melanesian agricultural systems has been particularly influential.

The Papua New Guinea Agricultural Systems Project was developed from two previous studies. Michael Bourke began mapping Papua New Guinea agricultural systems in the 1970s while a Senior Horticulturalist with the PNG Department of Primary Industry (Bourke 1976). Robin Hide created an annotated bibliography of information on Papua New Guinea agricultural systems while working with the CSIRO PNGRIS group (Hide and Cuddy 1988).

Participants

The following persons participated in the production of this paper:

Papua New Guinea Department of Agriculture and Livestock: Balthasar Wayi and Dr R.D. Ghodake (logistical support).

Department of the Prime Minister: Tom Nen (field mapping, data preparation, writing).

The University of Papua New Guinea Department of Geography: Dr Graham Sem (field mapping, data preparation).

Australian National University: Bryant Allen, Michael Bourke, Robin Hide (conceptualisation, field mapping, data preparation, writing); Robin Grau (GIS management, ARC/INFO, map preparation); Daniel Fritsch (computer programming and database management); Patricia Hobsbawn, Elanna Lowes, Stephen Lyon and Natalie Stuckings (research assistance); Merv Commons (technical assistance).

Field Survey

The main field surveys took place in January 1994 and September 1995. However, in May 1975, 10 days were spent visiting villages east of the Popondetta to Kokoda road between Agenahambo and Waseta as part of a UPNG Geography Department student field trip, and in March 1982 a walking traverse was made between Afore station and Itokama village.

In January 1994, a boat traverse was made from Wanigela along the coast of Collingwood Bay and into Milne Bay Province, with garden observations at Wanigela and Sinapa villages. A flight was made from Pumani mission in Milne Bay Province to Biniguni mission on the border between Milne bay and Northern Provinces.

In 1995, road traverses were made from Popondetta to Kokoda, to Siai village on the Kumusi River, to Gona mission, to Oro Bay, to Afore station and to the Bariji River. Flights were made from Girua airport to Kira station, Ioma station, Asimba village, Tedibedi village, Namudi mission and Safia station. Senior students from villages along the north coast between Ambassa mission and Deboin mission were interviewed at Popondetta High School.

Revised and reprinted version

The Mapping Agricultural Systems Project database was revised in late 1998 (see Introduction to Working Paper Number 1). This working paper was reprinted in 2002. Karen Lummis, Tess McCarthy, Natalie Stuckings, Laura Vallee, Amber Pares and Veerle Vlassak were responsible for the production of the revised paper.

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1. INTRODUCTION

The major purpose of the Papua New Guinea Agricultural Systems Project is to produce information on small holder (subsistence) agriculture at provincial and national levels. Information is collected by field observation, interviews with villagers and reference to published and unpublished documents. The information is entered into a computer database (dBase IV), from where it is transferred to a mapping program (ARC/INFO). Methods are described by Bourke et al. (1993). This paper contains a written summary of the information on the Agricultural Systems in this Province, maps of selected agricultural features, a complete listing of all information in the database in coded form, and lists of villages with National Population Census codes, indexed by Agricultural Systems. This information will eventually be available on disk as a map-linked database suitable for use on a personal computer.

Identification of agricultural systems and subsystems

An Agricultural System is identified when a set of similar agricultural crops and practices occur within a defined area. Six criteria are used to distinguish one system from another:

1. Fallow type (the vegetation which is cleared from a garden site before cultivation).
2. Fallow period (the length of time a garden site is left unused between cultivations).
3. Cultivation intensity (the number of consecutive crops planted before fallow).
4. The staple, or most important, crops.
5. Garden and crop segregation (the extent to which crops are planted in separate gardens; in separate areas within a garden; or are planted sequentially).
6. Soil fertility maintenance techniques (other than natural regrowth fallows).

Where one or more of these factors differs significantly and the differences can be mapped, then a separate system is distinguished.

Where variation occurs, but is not able to be mapped at 1:500 000 scale because the areas in which the variation occurs are too small or are widely dispersed within the larger system, a subsystem is identified. Subsystems within an Agricultural System are allocated a separate record in the database, identified by the Agricultural System number and a subsystem number.

Sago is a widespread staple food in lowland Papua New Guinea. Sago is produced from palms which are not grown in gardens. Most of the criteria above cannot be applied. In this case, systems are differentiated on the basis of the staple crops only.

Relationship to PNGRIS

The Papua New Guinea Resource Information System (PNGRIS) contains information on the natural resources of PNG (Bellamy 1986). However PNGRIS contains no information on agricultural practices, other than an assessment of land use intensity based on air photograph interpretation by Saunders (1993), and ECOPHYS which is concerned with predicted crop performance in a specific environment (Hackett 1988). The Agricultural Systems Project is designed to provide detailed information on agricultural practices and cropping patterns as part of an upgraded PNGRIS geographical information system. For this reason the Agricultural Systems database contains almost no information on the environmental settings of the systems, except for altitude and slope. The layout of the text descriptions, the database code files and the village lists are modelled on PNGRIS formats (Cuddy 1987).

The mapping of Agricultural Systems has been carried out on the same map base and scale as PNGRIS (Tactical Pilotage Charts, 1:500 000). It is also done within the areas of agricultural land use established by Saunders (1993) from aerial photography. Except where specifically noted, Agricultural Systems boundaries have been mapped without reference to PNGRIS Resource Mapping Unit (RMU) boundaries. Agricultural Systems are defined at the level of the Province (following PNGRIS) but their wider distribution is recognised in the database by cross-referencing systems which cross provincial borders.

A preliminary view of the relationships between RMUs and the Agricultural Systems in this Province can be obtained from the listing of villages by Agricultural System, where RMU numbers are appended (Section 6.3).

Note for reprinted edition

Most of the fieldwork for this project was conducted over a six year period (late 1990 to late 1996). Over this period, a number of minor inconsistencies arose in data classification and presentation. As well, some changes occurred in conventions for the text fields and in the definitions of data fields, for example, for seasonality, fencing and burning. These changes were noted in the Preface of the Provincial Working Papers (first editions) as they occurred. One of the more important changes was that the cutoff points for the classification of cash earning activities were applied more consistently. Because of these inconsistencies and changes in definitions, it was necessary to revise the database so that it was consistent for all 19 provinces and to incorporate changes in agriculture systems since the original papers were produced.

Most changes, as distinct from definitional changes, relate to cash income. The revisions were done in late 1998. The largest number of changes occurred in the first four provincial working papers: East Sepik, West Sepik, Western and Gulf Provinces. Papers for the five Island Region provinces required the least number of changes. Agricultural systems that cross provincial boundaries have been adjusted so that the information is identical on both sides of the boundary, apart from some minor differences in some of the text fields. However the notes have not been updated to incorporate new publications since the Working Papers were completed.

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- Smith, T., G. Keig, J. Marks and R. Grau 1992 Summary Results by Environmental Zone from the 1982-3 National Nutrition Survey of Papua New Guinea: Implications for Future Survey Design. Papua New Guinea Institute of Medical Research, Goroka.

2. DATABASE STRUCTURE, DEFINITIONS AND CODES

Information on agricultural systems is stored in a database, one record per agricultural system (or subsystem where identified) and 108 fields per record. This section lists the field *names* and their database abbreviations [NAMES]. Summary descriptions, explanatory notes and variable codes are given for each field.

LOCATION AND IDENTIFICATION

1. Provincial Identification [PROVINCE]: A two digit National Population Census code. Eg. code 14 = East Sepik Province. Provincial codes are listed in Appendix A.1.

2. System Identification [SYSTEMIDNO]: A two digit number identifying the agricultural system within this province. Eg. code 01 = System 01. Numbers are not assigned to systems within a province in any particular order.

3. Agricultural System [AGSYST]: Systems are also identified by a unique Papua New Guinea-wide four digit number. The first two digits are the National Population Census provincial code and the second two digits are the system identification number. Eg. 1401 = System 01 in the East Sepik Province.

4. Agricultural Subsystem [SUSBSYSIDNO]: Subsystems are identified by a single digit. When referred to in the text they are preceded by the agricultural system number and a hyphen. Eg. 1418-1 is Subsystem 1 of System 1418.

5. Number of Subsystems [NUMSUBSYS]: A single digit specifying the number of subsystems that occur within this System.

6. District [DISTRICT]: The 1990 National Population Census code for the District within which the System is located. More than one District may be listed. District codes are listed in Appendix A.2.

7. Census Divisions [CENSUSDIV]: The 1980 National Population Census code for the Census Divisions that occur within the System. Census Division codes for this Province are listed in Appendix A.2.

ENVIRONMENTAL

8. Lowest Altitude [ALTLOW]: The lowest altitude, in metres (rounded), to which the System extends.

9. Highest Altitude [ALTHIGH]: The highest altitude, in metres (rounded), to which the System extends.

10. Garden Slope [SLOPE]: The average slope of gardens in the System.

1	Flat	(<2°)
2	Gentle	(2-10°)
3	Steep	(10-25°)
4	Very steep	(>25°)
5	Multiple classes	

11. Survey Description [SURVDESC]: A text description of the areas visited or not visited within the system, the length of time spent in different areas, traverses undertaken, the mode of transport used, the month and year of the survey, and the sources of any documentary information used.

12. Summary Description [SYSSUMM]: A concise text description of the agricultural system, and subsystems (if any), focussed on the occurrence of the major distinguishing criteria.

13. System Boundary Definitions [BOUNDDEF]: A brief description of how the boundaries between systems were identified and mapped. The boundaries between agricultural and non-agricultural land use were taken from Saunders (1993).

14. Systems Crossing Provincial Borders [OTHPROV]: A logical field (yes/no) which indicates whether the System crosses a provincial border.

15. Same System in Adjacent Province [PROVSYS]: A listing of AGSYST numbers (see Field 3 above) of up to two systems in adjacent provinces which are identical to this system, for systems which cross provincial borders.

16. Subsystem Extent [SUBSYSEXT]: An estimate of the proportion of the area of the total system occupied by a subsystem. In the case of there being no subsystems this field is listed as 100 per cent.

1	25 per cent
2	50 per cent
3	75 per cent
4	100 per cent

17. Type of Fallow Vegetation Cleared [FALLTYPE]: The predominant type of vegetation cleared from garden sites at the beginning of a new period of cultivation. Where short fallows are used (see Field 18 below), fallow type refers to the vegetation cleared after a long fallow.

1	Short grass (<i>eg. kunai</i> < 1.5 m tall)
2	Tall grass (<i>eg. Miscanthus</i> or <i>Saccharum</i> > 1.5 m tall)
3	Grass and woody regrowth (<i>dense short or tall grass and short woody regrowth</i>)
4	Short woody regrowth (<i>shrubs/trees</i> < 10 m tall)
5	Tall woody regrowth (<i>trees</i> > 10 m tall)
6	Forest (<i>no indication of previous use</i>)
7	No long fallow
8	Savanna (<i>Scattered woody growth with grass ground cover</i>)

18. Use of Short Fallows [SHORTFALL]: A presence and significance measure which indicates whether short fallows are used. Short fallows are brief periods of less than 12 months between plantings during which land is left fallow.

19. The Long Fallow Period [FALLPER]: An estimate of the length of time (greater than 12 months) land is left to revert to regrowth, before it is cultivated again. Class 0 refers to situations where very long cropping intervals (40 plantings or more) make long fallows not significant.

0	Not significant
1	1 to 4 years
2	5 to 15 years
3	Greater than 15 years

20. Cropping Intensity [CROPINT]: The number of times staple crops are planted in the main gardens before those gardens are returned to a long fallow. Short fallows of less than 12 months (see Field 18 above) are excluded for this purpose: they may occur between plantings without affecting the classification. The class 'More than 40 plantings', refers to situations where land has been planted continuously without a long fallow since the Pacific War (1942-45) or longer. In such cases Field 19, Long Fallow Period, is classed as 'Long fallow period not significant'.

1	1 planting only
2	2 plantings
3	3 to 5 plantings
4	6 to 14 plantings
5	15 to 40 plantings
6	More than 40 plantings

CROP COMPONENTS

21. The Dominant Staple Crops [DOMSTAP]: The most important staple food crops grown in the subsystem. A major staple is defined as a crop estimated to cover more than one-third of staple garden area, and therefore no more than 3 dominant staples may be identified for a system. An important exception occurs when sago is the staple. Sago is extracted from palms which are not cultivated in gardens. In the text accounts (System Summaries and Notes), dominant staples are described as the '*most important crops*'.

22. The Subdominant Staple Crops [SUBSTAP]: Staple food crops of lesser importance grown in the subsystem. A subdominant staple is defined as a crop estimated to cover more than 10 per cent of a staple garden area; up to six crops may be listed. An important exception occurs when sago is the staple. Sago is extracted from palms which are not cultivated in gardens. In the text accounts (System Summaries and Notes), subdominant staples are described as '*important crops*'.

23. All Staple Crops [ALLSTAP]: A list of up to 10 staple crops including crops classed as dominant and subdominant, as well as other staple crops which occur commonly. In the text accounts (System Summaries and Notes), staple crops which are classified as neither dominant nor subdominant are described as '*other crops*'.

01	Mixed staple (no dominant staple: a mix of some or all of: banana, taro, sweet potato Chinese taro, yam, cassava and corn)		
02	Banana (<i>Musa cvs</i>)	13	Taro (<i>Colocasia esculenta</i>)
03	Breadfruit (<i>Artocarpus altilis</i>)	14	Yam (<i>Dioscorea alata</i>)
04	Cassava (<i>Manihot esculenta</i>)	15	Yam (<i>Dioscorea esculenta</i>)
05	Chinese taro (<i>Xanthosoma sagittifolium</i>)	16	Yam (<i>Dioscorea pentaphylla</i>)
06	Coconut (<i>Cocos nucifera</i>)	17	Other
07	Corn (<i>Zea mays</i>)	18	Queensland arrowroot (<i>Canna edulis</i>)
08	Potato (<i>Solanum tuberosum</i>)		
09	Sago (<i>Metroxylon sagu</i>)	19	Taro (<i>Amorphophallus</i>)
10	Swamp taro (<i>Cyrtosperma chamissonis</i>)		(<i>Amorphophallus paeoniifolius</i>)
11	Sweet potato (<i>Ipomoea batatas</i>)	20	Yam (<i>Dioscorea bulbifera</i>)
12	Taro (<i>Alocasia macrorrhiza</i>)	21	Yam (<i>Dioscorea nummularia</i>)

24. Other Vegetable Crops [VEG]: A list of up to 10 important vegetable crops:

01	Aibika (<i>Abelmoschus manihot</i>)	22	Rungia (<i>Rungia klossii</i>)
02	Amaranthus (<i>Amaranthus</i> spp.)	23	Tulip (<i>Gnetum gnemon</i>)
03	Bean, common (<i>Phaseolus vulgaris</i>)	24	Valangur (<i>Polyscias</i> spp.)
04	Bean, lablab (<i>Lablab purpureus</i>)	25	Balbal (<i>Erythrina variegata</i>)
05	Bean, winged (<i>Psophocarpus tetragonolobus</i>)	26	Bamboo shoots
06	Cabbage (<i>Brassica oleracea</i> var. <i>capitata</i>)	27	Bean, snake (<i>Vigna unguiculata</i>)
07	Chinese cabbage (<i>Brassica chinensis</i>)	28	Spring onion (<i>Allium cepa</i> var. <i>cepa</i>)
08	Choko tips (<i>Sechium edule</i>)	29	Sweet potato leaves (<i>Ipomoea batatas</i>)
09	Corn (<i>Zea mays</i>)	30	Taro leaves (<i>Colocasia esculenta</i>)
10	Cucumber (<i>Cucumis sativus</i>)	31	Watercress (<i>Nasturtium officinale</i>)
11	Ferns	32	Other
12	Ginger (<i>Zingiber officinale</i>)	33	Bean, lima (<i>Phaseolus lunatus</i>)
13	Highland pitpit (<i>Setaria palmifolia</i>)	34	Bottle gourd (<i>Lagenaria siceraria</i>)
14	Kangkong (<i>Ipomoea aquatica</i>)	35	Dicliptera (<i>Dicliptera papuana</i>)
15	Kumu musong (<i>Ficus copiosa</i>)	36	Kalava (<i>Ormocarpum orientale</i>)
16	Lowland pitpit (<i>Saccharum edule</i>)	37	Karakap (<i>Solanum nodiflorum</i>)
17	Nasturtium (<i>Nasturtium</i> spp.)	38	Basil (<i>Ocimum basilicum</i>)
18	Oenanthe (<i>Oenanthe javanica</i>)	39	Bean leaves (<i>Phaseolus</i> spp.)
19	Peanuts (<i>Arachis hypogaea</i>)	40	Cassava leaves (<i>Manihot esculenta</i>)
20	Pumpkin fruit (<i>Cucurbita moschata</i>)	41	Chilli leaves (<i>Capsicum frutescens</i>)
21	Pumpkin tips (<i>Cucurbita moschata</i>)	42	Eggplant (<i>Solanum melongena</i>)
		43	Pigeon pea (<i>Cajanus cajan</i>)
		44	Tomato (<i>Lycopersicon esculentum</i>)

25. Fruit Crops [FRUIT]: A list of up to 8 important fruits grown:

01	Avocado (<i>Persea americana</i>)	21	Granadilla (<i>Passiflora quadrangularis</i>)
02	Banana (<i>Musa cvs</i>)	22	Grapefruit (<i>Citrus paradisi</i>)
03	Bukabuk (<i>Burckella obovata</i>)	23	Guava (<i>Psidium guajava</i>)
04	Coastal pandanus (<i>Pandanus tectorius</i>)	24	Lemon (<i>Citrus limon</i>)
05	Malay apple (<i>Syzygium malaccense</i>)	25	Lime (<i>Citrus aurantifolia</i>)
06	Mandarin (<i>Citrus reticulata</i>)	26	Parartocarpus (<i>Parartocarpus venenosa</i>)
07	Mango (<i>Mangifera indica</i>)	27	Pomelo (<i>Citrus maxima</i>)
08	Marita pandanus (<i>Pandanus conoideus</i>)	28	Pouteria (<i>Pouteria maclayana</i>)
09	Orange (<i>Citrus sinensis</i>)	29	Raspberry (<i>Rubus</i> spp.)
10	Passionfruit, banana (<i>Passiflora mollissima</i>)	30	Soursop (<i>Annona muricata</i>)
11	Passionfruit, other (<i>Passiflora</i> spp.)	31	Tree tomato (<i>Cyphomandra betacea</i>)
12	Pawpaw (<i>Carica papaya</i>)	32	Watery rose apple (<i>Syzygium aqueum</i>)
13	Pineapple (<i>Ananas comosus</i>)	33	Governor's plum (<i>Flacourtia indica</i>)
14	Rambutan (<i>Nephelium lappaceum</i>)	34	Lovi-lovi (<i>Flacourtia inermis</i>)
15	Sugar (<i>Saccharum officinarum</i>)	35	Mon (<i>Dracontomelon dao</i>)
16	Ton (<i>Pometia pinnata</i>)	36	Rukam (<i>Flacourtia rukam</i>)
17	Watermelon (<i>Citrullus lanatus</i>)	37	Ficus (<i>Ficus</i> spp.)
18	Other		
19	Custard apple (<i>Annona squamosa</i>)		
20	Golden apple (<i>Spondias cytherea</i>)		

26. Nut Crops [NUT]: A list of up to 5 important nuts grown or collected:

01	Breadfruit (<i>Artocarpus altilis</i>)	09	Karuka, wild (<i>Pandanus brosimos</i>)
02	Candle nut (<i>Aleurites moluccana</i>)	10	Okari (<i>T. kaernbachii</i> / <i>T. impediens</i>)
03	Castanopsis (<i>Castanopsis acuminatissima</i>)	11	Sis (<i>Pangium edule</i>)
04	Coconut (<i>Cocos nucifera</i>)	12	Pao (<i>Barringtonia</i> spp.)
05	Finschia (<i>Finschia chloroxantha</i>)	13	Tulip (<i>Gnetum gnemon</i>)
06	Galip (<i>Canarium indicum</i>)	14	Other
07	Java almond (<i>Terminalia catappa</i>)	15	Polynesian chestnut (<i>Inocarpus fagifer</i>)
08	Karuka, planted (<i>Pandanus julianettii</i>)	16	Cycad (<i>Cycas</i> spp.)
		17	Entada (<i>Entada scandens</i>)
		18	Dausia (<i>Terminalia megalocarpa</i>)

27. Narcotic Crops [NARC]: A list of up to 5 important narcotics grown:

1	Betel nut, highland (<i>Areca macrocalyx</i>)
2	Betel nut, lowland (<i>Areca catechu</i>)
3	Betel pepper, highland (<i>Piper gibbilimum</i>)
4	Betel pepper, lowland (<i>Piper betle</i>)
5	Tobacco (<i>Nicotiana tabacum</i>)
6	Kava (<i>Piper methysticum</i>)

FORMS OF GARDEN AND CROP SEGREGATION

28. Garden Segregation [GARDSEG]: A presence and significance measure of whether individual staple food crops are planted in different gardens. A garden is a contiguous area of land planted with crops under the management of a social unit such as a family or a household. If some gardens are sited in different vegetation zones, and have different fallow periods, cultivation periods or other agronomic characteristics, then they are assigned to a separate subsystem.

All presence and significance measures are coded as follows:

0	None
1	Minor or insignificant
2	Significant
3	Very significant

29. Crop Segregation [CROPSEG]: A presence and significance measure of whether individual staple food crops are planted separately in different parts of the same garden.

30. Crop Sequences [CROPSEQU]: A presence and significance measure of whether the harvesting of one crop species is usually followed by the planting of another, eg. yams followed by sweet potato, or sweet potato followed by peanuts followed by sweet potato (see also Field 33 below).

31. Mixed Vegetable Gardens [MIXGARD]: A presence and significance measure of whether mixed gardens are used. A mixed garden is typically a garden which is subsidiary to that containing the main staple(s). It is planted with a wide range of either subdominant staples and/or other vegetables. It may or may not be distinguished from the main garden types by different fallow and agronomic techniques.

32. Household Gardens [HOUSGARD]: A presence and significance measure of whether house gardens are used. A house garden is typically a garden that is small relative to the main gardens, is located near houses, and which contains a variety of crops. Also known as door yard or kitchen gardens.

SOIL FERTILITY MAINTENANCE TECHNIQUES

33. *Legume Rotation* [LEGUMROT]: A presence and significance measure of whether a leguminous crop (eg. peanuts or winged bean) is grown between plantings of main food crops.

34. *Planted Tree Fallow* [TREEFALL]: A presence and significance measure of whether tree species (eg. *Casuarina oligodon* or *Parasponia* spp.) are planted into gardens or fallows for the stated purpose of improving soil quality during subsequent cultivations. This measure excludes the practice of planting fruit tree species into gardens and fallows, but does not exclude the planted trees being used for timber or firewood.

35. *The Use of Compost* [COMPOST]: A presence and significance measure of whether organic matter is placed beneath the surface of the soil.

36. *The Use of Animal Manure* [MANURE]: A presence and significance measure of whether animal manure is placed on or in the soil. The measure does not include the deposition of manure by the animals themselves, eg. pigs tethered in gardens.

37. *The Use of Island Beds*: [ISLBED]: A presence and significance measure of whether island beds are used. Island beds are beds of soil on which crops are planted and which are raised above the level of a surrounding area of standing or slowly moving water.

38. *The Contribution of Silt from Flooding* [SILT]: A presence and significance measure of whether silt from floods is deposited either regularly or sporadically on the soil surface in gardens. It is assumed the flooding is of natural causes, but the measure does not exclude deliberate manipulation of stream channels in order to enhance the delivery of silt or for the partial control of flood waters.

39. *The Use of Inorganic Fertiliser* [FERT]: A presence and significance measure of whether inorganic fertiliser is applied to gardens. This measure excludes the use of inorganic fertiliser on cash crops, such as coffee or vegetables.

OTHER AGRICULTURAL PRACTICES

40. *The Placing of Pigs in Gardens* [PIGSIN]: A presence and significance measure of whether pigs are placed in gardens between plantings. Pigs may be placed in gardens between plantings for a number of stated reasons, eg. to eat earthworms, to eat unharvested crops, or to till the soil. This measure excludes the deliberate breaking of fences to allow pigs to forage after the cropping phase.

41. *Burning* [BURN]: A presence and significance measure of whether fallow vegetation cleared and cut in a new garden site is burnt before the planting of the staple crops. The measure includes the burning of material which has been heaped. Significance takes into account the frequency of burning relative to the cropping intensity. So, for example, if the majority of the fallow material cleared from the site is burnt at the initial clearing of a garden, and only one or two plantings are made before fallowing, burning is Very Significant. If the same thing occurs at clearing, but a large number of plantings are made before the next long fallow, with little or no burning between plantings, burning is Minor.

42. Soil Tillage [TILL]: A presence and significance measure of whether soil in the staple food gardens is tilled before planting. Tillage includes the breaking up, or turning over, of the whole or the major part of the soil on the garden surface. The measure includes tillage in either the first planting and/or subsequent plantings. The formation of soil mounds and beds (see Fields 53-58 below) involves working the soil into a tilth, but in order to distinguish clearly between these processes, mounds and beds are not automatically classified as soil tillage.

43. The Use of Deep Holing [HOLE]: A presence and significance measure of whether deep holing is used. Deep holing is sometimes used in yam cultivation in order to influence the dimensions and shape of the tubers. Deep (> 50 cm) holes are dug, the soil is broken into a fine tilth and the hole re-filled before planting. The use of this technique is usually restricted to the cultivation of *Dioscorea alata*.

44. Cutting Fallow Vegetation Onto the Crops [FALLCUT]: A presence and significance measure of whether crops are planted beneath standing fallow vegetation, and the vegetation is later cut down onto the growing crops.

45. The Use of Fences [FENCE]: A presence and significance measure of whether gardens are fenced. Fences are linear barriers made of wood, bamboo, cane grass or stones, and may incorporate a ditch or a bank. The measure excludes low ridges which form between fields when stones are thrown to the perimeter during cultivation. In the assessment of the significance of fences, the occurrence of fences around every individual garden is given greater significance than one fence around a large number of gardens.

46. The Use of Irrigation [IRRIG]: A presence and significance measure of whether water is applied to crops by the use of channels or aqueducts.

47. The Use of Mulch [MULCH]: A presence and significance measure of whether a mulch is used to cultivate the staple crops. A mulch is organic material which is applied to the soil surface. If the material is placed beneath the soil surface it is defined as a compost (see Field 35 above).

48. The Seasonality of Main Crops [SEASMAJ]: A presence and significance measure of whether the dominant staples (most important food crops) and the subdominant staples (important food crops) are planted at about the same time each year.

49. The Seasonality of Other Crops [SEASMIN]: A presence and significance measure of whether other staple crops and vegetable crops are planted at about the same time each year.

50. The Use of Drains [DRAIN]: A presence and significance measure of whether ditches are used in and around gardens to remove surface water or to lower the groundwater table.

51. The Use of Soil Retention Barriers [SOILRET]: A presence and significance measure of whether structures (pegged logs, fences or hurdles, stone walls) are constructed along the contour or below individual plants, in order to prevent or reduce the down slope movement of soil.

52. The Use of Staking [STAKE]: A presence and significance measure of whether crops are trained or tied up stakes, trellises or standing dead trees to lift them off the soil surface. The practice is usually applied to yams (*Dioscorea* spp.), beans, sugarcane, and sometimes gourds, cucumber and choko.

MOUNDING TECHNIQUES

In many parts of Papua New Guinea the soil is formed into circular mounds of varying dimensions and crops are planted on them. Mounding should not be confused with composting (see Field 35 above). Mounds may or may not contain compost and composting may take place in the absence of mounds. Mounds are usually re-formed at each new planting. Mound formation usually involves extensive soil disturbance. The effect can be similar to complete soil tillage (see Field 42 above).

The following fields contain presence and significance measures of whether mounds of the specified dimensions are used in the system.

53. *Very Small Mounds* [VSMOUND]: Mounds up to 10 cm high.

54. *Small Mounds* [SMOUND]: Mounds 10 to 40 cm high.

55. *Medium Sized Mounds* [MOUND]: Mounds 40-70 cm high and between 1 m and 2.5 m in diameter.

56. *Large Mounds* [LRGEMOUND]: Mounds > 70 cm high and > 2.5 m in diameter.

GARDEN BED TECHNIQUES

In some locations the soil is also raised into beds and crops planted on them. Bed formation usually involves extensive soil disturbance. The effect can be similar to complete soil tillage (see Field 42 above). Two shapes of beds are distinguishable:

57. *Square Beds* [BEDSQ]: Square beds are constructed by digging shallow ditches typically 2 to 4 metres apart on a grid layout, and throwing the soil removed onto the surface to form a bed. The outcome is a characteristic chequerboard or gridiron pattern in gardens.

58. *Long Beds* [BEDLONG]: Long beds are constructed by digging shallow ditches down slope typically 2 to 4 metres apart and over 10 metres in length, and throwing the soil removed to the centre to form a bed.

59. *Mechanical Soil Tillage* [MECHAN]: The use of tractors or hand-held cultivators in the preparation of a garden site for food crops. The measure includes the use of machinery in the cultivation of crops for sale.

CASH EARNING ACTIVITIES

A presence and significance measure of the importance of the following common rural cash income sources. The list includes sources related to agricultural or land based production from the farmers' own resources.

60. *Animal Products* [ANSKIN]: The sale of animal skins, furs and bird plumes, but not fresh meat.

61. *Betel Nut* [BETEL]: The sale of betel nuts (*Areca catechu* or *A. macrocalyx*) and associated items like pepper and lime.

62. *Cardamom* [CARDAM]: The sale of cardamom (*Elettaria cardamomum*).

63. *Cattle* [CATTLE]: The sale of cattle as live beasts or as fresh meat.

- 64. Chillies [CHILLIE]:** The sale of dried chillies (*Capsicum frutescens*).
- 65. Cocoa [COCOA]:** The sale of cocoa (*Theobroma cacao*) beans.
- 66. Copra [CNUT]:** The sale of copra and nuts from coconut palms (*Cocos nucifera*).
- 67. Arabica Coffee [COFFARAB]:** The sale of Arabica coffee (*Coffea arabica*).
- 68. Robusta Coffee [COFFROB]:** The sale of Robusta coffee (*Coffea canephora*).
- 69. Crocodile Products [CROC]:** The sale of freshwater and saltwater crocodile (*Crocodylus* spp.) skins or meat, from managed and wild animals.
- 70. Firewood [FIREWOOD]:** The sale of firewood.
- 71. Fish [FISH]:** The sale of fresh or smoked freshwater or saltwater fish, shellfish or crustacea.
- 72. Fresh Food: [FOOD]:** The sale of fresh vegetables, fruits, nuts and fresh or smoked meat from domesticated or wild animals.
- 73. Oil Palm [OILPALM]:** The sale of palm oil fruit (*Elaeis guineensis*).
- 74. Potato [POTATO]:** The sale of Irish potatoes (*Solanum tuberosum*).
- 75. Pyrethrum [PYRETH]:** The sale of dried pyrethrum flowers (*Chrysanthemum cinerariaefolium*).
- 76. Rice [RICE]:** The sale of rice (*Oryza sativa*).
- 77. Rubber [RUBB]:** The sale of latex from rubber trees (*Hevea brasiliensis*).
- 78. Sheep and Wool [SHEEP]:** The sale of sheep as live animals, or meat and the sale of wool.
- 79. Tea [TEA]:** The sale of unprocessed tea (*Camellia sinensis*).
- 80. Tobacco [TOBACCO]:** The sale of the dried tobacco leaf (*Nicotiana tabacum*).
- 81-82. Other [OTHER1] [OTHER2]:** Other unlisted sources of cash include the sale of copal gum (*Agathis* sp.), massoi bark (*Massoia aromatica*), tigasso oil (*Camptosperma* sp.), salt extracted from plants or natural springs and deposits, mineral oil, bêche-de-mer, insects and butterflies, live birds, marsupials, pigs and horses, house building materials including thatching and sheets of woven cane, canoe hulls, clothing, weapons, string bags, carvings and artefacts. This category excludes other sources of cash income such as wages and salaries, logging or mining royalties, gold mining, banditry, gambling and remittances. These are mentioned in Notes (Field 83) if they are important.
- 83. Further Notes [NOTES]:** Additional notes on particularly outstanding features of the system and further information drawn from published and unpublished documents.

SURVEY DETAILS

Fields **84-101** contain details of dates when observations were made of the system for the purposes of this project and the names of the persons who made the observations. Up to three survey visits can be accommodated. The field names are:

Month of a short visit [SVDATMON]: Eg. 01 = January.

Year of a short visit [SVDATYR]: Eg. 1992.

Period of a longer term study [SVPERYRA]: Eg. 1971-72.

Person making the visit [SURVNAME]: Initials of person(s). Full names are given in a Key on the relevant page in Section 5.

The type of survey [SURVTYPE]

1	Very brief visit to one place (less than an hour), or interviews
2	Short visit to a few places (less than 1 day)
3	Visits to several places (1 to 3 days)
4	Multiple visits to many places (4 to 15 days)
5	Multiple visits to many locations over several years (more than 15 days)

102. Information From the National Nutrition Survey 1982-83 [NNS]: The National Nutrition Survey 1982/83, selected families in villages across most of the country from a sampling frame based on environments drawn from PNGRIS classifications. Amongst other questions, people were asked what foods they had eaten during the previous day (NNS 1982/3). For systems in which more than 10 families were interviewed, responses for particular foods are presented as percentages of the total number of families interviewed. Results are presented only for staple foods, fresh fish and purchased rice. The entry includes the number of families and number of villages surveyed, and the month and year of survey.

This information is more than 10 years old and is independent of the information collected by the Agricultural Systems Project. It should be used carefully (Smith et al. 1992). In some Systems the sample size is small and villages sampled may be restricted to one part of the System. It is possible that Chinese taro (*Xanthosoma sagittifolium*) has been included in the general term 'taro', increasing the importance of taro (*Colocasia esculenta*) and decreasing the importance of Chinese taro. Where diets change seasonally, the results may also be unrepresentative.

103. Main References [REF]: References to published and unpublished documents that contain substantial information on agriculture in the System.

104. Other References [REF2]: References to published and unpublished documents that contain additional information directly relevant to the Agricultural System.

105. The Area of the System [AREA]: The area, in square kilometres, occupied by the System. The figure is calculated by the mapping program ARC/INFO.

106. Total Resident Population 1980 [TOTPOP]: The total population resident within the area covered by the System at the time of the 1980 National Population Census. The 1990 National Population Census figures are not used because of questions over their reliability, but the 1990 National Population Census maps are used to locate most Census Units.

107. The Number of People Living Outside the System [ABSPOPPER]: An estimate of the proportion of the population absent from villages in the system in 1978-79, expressed as a percentage of the total population. The figure is the difference between the 'total' population and the 'resident' population listed in the 1978-79 Provincial Data System (PDS) Rural Community Register for the Province. The 'total' population is the total number of persons listed in the Village Book and the 'resident' population the number living in the village, or who have been absent for less than 6 months at the time of the census. In some cases 'total' and 'resident' populations in the PDS are the same.

108. The Population Density [POPDEN]: The number of persons per square kilometre in 1980, calculated by dividing Field 106 (total population) by Field 105 (area). There are two situations where adjusted figures are given (indicated by "*"). In some systems sago is the staple food and there is little or no agriculture or subsistence is based completely on non-agricultural activities (eg. fishing or trading) and no agricultural land use can be identified. For these systems the area has been adjusted to include a 5 kilometre buffer strip around the system boundary, or centred on settlements where no land use is identified. The 5 kilometre buffer zone is assumed to be the area of non-agricultural land, usually forest, in which wild plants and animals are exploited. In the latter case, settlements are identified with point symbols. The second kind of adjustment occurs where the populations of two adjoining systems, both of which use both systems, are unequally distributed in the two system areas due to the locations of the census units. In such cases, adjusted population density figures are shown (for example, Milne Bay Province Systems 0501 and 0502), with explanations in Notes (Field 83).

109. The Intensity of Land Use [RVALUE]: The R value (Ruthenberg 1980, 15) is an estimate of the intensity of land use, derived from the ratio of the Cropping Period in years to the length of the cultivation cycle in years. Cropping Period is estimated from the number of plantings of the staple crops before a long fallow (see Field 20 above). The cultivation cycle is the sum of the Cropping Period and the Long Fallow Period (see Field 19 above). The R value is thus:

$$\frac{\text{Cropping Period} \times 100}{\text{Cropping Period} + \text{Long Fallow Period}}$$

Because in this survey both the cropping period and the long fallow period are described as classes, conversion of the class ranges to single year values is necessary in order to calculate R values. The following conversions are used for most crops:

Cropping period	Years	Long fallow period	Years
1 planting only	1	Not used	0
2 plantings	2	1-4 years	3
3-5 plantings	4	5-15 years	10
6-14 plantings	10	>15 years	20
>14 plantings	20		

Triploid banana or Chinese taro may produce for several years from a single planting. In systems in which these crops are dominant staples or subdominant staples with significant land use, the cropping period is adjusted upwards. The adjustment is based on estimates of how long these crops produce from a single planting before a long fallow. Where there is evidence of a cropping period without a long fallow of longer than 20 years, the cropping period is adjusted upwards, to a maximum of 50 years.

3. AGRICULTURAL SYSTEMS: TEXT SUMMARIES

Text summaries take two forms: those for the first or only subsystem in an Agricultural System, and those for subsequent subsystems.

1. The headers on text summaries for the first or only subsystem in an Agricultural System are as follows:

PROVINCE 15 West Sepik	AGRICULTURAL SYSTEM No. 1 Subsystem No 1 of 1	
Districts 4 Telefomin	Subsystem Extent 100%	Area (sq km) 1259
Population 8,530	Population Density 7 persons/sq km	Population absent 7%

This header contains information in the top right hand corner on the number of subsystems descriptions which follow.

This header also contains information for the *whole* Agricultural System on Districts, area, population, population density and absenteeism.

2. Headers on text summaries of subsequent subsystems are as follows:

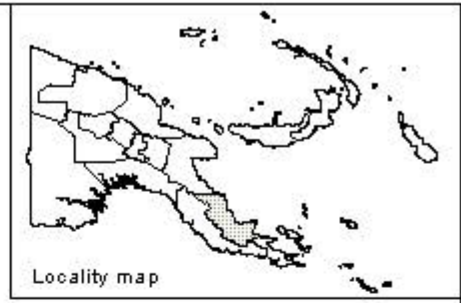
PROVINCE 15 West Sepik	AGRICULTURAL SYSTEM No. 3	Subsystem No 2 of 2
Districts 4 Telefomin	Subsystem Extent 25 %	

They contain information on Districts and subsystem extent only.

Headers on second and subsequent pages of summaries are as follows:

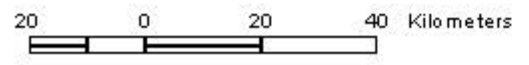
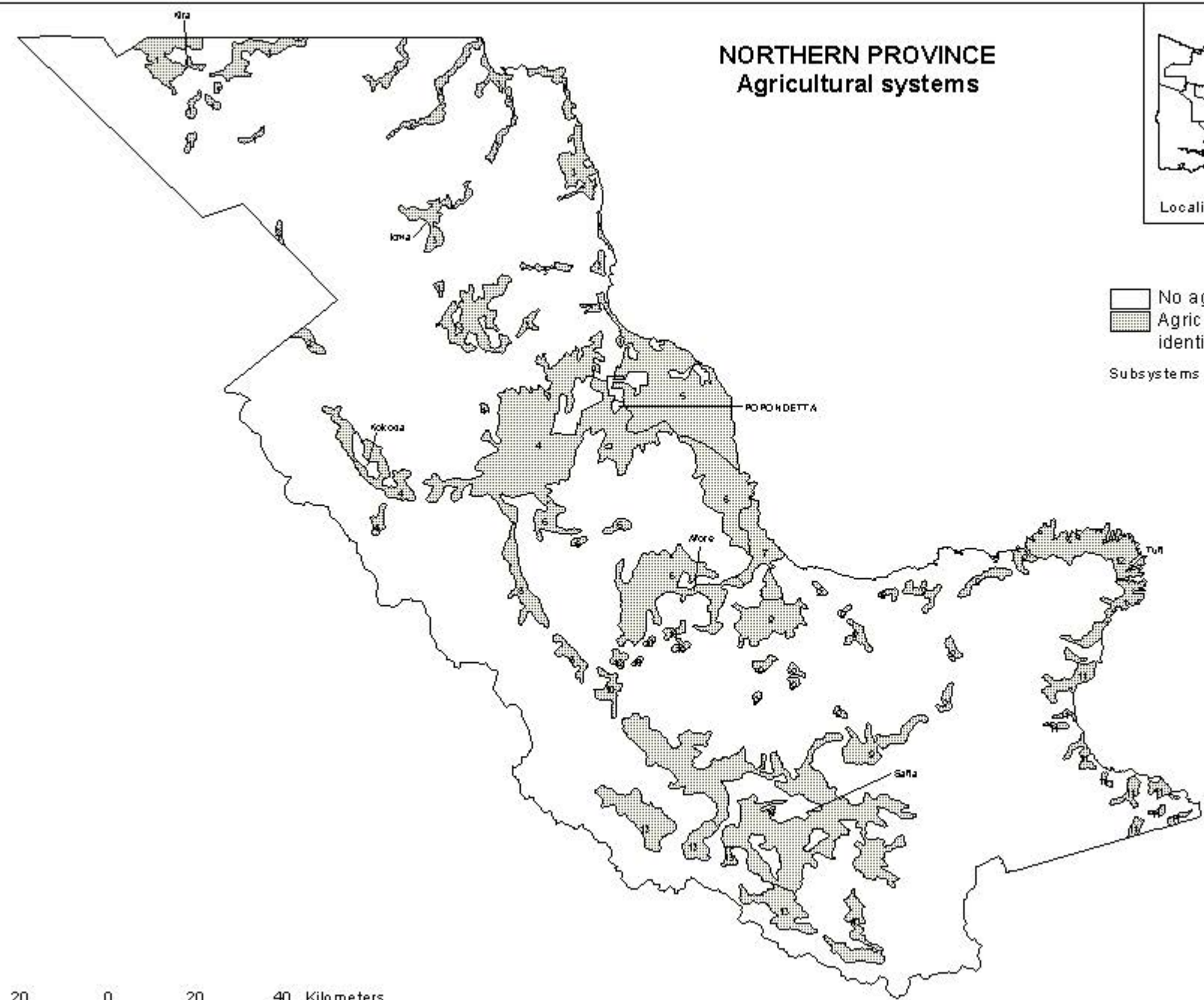
PROVINCE 15 West Sepik	AGRICULTURAL SYSTEM No. 1	Subsystem No 1 of 1
-------------------------------	----------------------------------	----------------------------

NORTHERN PROVINCE Agricultural systems



- No agriculture
- Agricultural system identified by number

Subsystems are present in System 5



Districts 2 Popondetta
Population 2,032

Subsystem Extent 100 %
Population density 11 persons/sq km

Area (sq km) 190
Population absent 24 %

System Summary

Located in the middle Waria River Valley, east of Mt Nelson, in steep hill country, and extending into Morobe Province. Tall woody regrowth fallows, more than 15 years old, are cleared and burnt. Sweet potato is the most important crop; taro is an important crop; other crops are Chinese taro, banana, cassava and sago. Taro is planted between August and October, but sweet potato is planted at any time of the year. Taro, sweet potato and Chinese taro are planted in separate gardens. Only one planting is made before a long fallow. Sweet potato is planted in small mounds.

Extends across provincial border to System(s) 1239

Altitude range (m) 500-1100 **Slope** Steep (10-25 degrees)

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Taro (Colocasia)
STAPLES PRESENT	Banana, Cassava, Chinese taro, Sago, Sweet potato, Taro (Colocasia)
OTHER VEGETABLES	Aibika, Amaranthus spp., Bean (common), Bean (winged), Corn, Cucumber, Highland pitpit, Lowland pitpit, Peanuts, Pumpkin tips
FRUITS	Avocado, Malay apple, Mandarin, Marita pandanus, Pineapple, Sugarcane, Watermelon, Guava
NUTS	Coconut, Karuka (wild), Okari
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	>15 years
CROPPING PERIOD	1 planting
R VALUE	5 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	Very significant
CROP SEGREGATION	Minor
CROP SEQUENCES	None
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	None

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Animal skins	Minor
2 Fresh food	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Very significant
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	None
STAKING OF CROPS	None
FALLOW CUT ONTO CROPS	Minor
SEASONAL MAIN CROPS	Minor
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION**Survey description**

In October 1991, a flight from Wau to Sim airstrip in System 1235 in the upper Waria Valley in Morobe Province with garden observations near Sim (1 hour); a flight from Sim to Timangosa mission in System 1235, east of Garaina station, with garden observations at Timangosa (2 hours). In September 1995, a flight from Girua airport to Kira station in Northern Province, with garden observations in the vicinity of Kira (1 day).

Boundary definition

The boundary with System 1225 was determined following visits to the lower Waria River area. The boundary with System 1235 is based on an aerial traverse down the Waria Valley from Sim to Timanigosa villages, with interviews at the latter place about where the boundary lay between the 'yam growers' of System 1235 and 'taro growers' of this system. The boundary with System 0602/0305 was determined by fieldwork in the Goilala area of Central Province and at Asimba village in Northern Province; and that with System 0603/1240 by fieldwork at Ioma station and interviews at Popondetta High School with students from the Deboin mission and Ambasi mission areas, in Northern Province.

Notes

This system is distinguished from System 1225 where fallow periods are shorter and both sweet potato and taro are the most important crops; from System 1235 where two plantings are made before fallowing and yam (*D. alata*) is an important crop; from System 0602/0305 where banana and Chinese taro are important crops; and from System 0603/1240 where banana and taro are important crops and two plantings are made before fallowing.

The Upper Waria Valley downstream from Kipu airstrip is steep and rugged hill country. Most settlement is located on benches some hundred of metres above the rivers. Immediately to the west of Kira station, Mt Nelson rises to 3540 m. In the late 1800s and early 1900s, this area was the site of a major gold rush and thousands of foreign miners walked up the Waria River to the headwaters. Gold mining remains a major source of cash income in the area.

Fallow vegetation is a mixture of tall woody and short woody regrowth, but tall woody fallows predominate at present. Older people say that short woody regrowth is becoming more common. Fallows to be planted in sweet potato or taro are felled and burnt. Chinese taro is planted beneath standing trees and the trees are felled onto the crop two or three months after planting.

Taro planting is completed before sweet potato is planted. Taro gardens are large and usually on steep slopes. They are laid out in blocks with sticks, but no attempt is made to restrict soil movement down slope. Taro is interplanted with widely spaced banana, beans, corn, aibika, amaranthus, Chinese cabbage, winged bean, lowland pitpit and highland pitpit. Taro gardens are cleared and planted in August-October every year and taro is harvested in January-May.

Sweet potato gardens are made after all taro planting has been completed. They are located on similar land to taro gardens, and also on small alluvial river flats. Sweet potato is interplanted with banana. Highland pitpit and lowland pitpit, cassava, corn, pumpkin, watermelon, spring onion, choko, peanuts and ginger are interplanted in separate sections of sweet potato gardens. Choko has only been planted since about 1980. Sweet potato gardens are made at any time of the year and sweet potato is eaten all year round. In the main hillside gardens, only one planting of sweet potato is made before fallowing. However on the alluvial flats, two plantings of sweet potato are commonly made before fallowing.

Chinese taro is grown in separate gardens. The fallow vegetation is not burnt for these gardens. Undergrowth is cleaned away and Chinese taro planted beneath standing trees. After about two or three months, the trees are cut down on top of the growing crop.

Sago grows in the valley bottoms and is eaten in June-September, a period when taro is not available. Coconuts are planted in villages and along the sides of streams in valley bottoms where they produce better.

Fruit trees are grown in the villages and can also be seen on old village sites, planted at a time when settlements were smaller, more numerous and more scattered. The most important fruit trees are marita pandanus, guava and Malay apple. Lemon, mandarin, orange and avocado are also grown. Mango does not bear fruit at Kira, just over 1000 m above sea level. Two varieties of okari nut are grown. They are said to have been introduced from the coast. People also harvest wild karuka pandanus growing on the slopes of Mt Nelson. The main karuka season is said to be August to October.

Notes continued

This area is isolated from main centres. In 1995 it was served by a weekly flight en route from Popondetta to Nadzab. The most important source of cash is alluvial gold mining. The sale of fresh food at Kira and Garaina stations, and of animal skins and bird plumes, are minor sources of income. Arabica coffee was planted during the 1970s, but it was not being harvested in 1995.

National Nutrition Survey 1982/83

No villages from this system were included in the survey.

Main References

None.

Other References

Haantjens, H.A., S.J. Paterson, B.W. Taylor, R.O. Slatyer, G.A. Stewart and P. Green 1964 General report on lands of the Buna-Kokoda area, Territory of Papua and New Guinea. Land Research Series No. 10, Commonwealth Scientific and Industrial Research Organization, Melbourne.

Nelson, H.N. 1976 Black, White and Gold: Goldmining in Papua New Guinea 1878-1930. Canberra, Australian National University Press.

Districts 1 Kokoda
Population 168

Subsystem Extent 100 %
Population density 7 persons/sq km

Area (sq km) 23
Population absent 8 %

System Summary

Located in the Owen Stanley Mountains north and east of Bereina station, in the lower headwaters of the Kunimaipa, Angabanga and Vanapa Rivers and extending into the northern headwaters of the Mambare Valley in Northern Province. Tall woody regrowth fallows, 15-25 years old, are cleared, burnt and fenced. The most important crop is sweet potato; important crops are banana, taro and Chinese taro; other crops are cassava and yam (*D. esculenta* and *D. alata*). Sweet potato is planted on small mounds. Only one planting is made before a long fallow. Chinese taro is planted around the edges of gardens.

Extends across provincial border to System(s) 0305

Altitude range (m) 100-1400

Slope Very steep (>25 degrees)

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Banana, Chinese taro, Taro (<i>Colocasia</i>)
STAPLES PRESENT	Banana, Cassava, Chinese taro, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>)
OTHER VEGETABLES	Aibika, Amaranthus spp., Bean (winged), Choko tips, Corn, Kumu musong, Lowland pitpit, Pumpkin tips, Tulip, Bean (snake)
FRUITS	Mandarin, Mango, Marita pandanus, Pawpaw, Pineapple, Sugarcane, Watermelon, Soursop
NUTS	Breadfruit, Coconut, Okari, Tulip
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	>15 years
CROPPING PERIOD	1 planting
R VALUE	5 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	Minor
CROP SEGREGATION	Significant
CROP SEQUENCES	None
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	None

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Betel nut	Significant
2 Fresh food	Significant
3 Coffee Arabica	Minor
4 Rubber	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Very significant
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Very significant
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	None
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION**Survey description**

In August 1995, a road traverse from the Port Moresby-Bereina highway to Kubuna mission in Central Province (1 day). In September 1995, a visit was made by aircraft to Asimba village in Northern Province (1 day). The Kosipe and Yongei mission areas were not visited.

Boundary definition

The boundary with Systems 0301 and 0302 is taken to be the southern edge of the Owen Stanley Mountains. The boundary with System 0304 was determined on a road traverse from Bereina station to Kubuna mission. The boundaries with Systems 0306 and 0307 were determined by walking traverses from Guari station to Tapini station, from Kerau mission to Tapini and from aerial observations between Waitape station, Kerau, Tapini, Guari, and Fane mission. These were extrapolated on the basis of Saunder's (1993) map of regrowth vegetation. The boundary with System 0309 was determined on a road traverse from Bereina station to Kubuna mission, and extrapolated along the 100 m contour. The boundaries with Systems 0311 and 0312 were determined by road traverses on the Bereina to Port Moresby highway. The boundary with System 0314 was determined by fieldwork at Kagi and Manumu villages. This system was distinguished from System 0601/1239 after field visits in the Kira area. The boundary with System 0603/1240 was determined by fieldwork near Ioma station; that with System 0604 by a road traverse between Popondetta and Kokoda station and aerial observations between Kokoda and Asimba village.

Notes

Most of this system is located in Central Province. It is distinguished from Systems 0301, 0302 and 0312 where banana is a most important crop; from Systems 0304 and 0309 where fallow vegetation is shorter and banana is the most important crop; from Systems 0306 and 0307 where fallow periods and fallow vegetation are shorter; from Systems 0311 where banana is a most important crop, and fallow periods and fallow vegetation are shorter; and from System 0314 where yam (*D. alata*) is an important crop. This system is very similar to Systems 0601/1239 and 0603/1240. Chinese taro and banana are more important crops here than in System 0601/1239; and two plantings are made before land is fallowed in System 0603/1240. It is distinguished from System 0604 where fallow vegetation is short woody regrowth and fallow periods are shorter.

This is a low intensity shifting cultivation system. Fallows are 15-25 years old and only one planting is made before a long fallow. Sweet potato is interplanted with other crops, mainly taro, banana and cassava. Yams (mostly *D. esculenta*) are grown in separate gardens, but are of minor importance as food. They are grown on stakes and are planted seasonally.

This system is located in the lower altitude valleys in the Owen Stanley Mountains (100-1400 m). The people occupying the system are Kuni speakers in the southwest and Fuyughe speakers in the northeast, known generally by outsiders as 'Goilala'. They have important trade and cultural links with people in the more intensive Goilala mountain systems. They previously acted as middle-men between the lower altitude areas and the mountainous inland. The Kuni were particularly closely associated with the Fuyughe in the eastern Goilala area.

Between 1953 and 1959, over 5000 coffee trees were planted in the area north of Bakoiudu mission, but marketing and transport difficulties caused the development to fail (Gostin 1986, 21). Around 1962, the priest at Bakoiudu mission persuaded about 1300 people to move from their scattered villages and to resettle on 16,000 ha of unoccupied land near Bakoiudu, and to plant rubber as a cash crop (Gostin 1986). Numerous social and economic difficulties have caused many people to return to their old land. They use their settlement blocks only as a source of cash, by periodically tapping rubber. Sales of betel nut and fresh food are the main sources of cash income. Rubber, Arabica and Robusta coffee, tobacco and animal skins are minor sources of income.

National Nutrition Survey 1982/83

No villages from this system were included in the survey.

Main References

None.

Other References

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Districts 2 Popondetta
Population 8,255

Subsystem Extent 100 %
Population density 18 persons/sq km

Area (sq km) 449
Population absent 23 %

System Summary

Located on the almost flat alluvial flood plains of the Mambare, Opi and Kumusi Rivers and extending into Morobe Province on the lower Waria River. Gardens are mainly sited along rivers. Tall woody regrowth fallows, more than 15 years old, are cleared and burnt. Sweet potato is the most important crop; important crops are taro and banana; other crops are yam (*D. alata* and *D. esculenta*), Chinese taro, cassava, rice and sago. Sweet potato, taro and yam are planted in separate gardens. Two plantings are made before a long fallow. Sweet potato is planted after taro and yam have been harvested. Banana is interplanted with taro and sweet potato. Sweet potato is grown on small mounds only where land is poorly drained. Yams are grown on stakes. Rice is grown for domestic consumption only.

Extends across provincial border to System(s) 1240

Altitude range (m) 0-100 **Slope** Flat (<2 degrees)

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Banana, Taro (<i>Colocasia</i>)
STAPLES PRESENT	Banana, Cassava, Chinese taro, Sago, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>), Rice
OTHER VEGETABLES	Aibika, Amaranthus spp., Corn, Cucumber, Kumu musong, Lowland pitpit, Peanuts, Pumpkin tips, Tulip, Bean (snake)
FRUITS	Mango, Marita pandanus, Orange, Pawpaw, Pineapple, Sugarcane, Watermelon
NUTS	Breadfruit, Coconut, Galip, Okari
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	>15 years
CROPPING PERIOD	2 plantings
R VALUE	9 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	Very significant
CROP SEGREGATION	None
CROP SEQUENCES	Minor
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	None

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	Minor
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Betel nut	Minor
2 Fish	Minor
3 Fresh food	Minor
4 Oil Palm	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Significant
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Very significant
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	Minor
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION**Survey description**

In September 1995, a road traverse from Agenahembo village to Siai village on the Kumusi River and to Sagere village, with garden inspections at Siai and Sagere (1 day); a visit by air to Ioma station from Popondetta; garden inspections and interviews at Iaudari village (1 day); interviews with students at Popondetta High School from Deboin mission and Embasi mission.

Boundary definition

The boundary with System 1225 was determined on the basis of the extension of the Waria River flood plain in Morobe Province. The boundary with System 1239/0601 was determined by fieldwork at Kira station, and with System 0602/0305 by fieldwork at Asimba village and in Central Province. The boundary with System 0604 was determined by a road traverse from Agenahambo village to the Kumusi River at Siai village, and to Sagere village; and that with System 0605 by fieldwork in the vicinity of Ioma station and a road traverse from Popondetta to Gona mission.

Notes

This system is distinguished from System 1225 where fallow periods are shorter and both sweet potato and taro are the most important crops. The system is very similar to System 1239/0601, and Northern Province Systems 0602/0305 and 0604. It distinguished from System 1239/0601 where only one planting is made before a long fallow and banana is not as important; from System 0602 where only one planting is made before a long fallow and Chinese taro is an important crop; and from System 0604 where the fallow vegetation is short woody regrowth, fallow periods are shorter and Chinese taro is an important crop. It is distinguished from System 0605 where some gardens are made after short grass fallows.

This system is located on low lying and poorly drained alluvial plains. Some parts of the system are flooded from time to time. Most gardens and settlements are located along rivers and people travel to gardens by canoe. Only in the western part of the system are gardens made on slightly higher, dissected fans. Most land on the plains is flooded every year in November-April and is not used for agriculture.

The system is occupied by Orokaiva people, culturally similar to those people who use System 0604 and with whom they have very close relationships.

Tall woody regrowth is felled and burnt. Clearing of gardens takes place throughout the year, particularly when dry spells offer an opportunity. However, slightly more gardens are made at the end of the dry season in August-October, than at other times (Waddell and Krinks 1968, 81-86). All gardens are fenced against pigs. Separate gardens are made for taro, sweet potato and yam (*D. esculenta* and *D. alata*). Not everyone plants yam every year. Sweet potato is a second planting in all gardens. Banana is planted at low densities in first plantings and the density is increased in second plantings.

Taro is mainly planted in September-November and is harvested in April-May. By the middle of the year, little taro is available for eating. This was previously a period when food was scarce. It was a time when breadfruit, sago and yams (stored from a late wet season harvest) were important. Taro remains culturally the most important crop, but people freely acknowledge that the second cropping of sweet potato makes it the more important nutritionally. The adoption of sweet potato and Chinese taro have also reduced the severity of food shortages.

The adoption of a second planting of sweet potato as a regular practice and the introduction of Chinese taro has occurred within the last 70 years. When the then Government Anthropologist F.E. Williams (1928; 1930) carried out his study of the Orokaiva in the 1920s, he found taro to be the most important crop, with sweet potato, banana and yam important. Williams, who seems to have made garden observations in this system on the Kumusi, Opi and Mambare Rivers, specifically observed that only one crop was planted before a long fallow, a practice he found 'primitive and wasteful' (Williams 1930, 42). Williams did not record Chinese taro in the gardens he observed.

Sago becomes an increasingly important food towards the lower parts of the main rivers. Everywhere it is a supplementary food and, prior to the adoption of sweet potato and Chinese taro, was more important as an end of dry season food.

Both species of yam are staked. Yam is a high status food, commonly used in feasts and exchanges. Feast are important in maintaining political alliances (Newton 1985, 92). Sweet potato is grown on small mounds in poorly drained areas, but is dibbled on higher ground.

Notes continued

People in the western part of the system have access to wild karuka pandanus growing at higher altitudes on the Otava and Ajule Kajale Ranges. River fishing is an important source of protein, hunting less so.

This area has a long history of contact and conflict with the outside world, relative to other inland parts of Papua New Guinea. In 1897 the people living in this system tried to prevent gold miners travelling from the coast up the Kumusi River to the Yodda goldfields, just north of Kokoda station, from crossing their territory (Nelson 1976).

In the early 1900s, villagers were required by the colonial government to plant cocoa, coffee, cotton, rubber, tobacco, rice and oil palm as cash crops in communal plantations (Crocombe 1964), but this compulsion failed to produce a smallholder cash economy (Miles 1956, 319-323).

In 1942, the Japanese Army occupied the area and serious fighting occurred with Australian and American forces until January 1943. In 1951, Mt Lamington erupted, killing over 4000 people. Direct damage and deaths were restricted to System 0604 but flooding and siltation caused damage to gardens within the area draining Mt Lamington, south and east of the Kumusi River.

North and west of the Kumusi River, there is no road connection to Popondetta or the port at Oro Bay. A road associated with smallholder oil palm development runs from near Agenahambo village to the Kumusi River at Siai village. South and east of the river, large areas of tall woody regrowth are being cleared, burnt and planted in oil palm, with sweet potato and banana being cultivated for two years after the initial clearing. The oil palm is then left to mature. In most of this system, oil palm is still immature and is not yet providing cash incomes. Much of this area was logged over in the 1980s and the oil palm development is upgrading existing logging roads. Villagers say an important motivation for the development of village oil palm is the provision of all weather roads to their villages.

In the Ioma area, villagers have been recently provided with rice processing equipment by their local Member of Parliament, and are growing rice for domestic consumption. There is no road to Ioma station. Minor amounts of fresh food, betel nut and fish are sold in Popondetta and at Ioma station. Small quantities of animal skins and firewood are also sold in some parts of the system.

National Nutrition Survey 1982/83

196 families from 15 villages were asked in March, April or June 1983 what they had eaten the previous day. 79 per cent reported eating taro, 66 per cent sweet potato, 45 per cent banana, 43 per cent coconut, 25 per cent sago, 18 per cent cassava, 5 per cent yam and 1 per cent Chinese taro. 22 per cent reported eating rice. 44 per cent reported eating fresh fish. This is similar to the crop pattern, except for the higher than expected consumption of taro and sago. The rice reported as being consumed here was almost certainly purchased rice.

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Other References continued

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Williams, F.E. 1928 Orokaiva Magic. London, Oxford University Press.

Districts 2 Popondetta
Population 18,435

Subsystem Extent 100 %
Population density 22 persons/sq km

Area (sq km) 839
Population absent 17 %

System Summary

Located between Kokoda station in the west to Girua airport in the east, in the Kumusi Valley and the lower slopes of Mt Lamington. Short woody regrowth fallows, 5-15 years old, are cleared and burnt. Sweet potato is the most important crop; taro and Chinese taro are important crops; other crops are cassava, yam (*D. esculenta* and *D. alata*), banana and sago. Taro and sweet potato are planted in separate gardens. Yam may also be planted in a separate garden or in a section of a garden, separate from taro and sweet potato. Two plantings are made before a long fallow, with either sweet potato or taro in the first year. Only sweet potato is planted in the second year. Sweet potato is planted on small mounds. Gardens are fenced.

Extends across provincial border to System(s) None

Altitude range (m) 100-800 **Slope** Gentle (2-10 degrees)

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Chinese taro, Taro (<i>Colocasia</i>)
STAPLES PRESENT	Banana, Cassava, Chinese taro, Sago, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>)
OTHER VEGETABLES	Aibika, <i>Amaranthus</i> spp., Corn, Cucumber, Kumu musong, Lowland pitpit, Peanuts, Pumpkin tips, Tulip, Bean (snake)
FRUITS	Mango, Malay apple, Marita pandanus, Orange, Pawpaw, Pineapple, Sugarcane, Watermelon
NUTS	Breadfruit, Coconut, Galip, Okari
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Short woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	5-15 years
CROPPING PERIOD	2 plantings
R VALUE	17 (low)

GARDEN SEGREGATION

GARDEN SEGREGATION	Very significant
CROP SEGREGATION	Minor
CROP SEQUENCES	Minor
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	None

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Oil Palm	Very significant
2 Fresh food	Significant
3 Betel nut	Minor
4 Cocoa	Minor
5 Firewood	Minor
6 Tobacco	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Very significant
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Significant
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	Minor
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION**Survey description**

In March 1982, a road traverse between Popondetta and Kokoda, with garden visits (1 day). In September 1995, a road traverse from Agenahembo village to Siai village on the Kumusi River and to Sagere village, with garden inspections at Siai and Sagere villages (1 day); a road traverse from Popondetta to Kokoda station with garden inspections en route at Kamondo, Hojaki, Waseta, Agenahembo and Huvivi villages (1 day); a road traverse from Waseta village to Urarituru village, with garden inspections en route at Sivepe and Isoge villages (half day); a flight from Tedibedi mission to Kokoda and from Kokoda to Girua airport. Road traverses from Popondetta to Oro Bay, Gona mission and Barisari village (3 days).

Boundary definition

The boundary with System 0602/0305 was determined by a road traverse between Popondetta and Kokoda station and aerial observations on a flight from Kokoda to Asimba village. The boundary with System 0603/1240 was determined on a road traverse from Agenahembo village to Siai village, on the Kumusi River, and to Sagere village; that with Systems 0605 and 0606 by road traverses from Popondetta to Kokoda station and to Gona mission and Oro Bay; that with System 0607 on a road traverse from Popondetta to Afore station; and that with System 0608 by fieldwork at Tedebedi mission and aerial observations between Tedibedi mission and Kokoda station.

Notes

This system is distinguished from System 0602/0305 where only one planting is made before a long fallow and fallow vegetation is taller; and from 0603/1240 where fallow vegetation is tall woody regrowth, more than 15 years old. It is distinguished from System 0605, where fallow vegetation is tall woody regrowth or short grass; and from System 0606 where the fallow period is longer and Chinese taro is less important. In System 0607, taro is a most important crop and in System 0608 Chinese taro is a most important crop.

This system is located on alluvial plains in the Kumusi Valley and on the lightly dissected lower slopes of Mt Lamington. This is an active volcano which erupted violently in 1951, killing almost 4000 people who then lived higher up the mountain in this system and System 0606 (Schwimmer 1973). Tall woody regrowth fallows are used in narrow valleys running into the rugged Hydrographers Range from Inonda village to just east of the Embi Lakes. These areas are too small to be mapped as a separate system. The lower slopes of Mt Lamington are considered to be 'some of the best land' in Papua New Guinea (Haantjens et al. 1964, 17). Average annual rainfall is around 3700 mm. A 'wet' season occurs from November to May and a 'dry' season from June to October, but the 'dry' season is less marked than at locations nearer the coast. The system is occupied by Orokaiva people, culturally similar to people in Systems 0603/1240, 0605 and 0606, with whom they have close relationships.

Short woody regrowth, dominated by *Piper aduncum*, is the dominant fallow vegetation. *Piper aduncum* is a recent introduction and is known locally as 'poroporo'. It is considered to be a useful introduction. It is said to be spread mainly by a small bat. Clearing of gardens takes place throughout the year, particularly when dry spells offer an opportunity. However slightly more gardens are made at the end of the dry season, between August and October, than at other times (Waddell and Krinks 1968, 81-86). Undergrowth is slashed and trees are cut off about shoulder height and the branches used for fences, block markers or firewood. Fences are less important than in System 0603/1240 because there are few wild pigs here. The undergrowth is burnt. Lowland pitpit and banana are planted throughout the garden and sugarcane is planted next to tree stems. Depending on the type of garden, taro, sweet potato or yams are planted. Sweet potato is grown on small mounds. Corn, cucumber and tobacco are interplanted in all gardens.

Separate gardens are made for taro, sweet potato and sometimes for yam (*D. esculenta* and *D. alata*) if there is enough planting material to warrant a separate garden. If not, yam are planted in a separate part of a taro garden. Not everyone plants yam every year. Sweet potato is a second planting in all gardens. Banana is planted at low densities in first plantings and the density is increased in second plantings. Chinese taro (known here as German taro) is planted extensively in separate gardens on steep slopes along valley sides.

Taro is mainly planted between September and November and is harvested in April and May. In the past, by the middle of the year, little taro was available for eating and garden food was scarce. It was a time when breadfruit, sago and yams (stored from a late wet season harvest) were important. The adoption of a second planting of sweet potato as a regular practice, and the introduction of Chinese taro, has occurred within the last 70 years. When the then Government Anthropologist F.E. Williams (1928; 1930) carried out his study of the Orokaiva in the 1920s, he found taro to be the most important crop, with sweet potato, banana and yam important supplementary crops. Taro remains culturally the most important crop, but people freely acknowledge that the second cropping of sweet potato makes it the more important nutritionally. Most taro varieties cultivated in 1995 were said to be introductions, a result of the spread of taro blight into the area in the 1970s. In 1979 at Koropata village, taro was being severely attacked by taro

Notes continued

blight and an increased reliance was being placed on sweet potato (Newton 1985, 93). In 1995, the newer varieties were said to be more disease resistant and more productive. Williams did not record Chinese taro in the gardens he observed. Williams, who seems to have made garden observations in this system at Koropata and Waseta villages, specifically observed that only one planting was made before a long fallow, a practice he found 'primitive and wasteful' (Williams 1930, 42).

In 1962-63, Rimoldi et al. (1966) found that at Sivepi village, sweet potato was grown only in small quantities, either in a separate garden, or interplanted with taro when the taro was almost mature. It was sometimes planted after the taro had been harvested, the beginnings of a second planting. At Sivepe in 1962-63, the average area of taro was recorded as 0.40 ha (range 0.16-0.93) and of sweet potato only 0.03 ha (range 0-0.08) (Rimoldi et al. 1966, 17). Rimoldi et al. (1966, 20) measured garden areas per person (using a chain and compass) at Sivepi of 0.06 ha of currently producing garden, 0.05 ha of garden planted but not yet producing and 0.04 ha of garden cleared but not planted, an average total area of land under cultivation of 0.15 ha per person (Rimoldi et al. 1966, 19). They noted that while this estimate of land in cultivation per person was possibly high, the Survey of Indigenous Agriculture in April 1961 and March 1962 had estimated 0.14 ha per person. The estimated fallow periods for individual gardens in 1962-63 ranged between 4-15 years, with an average of 6 years. Village populations in Saiho Census Division have increased at around 3 per cent per annum since 1963. Sivepe village has doubled its population from 159 in 1963 to an estimated 320 in 1990. In 1963, in order to maintain a 6 year fallow period and a 1 year cropping period, 167 ha of land was required. In 1990, with no changes in fallow or cropping periods, 336 ha would have been needed. The adoption of a second planting using sweet potato, has reduced overall land requirements to 192 ha, an increase in land area of less than 20 per cent, compared to a 100 per cent increase in population.

Sago is less important here than in System 0603/1240. It would seem logical that, prior to the adoption of sweet potato and Chinese taro, sago was more important than it is today. However, Waddell and Krinks (1968, 81) note 'the increasingly common practice of sago extraction' at Sivepe village, which implies that sago was becoming more important in 1964-65 in this area, than it had been previously. The implications of this statement are not known. Both species of yam are staked. Yam is a high status food, commonly used in feasts and exchanges. Feasts are important in maintaining political alliances (Newton 1985, 92).

This area has a long history of contact and conflict with the outside world, relative to other inland parts of Papua New Guinea. In 1897 the people living in this system tried to prevent gold miners travelling from the coast up the Kumusi River to the Yodda goldfields (just north of Kokoda station) from crossing their territory (Nelson 1976). In the early 1900s, villagers were required by the colonial government to plant cocoa, coffee, cotton, rubber, tobacco, rice and oil palm as cash crops in communal plantations (Crocombe 1964). This compulsion failed to produce a smallholder cash economy (Miles 1956, 319-323). A government rubber plantation was established at Kokoda in 1908 and by 1922 the villages in this system had planted over 8000 coconuts and 6900 rubber trees (Rimoldi et al. 1966, 87-88). However, this compulsion failed and the trees were not tapped for 20 years. In 1942, the Japanese Army occupied the area. Serious fighting occurred between Japanese and the Australian and American forces, until January 1943. After the war, an attempt was made to revive smallholder rubber activity. Rubber was being processed in 1975, but in 1995 it appeared as though many rubber plantations had been cleared for subsistence gardens. Rimoldi et al. (1966, 88) reported that in 1962-63 many trees had become unproductive because of poor tapping techniques. Some of the trees being tapped in 1962 were self-sown.

In the late 1950s, approximately 10,450 ha of land at Sangara, between Popondetta and Saiho was purchased from village people for the Popondetta European Land Settlement Scheme. Under this scheme, land and loans were made available to Australian and Papua New Guinean ex-servicemen for the development of plantations. These areas were planted mainly in cocoa, with some small areas of coffee and rubber (Howlett 1965). The plantations were attacked by army worm and weevils, and the cocoa industry was beset by low prices. By the 1970s, many blocks had been abandoned. During the 1980s, the leases were taken back by the government and 6000 ha of nucleus estate oil palm were planted by Higaturu Oil Palm Pty Ltd (HOPPL) at Sangara. This company also established an oil palm processing factory at Sangara. A further 6000 ha of oil palm has been planted by smallholder settlers on blocks from the original Land Settlement Scheme, or on their own village land. In 1994, HOPPL paid K2.2 million to smallholder oil palm producers, in this system and System 0605 (D. Munro, pers. comm.). Village oil palm planting is continuing in the Kokoda area, towards the Kumusi River around Siai village. Garden observations and interviews in 1995 on the smallholder oil palm blocks at Isivini, immediately north of Sangara found short woody regrowth fallows, 5-15 years old, were being cleared, burnt, and planted in sweet potato, Chinese taro and taro. The most important crops were sweet potato and Chinese taro. Other crops were yam (*D. alata* and *D. esculenta*), banana and cassava. The fruit and nut trees grown were the same as in the surrounding villages. The frequency of planting of triploid bananas was probably higher on the blocks than in village gardens. However, agriculture on the blocks is

Notes continued

similar enough to the surrounding system, for the oil palm blocks not to be distinguished as a separate system. In 1979 and 1980, Eng (1980a; 1980b; 1980c; 1981; 1983) surveyed the socio-economic and nutritional status of settlers on the Isivini and Egora oil palm blocks. She reported that half of the settlers were from Northern Province, with 18 per cent from Morobe, 8 per cent from Madang, 8 per cent from West Sepik and 6 per cent from East Sepik. This system has excellent road connections to Popondetta and to the port at Oro Bay. An all weather road runs from Popondetta to Kokoda station, and gravel surfaced side roads link most villages to the main road. The most important source of cash is the sale of oil palm fruit. Other sources are the sale of fresh food, firewood, tobacco and betel nut. These are sold in local markets, at the Higturu oil palm factory, at Popondetta and at Kokoda.

National Nutrition Survey 1982/83

272 families from 20 villages were asked in March, April, May or June 1983 what they had eaten the previous day. 73 per cent reported eating sweet potato, 58 per cent taro, 46 per cent banana, 26 per cent coconut, 10 per cent yam, 8 per cent Chinese taro, 1 per cent cassava and none sago. 33 per cent reported eating rice. 3 per cent reported eating fresh fish. This is similar to the crop pattern, except for the lower than expected consumption of Chinese taro and higher than expected consumption of banana.

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Districts 2 Popondetta
Population 5,835

Subsystem Extent 75 %
Population density 13 persons/sq km

Area (sq km) 456
Population absent 20 %

System Summary

Located between Popondetta and the coast from Gona mission at Cape Killerton to Buna mission at Cape Endaiadere. This is an area of open short grasslands with patches of tall forest. Two subsystems are identified on the basis of fallow vegetation. For the entire system, sweet potato is the most important crop; taro, banana and coconut are important crops; other crops are cassava, yam (*D. esculenta* and *D. alata*), sago and Chinese taro. This subsystem occurs in forested areas and occupies an estimated 80 per cent of the land in use. Tall woody regrowth fallows, more than 15 years old, are cleared and burnt. Taro and sweet potato are usually planted in separate gardens, or they may be planted in separate parts of the same garden. Yam is planted in separate sections of the same garden with taro or sweet potato. Bananas are planted in both taro and sweet potato gardens. Two plantings are made before a long fallow. Taro and sweet potato are planted in first year gardens and sweet potato in second year gardens. Sweet potato is planted in small mounds.

Extends across provincial border to System(s) None

Altitude range (m) 0-100 **Slope** Gentle (2-10 degrees)

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Banana, Coconut, Taro (<i>Colocasia</i>)
STAPLES PRESENT	Banana, Cassava, Chinese taro, Coconut, Sago, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>)
OTHER VEGETABLES	Aibika, Amaranthus spp., Corn, Cucumber, Kumu musong, Lowland pitpit, Peanuts, Pumpkin tips, Tulip, Bean (snake)
FRUITS	Mango, Orange, Pawpaw, Pineapple, Sugarcane, Watermelon, Guava
NUTS	Breadfruit, Galip, Okari
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	>15 years
CROPPING PERIOD	2 plantings
R VALUE	9 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	Very significant
CROP SEGREGATION	Minor
CROP SEQUENCES	Minor
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	Minor

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Oil Palm	Significant
2 Betel nut	Minor
3 Cocoa	Minor
4 Fresh food	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Very significant
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Very significant
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	Minor
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION**Survey description**

In September 1995, a road traverse from Popondetta to Gona mission (half day); from Popondetta to Girua airport and from there to Barisari village, returning via Dobodura village (half day).

Boundary definition

The boundary with System 0603/1240 was determined by fieldwork in the vicinity of Ioma station and a road traverse from Popondetta to Gona mission; and that with Systems 0604 and 0606 by road traverses from Popondetta to Kokoda station, Gona mission and Oro Bay.

Notes

This system is distinguished from the surrounding systems, mainly because short grass fallows are used in about 20 per cent of gardens, and these gardens are distinguished as a subsystem. The tall woody regrowth fallow gardens which make up the other subsystem, and about 80 percent of land use, are similar to those in Systems 0603/1240, 0604 and 0606. There is a greater tendency to plant taro and sweet potato in separate parts of the same garden here, rather than in separate gardens, the common practice in those systems. System 0604 is more intensive, with short woody regrowth fallows, 5-15 years old.

The system occurs on gently sloping, sandy outwash plains on the lowest slope of Mt Lamington, an active volcano, which erupted with little warning in 1951, killing almost 4000 people. The plains are a mosaic of forest and grasslands. The grasses are *Saccharum* and *Imperata* and the forest lowlands rainforest and regrowth. Nearer the coast, the plains become poorly drained and swampy and the forest areas more degraded.

Orokaiva people occupy most of this area. They are culturally similar to those people who use Systems 0603/1240 and 0604 with whom they have very close relationships.

Interviews at Mumburada village between Popondetta and Gona mission indicated that most households had three or four gardens in forest fallows for every one in the grasslands. Gardens are usually fenced. Gardens are made throughout the year. Aibika, sugarcane, corn, watermelon and green vegetables are planted with taro. When all the taro is planted, sweet potato is planted in separate sections of the one garden. Corn, lowland pitpit and sugarcane are interplanted with sweet potato. Cassava is planted in a single line along the boundaries of the garden sections. Yams are either planted in small sections, separated from other crops, or are interplanted with taro at very low densities. They are grown on stakes and are planted in July-September.

Two plantings are made before a long fallow. Sweet potato is replanted after the first planting of sweet potato has been harvested. Sweet potato is also planted following the first planting of taro. Banana is planted once only throughout the garden, but more is planted in the taro parts of the garden after the taro harvest, than in the sweet potato parts of the garden. Some people say they plant sweet potato three times before a long fallow.

Villages are densely planted with coconut, and small plantations of coconuts are seen elsewhere, the outcome of compulsory plantings in the 1920s and 1930s. Sago is eaten only once or twice a year. Other common fruit and nut trees are breadfruit, guava, and mango. The small tree used for the manufacture of 'tapa', the beaten bark 'cloth' which the Orokaiva paint, is planted in the gardens. Small household gardens are made, containing aibika, sugarcane, sweet potato and other crops.

A major change in this system since 1980 is the widespread planting of village oil palm blocks. Most oil palm has been planted in the grasslands. Oil palm has radically changed the landscape in this area, as well as reclaiming land which was previously little used other than for hunting.

This area is well connected by road to Popondetta. The most important source of cash is village oil palm. Other sources of cash are the sale of fresh food, firewood, betel nut, fish from the sea, and crabs from the mangrove swamps along the coast. These are sold in local markets and in Popondetta. Some cocoa is grown and sold. Old, now abandoned and overgrown, cocoa plantations are common.

National Nutrition Survey 1982/83

55 families from 6 villages were asked in March, April, May or June 1983 what they had eaten the previous day. 91 per cent reported eating taro, 51 per cent sweet potato, 49 per cent coconut, 42 per cent banana, 11 per cent cassava, 7 per cent sago and none Chinese taro or yam. 53 per cent reported eating rice. 13 per cent reported eating fresh fish. This is similar to the crop pattern, except for the higher than expected consumption of taro.

Main References

None.

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Districts 2 Popondetta

Subsystem Extent 25 %

System Summary

This subsystem occurs in short grasslands and occupies an estimated 20 per cent of the land in use. Short grass fallows, more than 15 years old, are slashed and burnt. Sweet potato is the most important crop; taro, banana and coconut are important crops; other crops are cassava, sago and yam (*D. esculenta* and *D. alata*). Taro, sweet potato and yam are planted in separate parts of the same garden. Two plantings are made before a long fallow, with either sweet potato or taro in the first year. Only sweet potato is planted in the second year. Sweet potato is planted in small mounds.

Extends across provincial border to System(s) None

Altitude range (m) 0-100

Slope Gentle (2-10 degrees)

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Banana, Coconut, Taro (<i>Colocasia</i>)
STAPLES PRESENT	Banana, Cassava, Coconut, Sago, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>)
OTHER VEGETABLES	Aibika, Amaranthus spp., Corn, Lowland pitpit, Peanuts, Pumpkin tips, Bean (snake), Spring onion
FRUITS	Mango, Orange, Pawpaw, Pineapple, Sugarcane, Watermelon, Guava
NUTS	Breadfruit, Galip, Okari
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Short grass
SHORT FALLOW	None
LONG FALLOW PERIOD	>15 years
CROPPING PERIOD	2 plantings
R VALUE	9 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	None
CROP SEGREGATION	Significant
CROP SEQUENCES	Minor
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	Minor

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Oil Palm	Significant
2 Betel nut	Minor
3 Cocoa	Minor
4 Fresh food	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Very significant
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Minor
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	Minor
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION**Notes**

Grass fallows are cut and burnt. The garden is not tilled, except for the preparation of small mounds for planting sweet potato. Other than this, these gardens are similar in almost all respects to the gardens in Subsystem 1. Yams are planted in small sections, separated from other crops.

Presumably, this subsystem evolved because forest was being transformed into grassland by cultivation and by the burning of grasslands for hunting. A point may have been reached where insufficient forest was available to satisfy the need for gardening land. Whether the introduction of sweet potato and the adoption of a second planting before a long fallow reduced the number of gardens made in grasslands is not known. If the planting of oil palm in the grasslands continues, this subsystem may disappear.

Districts 2 Popondetta
Population 8,809

Subsystem Extent 100 %
Population density 18 persons/sq km

Area (sq km) 500
Population absent 7 %

System Summary

Located on a dissected volcanic plateau west of the Hydrographers range and south of Mt Lamington, known as the Managalas Plateau, and extending to the coast in steep hill country between Oro Bay and Emo mission. Short woody regrowth, more than 15 years old, is cut and burnt. Sweet potato is the most important crop; Chinese taro, banana and yam (*D. esculenta* and *D. alata*) are important crops; other crops are cassava and taro. Separate gardens are made for sweet potato, yam and Chinese taro. Only one planting is made before a long fallow, but the density of banana is increased after sweet potato and taro have been harvested. Triploid bananas are planted in sweet potato gardens. Bananas and Chinese taro are maintained for at least 5 years before a long fallow. Yam gardens are cleared and planted between August and October every year. Other gardens are not made seasonally. Yam (*D. esculenta*) is staked. Yam (*D. alata*) is planted in specially prepared deep holes. Sweet potato is planted on small mounds.

Extends across provincial border to System(s) None

Altitude range (m) 0-1000 **Slope** Steep (10-25 degrees)

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Banana, Chinese taro, Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>)
STAPLES PRESENT	Banana, Cassava, Chinese taro, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>)
OTHER VEGETABLES	Aibika, Amaranthus spp., Bean (winged), Choko tips, Corn, Cucumber, Highland pitpit, Lowland pitpit, Pumpkin tips, Bean (snake)
FRUITS	Mandarin, Mango, Marita pandanus, Pawpaw, Pineapple, Sugarcane, Watermelon, Guava
NUTS	Breadfruit, Coconut, Okari, Pangium edule
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Short woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	>15 years
CROPPING PERIOD	1 planting
R VALUE	16 (low)

GARDEN SEGREGATION

GARDEN SEGREGATION	Very significant
CROP SEGREGATION	Minor
CROP SEQUENCES	Minor
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	None

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Betel nut	Minor
2 Coffee Arabica	Minor
3 Firewood	Minor
4 Fresh food	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	Minor
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Significant
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Minor
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	Minor
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION**Survey description**

In March 1982, a road traverse from Popondetta to Afore station (1 day); a walking traverse from Afore to Jaraka village (1 day); and from Jaraka to Itokama village (1 day). In September 1995, a road traverse from Popondetta to Afore, and from Afore to Itokama village and return (2 days).

Boundary definition

The boundaries with Systems 0604, 0605, 0607 and 0609 were determined by road traverses from Popondetta to Kokoda station, Popondetta to Afore station and Popondetta to Bariji River and by aerial inspections on flights from Girua airport to Tedibedi and Namudi missions. The boundary with System 0608 was determined by fieldwork at Tedibedi mission and by aerial inspections on flights from Girua airport to Tedibedi. The boundary with System 0610 was determined by fieldwork on the Managalas Plateau and aerial observations between Safia station and Namudi mission.

Notes

This system is distinguished from System 0604 where fallow periods are shorter and two plantings are made before fallowing; it is distinguished from System 0608 to the immediate west mainly by the shorter length of fallows. The shorter fallows periods in System 0608 are said to have been brought about by settlements concentrating around two mission airstrips; whereas settlement in this system, despite moves towards roads, has remained relatively spread out. It is distinguished from System 0605, where a minority of gardens are made in grass fallows; from System 0607 where taro is a most important crop; and System 0609 where sago is the most important crop. It is distinguished from System 0610 where fallow vegetation is tall woody regrowth and two plantings are made before fallowing.

Agriculture on the Managalas Plateau stands over an altitudinal range of 600-1000 m, but part of the system is located near the coast near sea level.

Separate gardens are made for sweet potato, yam and Chinese taro. Banana gardens develop out of sweet potato gardens. Short woody regrowth is cut down, allowed to dry, and is burnt. Yam gardens are cleared from July to August every year. Yam (*D. alata*) is planted from August to September, and yam (*D. esculenta*) from September to October. Clearing commences after *Pangium edule* nuts mature in around July. Sweet potato and Chinese taro gardens are also cleared at the end of the dry period from July, but are less seasonal and may be cleared at other times, especially Chinese taro gardens, where burning is less important. Gardens were seen in which sweet potato and yam gardens were adjacent and were cleared at the same time. In some gardens, a second planting of sweet potato is made.

Some yam (*D. alata*) are planted in specially prepared deep holes. Holes are dug to 1.5-2 metres, the soil removed and broken into a fine tilth, and replaced. The whole tuber is used as seed, and is laid across the slope, with the head placed over the re-filled hole. The head is then covered with soil in the form of small mound. The rest of the tuber is supported off the surface slightly by 3-4 small Y-shaped sticks. A covering of bark is placed over the seed tuber to protect it from the sun. Yam (*D. alata*) are not staked; yam (*D. esculenta*) is staked to about 2 m. Yam magic is said to be important in producing long yams. The relative importance of *D. esculenta* and *D. alata* is difficult to judge. Towards Afore, yam (*D. esculenta*) was said to be more important, while at Ugunomo village between Afore and Itokama village, yam (*D. alata*) was said to be more important.

Chinese taro gardens are made on steeper land. Burning is less important. Chinese taro is maintained for up to 5 years before the garden is allowed to go back to a long fallow. Chinese taro is also planted around the steeper edges of sweet potato and yam gardens. The identification of Chinese taro as an important crop was made on the basis of its cultivation for up to 5 years after planting and on villagers volunteering opinions that this crop had become the most important food in the diet.

A few triploid banana are interplanted with sweet potato in many gardens. Following the sweet potato harvest, more triploid banana are planted and are maintained for 3-5 years before a long fallow. Although this is a second planting, it occurs on approximately only one-third of the land in use; therefore, the system has been described as having, overall, only one planting before a long fallow. Triploid banana is said to have arrived on the Managalas Plateau '50 years ago'. A number of varieties are now grown. Cassava is planted on the edges of sweet potato and yam gardens. It is the most important of the other staple crops.

Notes continued

In 1982, Bourke (1982) recorded the most important crops as taro and yam (*D. esculenta* and *D. alata*), but possibly underestimated the significance of sweet potato. He reported that banana, sweet potato and Chinese taro were less important foods than taro and yam. The main gardens contained taro and yam and smaller separate gardens were devoted to sweet potato and to Chinese taro. Yam (*D. pentaphylla*) was common in gardens and yam (*D. bulbifera*) and *Amorphophallus* taro were occasionally grown.

Vegetables, in particular corn, choko, aibika, cucumber, highland pitpit, lowland pitpit and snake bean, are interplanted with sweet potato and yam. They are planted early in these gardens, before the main tuber planting occurs. Choko tips are the most important green vegetable, and choko continues to grow over weeds and shrubs well into the second year of a long fallow. Okari nut is important. Its seasonal cycle is associated with the phases of yam growing. Sago is consumed once or twice a year.

Despite an all weather road access to Oro Bay and Popondetta, this system is relatively isolated. Between Oro Bay and Afore station, the road is in poor condition and is impassable following rain. The most important sources of cash are the sale of betel nut and coffee. Arabica coffee was planted in this system in the 1960s but was allowed to deteriorate. Recently Coffee Industry Corporation teams have rehabilitated coffee plants. Regular picking, processing and sale of coffee was occurring in 1995. The coffee harvesting season is from May to August.

Betel nut is sold to buyers from the PNG Highlands, who travel to the plateau via Lae and Oro Bay. Nuts are purchased off-the-tree for K4-6 per hand. The buyers strip the nuts from the hands, bag them and transport them back to Lae by ship. The same buyers return to the same villages every year. As a result, a considerable amount of new betel nut planting is taking place. Small amounts of food and firewood are sold in local markets. The Oro Conservation Project is promoting cash cropping, including 'organic' coffee, and was investigating the possibility of exporting birdwing butterflies (Ornithoptera) in 1995. Small quantities of okari nut have been sent to Port Moresby in recent years for sale (Ase 1996).

National Nutrition Survey 1982/83

78 families from 4 villages were asked in April or May 1983 what they had eaten the previous day. 78 per cent reported eating sweet potato, 68 per cent taro, 62 per cent yam, 58 per cent banana, 6 per cent Chinese taro, 4 per cent coconut, 1 per cent cassava and none sago. 5 per cent reported eating rice. 1 per cent reported eating fresh fish. This is similar to the crop pattern, except for the lower than expected consumption of Chinese taro and the higher than expected consumption of taro.

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None.

Other References

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Districts 2 Popondetta
Population 1,150

Subsystem Extent 100 %
Population density 11 persons/sq km

Area (sq km) 102
Population absent 19 %

System Summary

Located in the Pongani Valley on Dyke Ackland Bay, between Oro Bay and Tufi station. Short woody regrowth, more than 15 years old, is cut and burnt. Gardens are fenced. Taro and sweet potato are the most important crops; banana is an important crop; other crops are yam (*D. esculenta*), cassava and sago. Taro and sweet potato are planted in separate parts of the same garden. Two plantings are made before a long fallow. In the first planting, most of the garden is planted in taro. After the taro has been harvested, the entire garden is planted with sweet potato. The density of banana is increased in the second planting. Banana is maintained for up to 5 years. Sweet potato is planted in small mounds. Household gardens, cleared from grass fallows, are maintained around villages.

Extends across provincial border to System(s) None

Altitude range (m) 10-100 **Slope** Gentle (2-10 degrees)

CROPS

STAPLES DOMINANT	Sweet potato, Taro (<i>Colocasia</i>)
STAPLES SUBDOMINANT	Banana
STAPLES PRESENT	Banana, Cassava, Sago, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. esculenta</i>)
OTHER VEGETABLES	Aibika, Corn, Lowland pitpit, Pumpkin tips, <i>Amaranthus</i> spp.,
FRUITS	Mango, Marita pandanus, Pawpaw, Pineapple, Sugarcane, Watermelon
NUTS	Breadfruit, Coconut, Okari
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Short woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	>15 years
CROPPING PERIOD	2 plantings
R VALUE	9 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	None
CROP SEGREGATION	Very significant
CROP SEQUENCES	Very significant
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	Significant

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Fish	Minor
2 Fresh food	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Significant
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Very significant
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	Minor
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION**Survey description**

In September 1995, a road traverse from Oro Bay to Afore station with garden inspections en route (1 day). A road traverse from Afore to Pongani village and the Bariji River at Nembade village, and return (half day).

Boundary definition

The boundary with System 0605 was determined on a road traverse from Popendetta to Pongani village. The boundaries with System 0606 and 0609 were determined by road traverses from Oro Bay to Afore station and the Bariji River.

Notes

This system is distinguished from those to the northwest and west mainly by the greater importance of taro here. In the first planting, taro dominates and is replaced by sweet potato in the second planting. In System 0605, which occurs in a similar environment, fallows are tall woody regrowth, and sweet potato occupies at least half of the garden area in the first planting. Grass fallows are also used for a minority of gardens. This system is distinguished from System 0606 on the Managalas Plateau where Chinese taro and yam are important crops. Fallow periods and fallow vegetation are similar to this system, but only one planting is made before a long fallow there. In System 0609, sago is the most important food.

The area comprises gently sloping alluvial terraces. Vegetation is open short grasslands with patches of tall forest. Steep, rugged and unoccupied volcanic hills occur to the immediate west. Gardens are made in the forest, along the edge of the forest-grassland boundary.

The gardens in this system are large, are well fenced and are planted predominantly in taro at the first planting. Some sweet potato is planted to fill in sections where taro planting material is not available. A second planting of sweet potato is made over the whole garden, with an increasing density of banana, including triploids. The banana are maintained for 3-5 years. Sago is made about once per month, mainly in the 'dry' season. Very few yam were observed and all were *D. esculenta*. They are grown on stakes and are planted seasonally. Yams are not an important food in this system.

The grasslands are said to be expanding at the expense of the wooded land, mainly as a result of gardening. Fires in the grassland burn into woody regrowth in the early stages of fallow succession. This is because gardens are almost always sited along the forest-grassland edge. The fallows observed were distinctly degraded, (low, thin stemmed, little species diversity) despite there being good evidence that they were more than 15 years old.

The area has good road access to Oro Bay, but is isolated and under developed. Fresh food and fish are sold at roadside markets and at Bariji High School.

National Nutrition Survey 1982/83

26 families from 5 villages were asked in April or May 1983 what they had eaten the previous day. 73 per cent reported eating banana, 73 per cent taro, 42 per cent sweet potato, 27 per cent sago, 8 per cent coconut and none cassava, Chinese taro or yam. 31 per cent reported eating rice. 31 per cent reported eating fresh fish. This is similar to the crop pattern, except for the higher than expected consumption of banana and sago.

Main References

None.

Other References

Haantjens, H.A., S.J. Paterson, B.W. Taylor, R.O. Slatyer, G.A. Stewart and P. Green 1964 General report on lands of the Buna-Kokoda area, Territory of Papua and New Guinea. Land Research Series No. 10, Commonwealth Scientific and Industrial Research Organization, Melbourne.

Districts 2 Popondetta
Population 1,475

Subsystem Extent 100 %
Population density 16 persons/sq km

Area (sq km) 93
Population absent 13 %

System Summary

Located in the upper Kumusi Valley on the northern edge of the Owen Stanley Mountains, west of the Managalas Plateau. Fallow vegetation is short woody regrowth, 5-15 years old. Fallow vegetation is burnt for sweet potato and yam gardens, but not for Chinese taro gardens. Chinese taro and sweet potato are the most important crops; yam (*D. esculenta* and *D. alata*) are important crops; other crops are banana, cassava and taro. Separate gardens are made for Chinese taro, sweet potato and yam. Only one planting is made before a long fallow. Chinese taro gardens are maintained for at least 5 years before a long fallow. Yam gardens are planted between August and October every year. Other gardens are not seasonal. Yam (*D. esculenta*) is staked. Yam (*D. alata*) is planted in specially prepared deep holes. Sweet potato is planted on small mounds.

Extends across provincial border to System(s) None

Altitude range (m) 800-1200 **Slope** Very steep (>25 degrees)

CROPS

STAPLES DOMINANT	Chinese taro, Sweet potato
STAPLES SUBDOMINANT	Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>)
STAPLES PRESENT	Banana, Cassava, Chinese taro, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>)
OTHER VEGETABLES	Aibika, Amaranthus spp., Choko tips, Corn, Highland pitpit, Kumu musong, Lowland pitpit, Pumpkin tips, Tulip, Bean (snake)
FRUITS	Avocado, Malay apple, Mandarin, Mango, Marita pandanus, Pawpaw, Pineapple, Sugarcane
NUTS	Breadfruit, Coconut, Karuka (wild), Okari
NARCOTICS	Betel nut (highland), Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Short woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	5-15 years
CROPPING PERIOD	1 planting
R VALUE	33 (medium)

GARDEN SEGREGATION

GARDEN SEGREGATION	Very significant
CROP SEGREGATION	None
CROP SEQUENCES	None
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	Minor

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Animal skins	Minor
2 Coffee Arabica	Minor
3 Fresh food	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	Minor
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Significant
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Significant
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	Minor
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION**Survey description**

In September 1995, a visit to Tedibedi mission by plane, with garden observations and interviews adjacent to the mission (half day).

Boundary definition

The boundaries with Systems 0606 and 0610 was determined by fieldwork on the Managalas Plateau, Safia station and Namudi mission, and aerial inspections en route from Tedibedi and Namudi missions to Girua airport. The boundary with System 0604 was determined by fieldwork at Uraituru village and by aerial inspection en route from Tedibedi mission to Kokoda station.

Notes

This system is distinguished from Systems 0604 and 0610, to the north and southeast respectively, by the importance here of Chinese taro and the fact that only one planting is made before land is fallowed. It is similar in many respects to System 0606 to the east on the Managalas Plateau, and is distinguished mainly on the longer fallow length there.

Like the Managalas system (0606), this system is characterised by the almost complete segregation of the most important crops into separate gardens. Only one planting is made before a long fallow in all gardens, but Chinese taro gardens are maintained for a number years.

In sweet potato gardens, short woody regrowth is cut and burnt. Gardens are fenced. Sweet potato is planted on small mounds, with corn, aibika, pumpkin, snake bean, lablab bean, choko and amaranthus. A few banana are planted. Cassava is planted around the edge of the garden. It is left to fallow after the first harvest, which begins six months from planting.

Three yam species, *D. esculenta*, *D. alata* and *D. bulbifera*, are interplanted, together with winged bean, taro, highland pitpit, and sugarcane. Lowland pitpit is planted around the edge of the garden. Yam (*D. alata*) is planted between August and September and yam (*D. esculenta*) between September and October. Yam (*D. alata*) is planted in specially prepared deep holes. All yam species are staked. The yam harvest begins about 10 months after planting. The garden is left to a long fallow after the harvest.

Chinese taro gardens are cleared in tall woody regrowth and are not burnt. Chinese taro, with small amounts of taro and banana are planted. The gardens are maintained for up to 5 years and possibly 10 years before being abandoned to a long fallow. Chinese taro was introduced here post-1945. Sago is not used as a food in this system. The main greens are aibika, amaranthus, kumu musong and tulip. Corn is an important vegetable. Small household gardens are made, mainly for growing aibika.

The short woody regrowth fallows of this system, which are now clearly distinguishable on the slopes of the Owen Stanley Mountains, are a postwar development. They are made worse by the concentration of people around the airstrips and missions at Tedebedi and Emo.

The upper Kumusi Valley has no road connection to the rest of the province and is served by two airstrips within a few kilometres of one another. The main sources of cash are the sale of bird plumes, animal skins, Arabica coffee and fresh food. The coffee is sold to a Popondetta purchaser who arranges air charters. Chilli has been planted previously but there was no production in 1995.

National Nutrition Survey 1982/83

33 families from 2 villages were asked in April 1983 what they had eaten the previous day. 79 per cent reported eating Chinese taro, 61 per cent banana, 55 per cent sweet potato, 52 per cent yam, 3 per cent taro and none cassava, coconut or sago. 18 per cent reported eating rice. 6 per cent reported eating fresh fish. This is similar to the crop pattern, except for the higher than expected consumption of banana.

Main References

None.

Other References

None.

Districts 2 Popondetta, 3 Tufi
Population 2,082

Subsystem Extent 100 %
Population density 6 persons/sq km

Area (sq km) 344
Population absent 22 %

System Summary

Located on the Musa Plain between the Bariji River and the Musa River, inland of Collingwood Bay. Sago, from extensive sago swamps, is the most important food. Gardens are made in tall woody regrowth, more than 15 years old, which is cleared and burnt. Taro is an important crop; other crops are sweet potato, yam (*D. esculenta* and *D. alata*), cassava and banana. Only one planting is made before a long fallow. Sweet potato is planted on small mounds. Yam and sugarcane are staked. Gardens are fenced. Taro is planted in separate parts of the garden from yam and sweet potato. Most gardens are cleared between August and October every year.

Extends across provincial border to System(s) None

Altitude range (m) 0-600 **Slope** Multiple classes

CROPS

STAPLES DOMINANT	Sago
STAPLES SUBDOMINANT	Taro (<i>Colocasia</i>)
STAPLES PRESENT	Banana, Cassava, Sago, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>)
OTHER VEGETABLES	Aibika, <i>Amaranthus</i> spp., Corn, Cucumber, Kumu musong, Lowland pitpit, Pumpkin tips
FRUITS	Mango, Marita pandanus, Pawpaw, Pineapple, Sugarcane, Watermelon
NUTS	Breadfruit, Coconut, Okari
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	>15 years
CROPPING PERIOD	1 planting
R VALUE	5 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	None
CROP SEGREGATION	Very significant
CROP SEQUENCES	None
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	Minor

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Fish	Minor
2 Fresh food	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Minor
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Very significant
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	Significant
SEASONAL SEC'DARY CROPS	Significant

OTHER DOCUMENTATION**Survey description**

In January 1994, by air from Port Moresby to Wanigela mission; garden observations at Wanigela (1 day); a boat traverse from Wanigela mission to Sinapa village (1 day). In February 1996, a boat traverse from Wanigela to Tufi station and walking traverse from Tufi (3 days).

Boundary definition

The boundary with Systems 0606 and 0607 was defined by a road traverse from Oro Bay to Afore station and to the Bariji River; that with System 0610 by fieldwork in the vicinity of Safia station and Namudi mission; that with Systems 0611/0530 and 0612 by fieldwork between Tufi station and Sinapa village.

Notes

This system is distinguished from all nearby systems because sago is the most important food here.

This system occupies the Musa coastal plain, a large triangular area of gently sloping and generally poorly drained land, between the Didana Range to the south, the Managalas Plateau in the west, and the Nelson Range in the east. The coast on Collingwood Bay is mainly mangrove swamps. In the west the Bariji River, which drains the Managalas Plateau, disappears into swamps near the coast and does not reach the sea as a well defined river. In better drained areas, relatively large patches of grassland and savanna occur. Gardens are not made in grasslands. The system is sparsely populated.

Sago is eaten every day and is the most important food. Taro occupies about 75 per cent of most gardens. The rest of the garden is planted in sweet potato and a small amount of yam (*D. esculenta* and *D. alata*). Taro, sweet potato and yam are planted in separate sections of the same gardens. Gardens are stoutly fenced. After the yam harvest, sweet potato is planted in the holes left by the yam. No second planting occurs after the taro harvest, so the system has been classed as having only one planting before a long fallow. Most gardens are cleared at the beginning of the wetter period from August until October every year. Small household gardens are used mainly for growing green vegetables.

The system is isolated. The only road connection reaches Popondetta from the Bariji River at Nambade village. Small amounts of cash are earned by selling fresh food and fish at Bariji High School. Most movement within the system occurs along rivers. There is an airstrip at Embassa mission on the Musa River.

National Nutrition Survey 1982/83

32 families from 3 villages were asked in April or May 1983 what they had eaten the previous day. 91 per cent reported eating sago, 41 per cent banana, 22 per cent sweet potato, 9 per cent coconut, 3 per cent taro and none cassava, Chinese taro or yam. 3 per cent reported eating rice. 6 per cent reported eating fresh fish. This is similar to the crop pattern, except for the lower than expected consumption of taro and the higher than expected consumption of banana.

Main References

None.

Other References

None.

Districts 3 Tufi
Population 1,920

Subsystem Extent 100 %
Population density 2 persons/sq km

Area (sq km) 852
Population absent 27 %

System Summary

Located in the Moni Valley, in the headwaters of the Musa River from Namudi mission in the west to Safia station in the east. Tall woody regrowth, more than 15 years old, is cleared and burnt. Sweet potato is the most important crop; cassava and yam (*D. esculenta*) are important crops; other crops are yam (*D. alata*), banana and taro. Two plantings are made before a long fallow. Sweet potato is a second planting after yam. Yam and sweet potato are planted in separate sections of the same garden. Gardens are cleared from July and August every year. Yam is planted from September to November and sweet potato in January. Yam and sugarcane are staked.

Extends across provincial border to System(s) None

Altitude range (m) 100-600 **Slope** Multiple classes

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Cassava, Yam (<i>D. esculenta</i>)
STAPLES PRESENT	Banana, Cassava, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>)
OTHER VEGETABLES	Aibika, Amaranthus spp., Corn, Cucumber, Kumu musong, Lowland pitpit, Peanuts, Pumpkin tips, Tulip
FRUITS	Mango, Marita pandanus, Orange, Pawpaw, Pineapple, Sugarcane, Watermelon
NUTS	Breadfruit, Coconut, Galip, Okari
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	>15 years
CROPPING PERIOD	2 plantings
R VALUE	9 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	None
CROP SEGREGATION	Very significant
CROP SEQUENCES	Significant
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	Minor

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Cattle	Minor
2 Fresh food	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	None
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	None
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	Significant
SEASONAL SEC'DARY CROPS	Significant

OTHER DOCUMENTATION

Survey description

In September 1995, flights from Girua airport to Namudi mission and Safia station by two parties (1 day each).

Boundary definition

The boundaries with Systems 0606 and 0608 were determined by fieldwork on the Managalas Plateau and aerial observations between Safia station, Namudi mission and Girua airport. The boundaries with System 0609 were determined by fieldwork between Pongani village and the Bariji River; and that with System 0613 by fieldwork and interviews in the vicinity of Safia and Namudi and interviews at the Cape Rodney Agricultural Development Project in Central Province.

Notes

This system is distinguished from Systems 0606, 0608 and 0613 because in those systems only one planting is made before fallowing. It is distinguished from System 0609 because sago is the most important crop there.

The system occurs in an intra-montane basin in the headwaters of the Musa River, adjacent to the Owen Stanley mountains in the southwest. Agriculture occurs on gently sloping terraces and fans; and in dissected hills. Vegetation is mainly a savanna of Eucalypt trees and Themeda and Imperata grasses. Areas of forest occur, particularly on active fans along stream lines (Ruxton et al. 1967). Gardening occurs in this forest. No gardens are made in the grasslands. Local people say gardening is causing the savanna to expand onto previously forested land.

Tall woody regrowth is felled and burnt. About half of the gardens are planted in yam, mainly *D. esculenta*, and about half in sweet potato. Yam is planted first from September to November. When yam planting is completed, sweet potato is planted. After the first planting of yam and sweet potato have been harvested, a second planting of sweet potato is made. Yam (*D. esculenta*) is staked; yam (*D. alata*) is not. Staking is said to improve productivity. Gardens are not fenced. Sweet potato is dibbled, not mounded.

Prior to yams being planted, corn, aibika, sugarcane, taro and banana are planted within the garden. Taro and banana are planted at low density. Cassava is planted in 'hedges' around the garden perimeter and in lines through the garden. Chinese taro was not observed near Safia station nor near Namudi mission, but observations were restricted to gardens near the airstrips.

The system is not connected to the rest of the province by road. Safia station is the site of a large cattle project, previously managed by the government, but now handed over to local land owners. A large slaughterhouse and freezer facility, with generators and water supply was in severe disrepair in 1995. All killing had to be done on the same day as an aerial charter could be organised to fly the meat out to Popondetta. People at Safia said the costs of an aerial charter means they cannot make a profit, nor generate funds for maintenance or repairs. Small amounts of fresh food are sold locally and at Popondetta. Some people from this system have rubber blocks at Cape Rodney, in Central Province (System 0308).

National Nutrition Survey 1982/83

23 families from 3 villages were asked in April or July 1983 what they had eaten the previous day. 70 per cent reported eating yam, 57 per cent sweet potato, 35 per cent banana, 13 per cent coconut, 9 per cent taro and none cassava, Chinese taro or sago. 26 per cent reported eating rice. 4 per cent reported eating fresh fish. This differs from the crop pattern, with lower than expected consumption of cassava and higher than expected consumption of banana and yam.

Main References

None.

Other References

Ruxton, B.P., H.A. Haantjens, K. Paijmans and J.C. Saunders 1967 Lands of the Safia-Pongani area, Territory of Papua and New Guinea. Land Research Series No. 17, Commonwealth Scientific and Industrial Research Organisation, Melbourne.

Districts 3 Tufi
Population 2,389

Subsystem Extent 100 %
Population density 17 persons/sq km

Area (sq km) 141
Population absent 30 %

System Summary

Located immediately inland of extensive mangrove swamps along the coast of Collingwood Bay, south of Wanigela and extending into Milne Bay Province. Tall woody regrowth, more than 25 years old, is cleared and burnt. Sweet potato is the most important crop; coconut, taro and banana are important crops; other crops are cassava, Alocasia taro, sago and yam (*D. esculenta*). About six plantings are made before a long fallow. Land is fallowed for short periods between plantings. Banana are planted in separate gardens from all other crops. Taro, sweet potato and yam are planted on separate blocks within gardens. Taro and yam are planted in first year gardens, taro is usually replanted after harvest. After the second planting of taro, up to five plantings of sweet potato may be made. Banana are maintained for at least 10 years. Sweet potato is planted in small mounds. Taro gardens are cleared from January to May each year, but sweet potato is planted throughout the year. Many gardens are flooded for short periods each year, resulting in significant deposition of silt. All gardens are fenced.

Extends across provincial border to System(s) 0530

Altitude range (m) 0-40 Slope Flat (<2 degrees)

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Banana, Coconut, Taro (<i>Colocasia</i>)
STAPLES PRESENT	Banana, Cassava, Coconut, Sago, Sweet potato, Taro (<i>Alocasia</i>), Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>)
OTHER VEGETABLES	Aibika, Amaranthus spp., Corn, Cucumber, Lowland pitpit, Pumpkin tips, Tulip, Bean (snake)
FRUITS	Malay apple, Mango, Pawpaw, Pineapple, Sugarcane, Ton, Watermelon
NUTS	Breadfruit, Galip, Okari
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	Very significant
LONG FALLOW PERIOD	>15 years
CROPPING PERIOD	6-14 plantings
R VALUE	33 (medium)

GARDEN SEGREGATION

GARDEN SEGREGATION	Minor
CROP SEGREGATION	Very significant
CROP SEQUENCES	Significant
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	None

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	Very significant
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Fish	Minor
2 Fresh food	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Very significant
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Very significant
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	Minor
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION

Survey description

In January 1994, by air from Port Moresby to Wanigela mission; garden observations at Wanigela (1 day); a boat traverse from Wanigela to Sinapa village (1 day); garden observations at Sinapa on the Beria and Garandi Rivers (half day); from Sinapa to Midina mission in Milne Bay Province (half day).

Boundary definition

The boundary with Systems 0612 and Milne Bay System 0505 were determined by fieldwork at Wanigela mission and a boat traverse from Wanigela to Midina mission in Milne Bay Province, and a flight from Pumani airstrip to Biniguni mission. The boundaries with Systems 0609 and 0610 were determined by fieldwork between Tufi station and Sinapa village, and interviews at Safia station and Namudi mission.

Notes

This system is distinguished from nearby systems because about 6 plantings are made before a long fallow here. Settlements are situated along the coast on sandy beach ridges, among dense stands of coconuts and casuarina trees. Behind the villages are mangrove and sago swamps. Gardens are made on narrow alluvial floodplains above the tidal limit along rivers and streams; inland of a strip of mangrove forest (15-25 m tall and 1-2 km wide) and a strip of sago swamp. People travel in outrigger canoes, upstream along channels through the mangrove forest from the villages to the gardens. Substantial garden houses are built and many families spend long periods living in the gardens.

This system has unusually long cropping periods for a lowland PNG agricultural system with a long fallow period. The excellent alluvial soils and annual flooding which deposits new silt probably enable many plantings before a long fallow. The most important reason given by people for the final abandonment of the garden to a long fallow was the breaking down of fences by bush dwelling pigs.

After fallows are cleared and burnt and the garden is fenced, taro is interplanted with aibika, sugarcane, cucumber, snake bean and corn. Cassava is planted around the garden edges. Small areas of yam (*D. esculenta*) are planted in separate parts of the garden. A second planting of taro is common. Up to five plantings of sweet potato are made after the second taro harvest and after the first yam harvest. Short fallows of up to 3 months occur between all plantings. Weeds and grasses that grow during the short fallow are pulled up, heaped and burnt.

Triploid bananas, introduced since 1945, is now planted as a monocrop in separate gardens to taro and sweet potato, and are maintained for at least 10 years before a long fallow. This banana is said to have an origin somewhere on the southern side of the Cape Vogel peninsular. *Alocasia* taro is an even more recent introduction, being first planted in the 1980s. *Alocasia* is planted at low densities in the corners of taro and sweet potato gardens, and often in small patches in banana gardens. Chinese taro was not observed here. Yam (*D. esculenta*) and sugarcane are staked. Village sites are densely planted with coconut which is an important food.

Fishing is a very important activity. Most families fish every night when weather allows using lines, spears and pressure lamps. Hunting is also important. The main prey are pigs; less important are wallaby and cassowary. There is a large area of unoccupied land inland of this system.

This area is relatively isolated. All travel is by canoe along the coast to Waingela mission and airstrip. Small amounts of cash are earned locally from the sale of fish and fresh food. The main source of cash appears to be remittances from wage earners in towns. Local schools have produced a large number of well educated people. Outboard motors, pressure lamps and radios are common possessions in the villages, suggesting that significant amounts of cash are remitted to the area.

National Nutrition Survey 1982/83

22 families from 1 village were asked in April or June 1983 what they had eaten the previous day. 100 per cent reported eating sweet potato, 68 per cent coconut, 55 per cent banana, 32 per cent yam, 23 per cent taro, 9 per cent sago, 5 per cent cassava and none Chinese taro. 32 per cent reported eating rice. 45 per cent reported eating fresh fish. This is similar to the crop pattern, except for the higher than expected consumption of yam.

Other References

Ruxton, B.P., H.A. Haantjens, K. Paijmans and J.C. Saunders 1967 Lands of the Safia-Pongani area, Territory of Papua and New Guinea. Land Research Series No. 17, Commonwealth Scientific and Industrial Research Organisation, Melbourne.

Tietjen, A.M. 1985 Infant care and feeding practices and the beginnings of socialization among the Maisin of Papua New Guinea. In Marshall, L.B. (ed), *Infant Care and Feeding in the South Pacific*. London, Gordon and Breach, 121-135.

Districts 3 Tufi
Population 3,233

Subsystem Extent 100 %
Population density 14 persons/sq km

Area (sq km) 225
Population absent 38 %

System Summary

Located on the lower slopes of the Topographers Range, from Porlock Bay to Wanigela mission and centred on Tufi station. Tall woody regrowth fallows, 5-15 years old, are cleared and burnt. Sweet potato is the most important crop; banana, Chinese taro, coconut and taro are important crops; other crops are yam (*D. alata*), cassava and sago. Sweet potato, Chinese taro, taro and yam are planted in separate parts of the same garden. However, gardens with taro and sweet potato as a monocrop are also made. Banana is planted throughout gardens. Two plantings are made before a long fallow. Sweet potato is planted after taro and yam have been harvested. Sweet potato is planted on small mounds. A short fallow up to 6 months long occurs between plantings of taro and sweet potato. Chinese taro is planted only once. Chinese taro intercropped with banana may be maintained for 3-4 years. Gardens are cleared from October each year.

Extends across provincial border to System(s) None

Altitude range (m) 10-200 Slope Gentle (2-10 degrees)

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Banana, Chinese taro, Coconut, Taro (<i>Colocasia</i>)
STAPLES PRESENT	Banana, Cassava, Chinese taro, Coconut, Sago, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>)
OTHER VEGETABLES	Aibika, Amaranthus spp., Bean (winged), Corn, Cucumber, Ferns, Kangkong, Lowland pitpit, Pumpkin tips, Bean (snake)
FRUITS	Coastal pandanus, Mango, Orange, Pawpaw, Pineapple, Sugarcane, Watermelon
NUTS	Breadfruit, Java almond, Okari
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	Significant
LONG FALLOW PERIOD	5-15 years
CROPPING PERIOD	2 plantings
R VALUE	17 (low)

GARDEN SEGREGATION

GARDEN SEGREGATION	Minor
CROP SEGREGATION	Very significant
CROP SEQUENCES	Significant
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	Minor

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Betel nut	Minor
2 Fish	Minor
3 Fresh food	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	Very significant
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Minor
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	Very significant
SEASONAL SEC'DARY CROPS	Significant

OTHER DOCUMENTATION

Survey description

In January 1994, by air from Port Moresby to Wanigela mission; garden observations at Wanigela (1 day); a boat traverse from Wanigela to Sinapa village (1 day). In February 1996, a boat traverse from Wanigela to Tufi station and walking traverses from Tufi (3 days).

Boundary definition

The boundary with System 0609 was determined by fieldwork between Pongani village and the Bariji River and in the vicinity of Tufi and Wanigela stations. The boundary with System 0611/0530 was determined by a boat traverse between Wanigela mission and Sinapa village.

Notes

This system is distinguished from System 0609 where sago is the most important crop; and from System 0611/0530 where about 6 plantings are made before a long fallow.

This system is located on the dissected lower slopes of the Topographers Range volcanos, and the lower more gentle slopes. Over much of the system, 30-80 per cent of the land area is covered in short grasses, mainly *Themeda australis*. Most gardens are made after tall woody regrowth and less than 5 per cent of gardens are made in grasslands. Gardens which are cleared from grass fallows are planted only in sweet potato, interplanted with corn and cassava.

Fallow vegetation is taller than 10 m, but is thin stemmed and of poor quality. Most fallows are 10-15 years old. Older fallows are used further away from settlements and taro in particular tends to be planted in these locations. Sweet potato is planted in fallows as short as 7 years old.

Most gardens are divided into regular sections, using sticks laid on the ground. Taro and Chinese taro are planted with banana. Yam is planted without banana. Yam is staked. Aibika, sugarcane, corn, snake bean, cucumber, tomato, spring onion, watermelon and pawpaw are planted throughout the garden. Few gardens are fenced, but fencing is used near settlements, where domestic pigs are found.

After the taro harvest, the land is left to a short fallow for 4-6 months. Weeds and grasses are pulled up, heaped and burnt. Sweet potato is planted over the whole of the area previously planted in taro and yam. Sweet potato is planted on widely spaced small mounds. After the sweet potato harvest, it is usual for a long fallow to occur, although small areas may be planted a third time with more sweet potato. Chinese taro and banana are planted only once. Small amounts of Queensland arrowroot are planted. Sago is used once or twice a year.

Fishing is a very important activity. Many families fish every night when weather allows using lines, spears and pressure lamps. Hunting is also important. The main prey are pigs; less important are wallaby and cassowary. There is a large area of unoccupied land inland of this system.

Small amounts of cash are earned from the sale of fresh vegetables, betel nut, fish and meat from hunting. The main source of cash is probably remittances from wage earners in towns. Local schools have produced a large number of well educated people. Outboard motors, pressure lamps and radios are common possessions in the villages.

National Nutrition Survey 1982/83

32 families from 9 villages were asked in April 1983 what they had eaten the previous day. 78 per cent reported eating sweet potato, 56 per cent banana, 41 per cent cassava, 41 per cent coconut, 28 per cent sago, 13 per cent taro, 9 per cent yam and none Chinese taro. 6 per cent reported eating rice. 78 per cent reported eating fresh fish. This differs the crop pattern, with lower than expected consumption of Chinese taro and taro and higher than expected consumption of cassava and sago.

Main References

None.

Other References

Ruxton, B.P., H.A. Haantjens, K. Paijmans and J.C. Saunders 1967 Lands of the Safia-Pongani area, Territory of Papua and New Guinea. Land Research Series No. 17, Commonwealth Scientific and Industrial Research Organisation, Melbourne.

Districts 3 Tufi
Population 0

Subsystem Extent 100 %
Population density 0 persons/sq km

Area (sq km) 308
Population absent 0 %

System Summary

Located in the headwaters of the Musa River, in mountainous country in the Owen Stanley range. Tall woody regrowth fallows, more than 25 years old, are cleared and burnt. Gardens are fenced. Sweet potato is the most important crop; banana, cassava and Chinese taro are important crops; other crops are taro, yam (*D. esculenta* and *D. alata*) and *Amorphophallus* taro. Only one planting is made before a long fallow. No census points occur in this system. It is used by people from System 0310.

Extends across provincial border to System(s) None

Altitude range (m) 600-1200 **Slope** Very steep (>25 degrees)

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Banana, Cassava, Chinese taro
STAPLES PRESENT	Banana, Cassava, Chinese taro, Sweet potato, Taro (<i>Colocasia</i>), Yam (<i>D. alata</i>), Yam (<i>D. esculenta</i>), Taro (<i>Amorphophallus</i>)
OTHER VEGETABLES	Aibika, Amaranthus spp., Corn, Highland pitpit, Lowland pitpit, Pumpkin tips, Tulip, Bean (snake), Sweet potato leaves
FRUITS	Malay apple, Mango, Marita pandanus, Orange, Pawpaw, Pineapple, Sugarcane, Guava
NUTS	Breadfruit, Coconut, Galip, Karuka (planted), Okari
NARCOTICS	Betel nut (highland), Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	>15 years
CROPPING PERIOD	1 planting
R VALUE	5 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	None
CROP SEGREGATION	None
CROP SEQUENCES	None
MIXED VEGETABLE GARDENS	None
HOUSEHOLD GARDENS	None

SOIL FERTILITY MAINTENANCE

LEGUME ROTATION	None
PLANTED TREE FALLOW	None
COMPOST	None
ANIMAL MANURE	None
ISLAND BED	None
SILT FROM FLOOD	None
INORGANIC FERTILISER	None

CASH EARNING ACTIVITIES

1 Fresh food	Minor
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OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	None
MECHANIZATION	None
DEEP HOLING	None
MULCHING	None
SOIL RETENTION BARRIERS	None
Mounding Techniques:	
VERY SMALL MOUNDS	None
SMALL MOUNDS	None
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Very significant
STAKING OF CROPS	None
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	None
SEASONAL SEC'DARY CROPS	None

OTHER DOCUMENTATION

Survey description

This system was not visited. Data are based upon interviews in August 1995 with people from this system resident at the Cape Rodney Agricultural Development Scheme; and interviews at Safia station in September 1995.

Boundary definition

The boundary with System 0610 and with Central Province Systems 0317, 0318 and 0319 were determined from interviews at Cape Rodney and in the vicinity of Safia station; and by using regrowth data from Saunders (1993).

Notes

This system is distinguished from 0610 where two plantings are made before a long fallow and yam is an important crop; and from Systems 0317, 0318 and 0319 where banana is a most important crop.

There are no census points in this system. People who use this system probably also use System 0610 and census in that system. Information is based on interviews at the Cape Rodney Agricultural Development Project in Central Province. A number of families occupy rubber blocks on the Scheme and travel back and forth over the main range to their home villages in this system. The families interviewed were from Domara village, south of Safia station.

From the descriptions provided, this system is a low intensity bush fallow system, similar to Systems 0319 and 0321 in Central Province, although only one planting is made before fallow here. All gardens are said to be fenced. Sweet potato is not planted on small mounds but dibbled. Yam (*D. alata*), which is a minor crop, is not staked.

Crops, in order of importance are said to be sweet potato, banana, cassava and Chinese taro.

The area is isolated and accessible only by walking tracks. The main source of cash is the sale of rubber by people from this area who have blocks on the Cape Rodney Agricultural Development Project in Central Province. The sale of fresh food, and meat from hunting, carried either to Safia station or Cape Rodney is a minor source of cash.

National Nutrition Survey 1982/83

There are no permanent villages located in this system.

Main References

None.

Other References

None.

4. AGRICULTURAL SYSTEMS: MAPS

The maps show the location of the Agricultural Systems identified in the Province and selected important characteristics of the systems. Where subsystems exist within an Agricultural System, the maps display information from the first subsystem only. Subsequent subsystem information is not displayed, but it is available in the text summaries. For crop combinations, cash income activities, population density and population absent, the maps show information for the entire system. A note in the key on the Agricultural Systems map lists the systems in which subsystems occur. Maps can be produced from computer files at any scale down to 1:500 000.

The following notes explain the classes used on the maps.

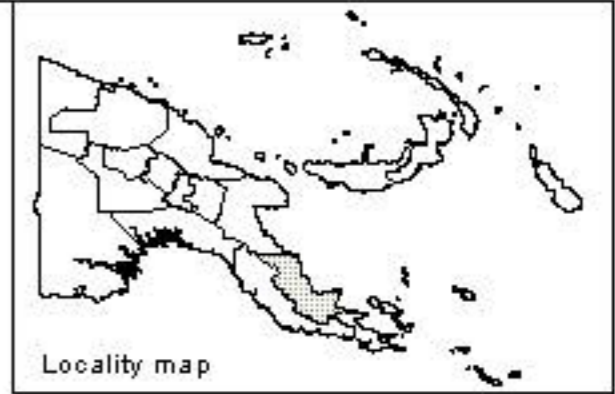
Map title	Notes
1. Agricultural Systems	Boundaries and identification numbers (eg. 1 = System 1401). See key for subsystem occurrences.
2. Fallow vegetation	The vegetation cleared from garden sites at the beginning of a new period of cultivation (8 classes).
3. Long fallow period	An estimate of the length of time land is left fallow before it is cultivated again (4 classes).
4. Number of plantings before fallow	The number of times staple crops are planted in the main gardens before those gardens are returned to a long fallow (5 classes).
5. Intensity of land use	Ratio of the cropping period (estimated from the number of plantings) to the length of the complete cultivation cycle, ie. cropping period plus fallow period (4 classes based on Ruthenberg's R factor) ¹ . Very low: (R < 10) Low: (R = 10 - 32) Medium: (R = 33 - 66) High: (R > 66)
6. Crop combinations	Combinations of the most important (dominant staple) and important (subdominant staple) crops in this Province.

¹ $R = (\text{Number of years of cultivation} \times 100) / (\text{Number of years of cultivation} + \text{Number of years of long fallow})$, (Ruthenberg 1980, 15)

Map title	Notes
7. Garden and crop segregation	Separation of crops into different gardens or into different plots within a garden (4 classes). A combination of Fields 28 and 29. For both fields, 'nil' and 'minor or insignificant' are defined as 'absent'; and 'significant' and 'very significant' as 'present'. Classes are: both absent = 'No segregation'; garden segregation present only = 'Garden segregation'; crop segregation present only = 'Crop segregation'; both present = 'Garden and crop segregation'.
8. Soil fertility maintenance	The presence or absence of the following: legume rotation, planted tree fallow, composting and mulching. For all features, 'nil' and 'minor or insignificant' are defined as 'absent'; and 'significant' and 'very significant' as 'present'.
9. Soil tillage	The use of tillage in the preparation of land for cultivation (4 classes).
10. Fallow clearing practices	A combination of the practices of burning fallow vegetation before planting, and cutting down fallows onto crops after planting. For both features, 'none' and 'minor or insignificant' are defined as 'absent'; and 'significant' and 'very significant' as 'present' (3 classes).
11. Soil mounds and beds	A combination of measures of significance for mounds and beds: Medium and large mounds are classed together as 'large mounds'. Square and long beds are classed together as 'beds'. Very small mounds are excluded. Absent = 'none' and 'minor or insignificant' for all mounds and beds. Present = 'significant' and 'very significant' for all mounds and beds (6 classes).
12. Water management techniques	The presence or absence of the following: drainage, irrigation and soil retention barriers. For all features, 'nil' and 'minor or insignificant' are defined as 'absent'; and 'significant' and 'very significant' as 'present' (4 classes).

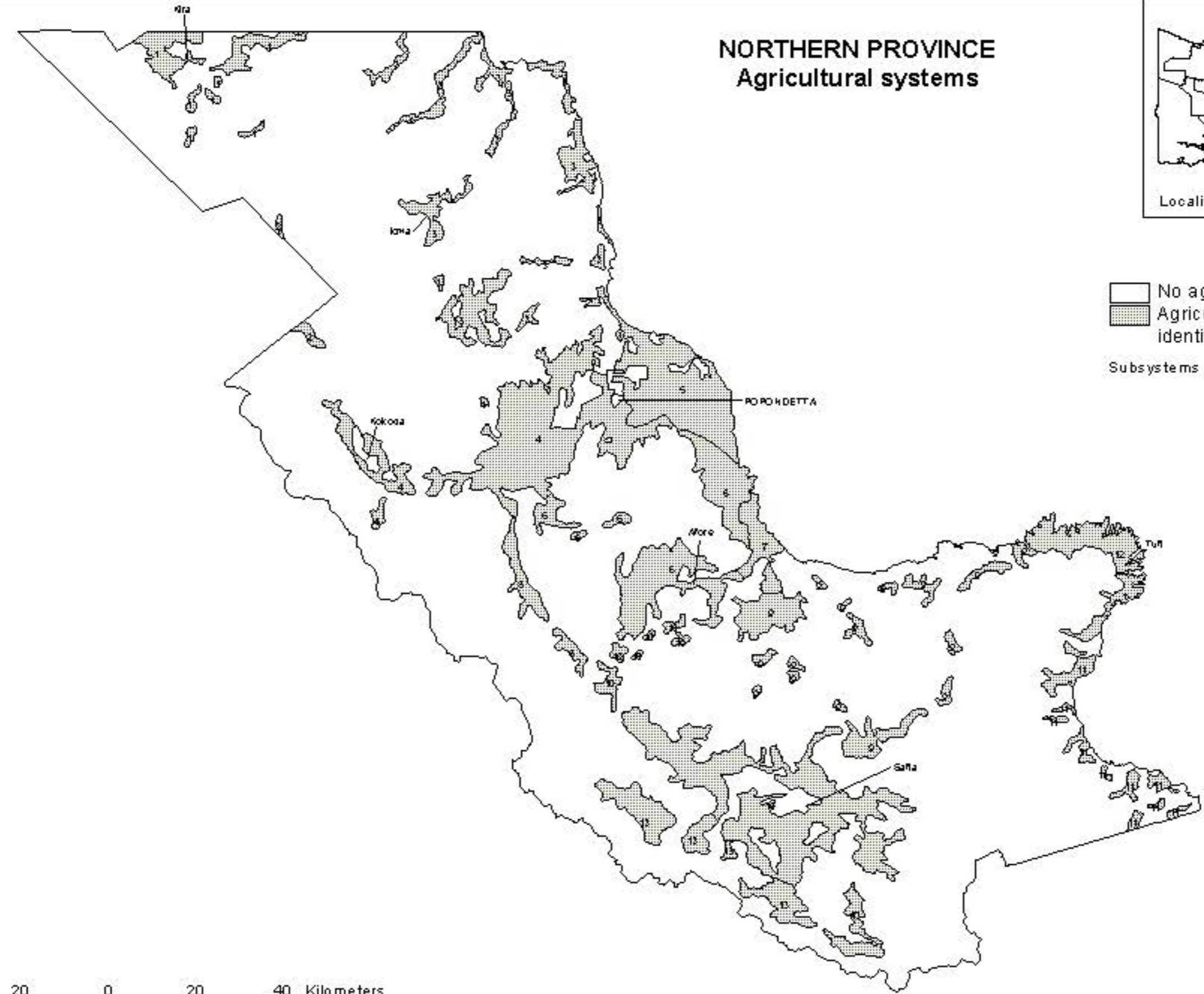
Map title	Notes
13. Cash income activities	Combinations of cash earning activities specific to this province. For all activities, 'nil' and 'minor or insignificant' are defined as 'absent'; and 'significant' and 'very significant' as 'present'.
14. Seasonality of the main food crops	Whether the dominant staple (most important) crops and the subdominant staple (important) are planted at about the same time each year. 'Nil' and 'minor or insignificant' are defined as 'absent'; and 'significant' and 'very significant' as 'present' (2 classes).
15. Population density	Persons per square kilometre, based on the 1980 National Population Census and the area occupied by the System (6 classes). 'Not applicable' refers to Systems where there are no census points.
16. Population absent	The proportion of the 'total' population listed in the 1979 Provincial Data System Rural Community Register as being 'absent 6 months or more' from the Census Unit (5 classes). 'Not applicable' refers to Systems where either there are no census points, or where the PDS data do not distinguish between the 'total' and 'resident' populations.

NORTHERN PROVINCE Agricultural systems



- No agriculture
- Agricultural system identified by number

Subsystems are present in System 5

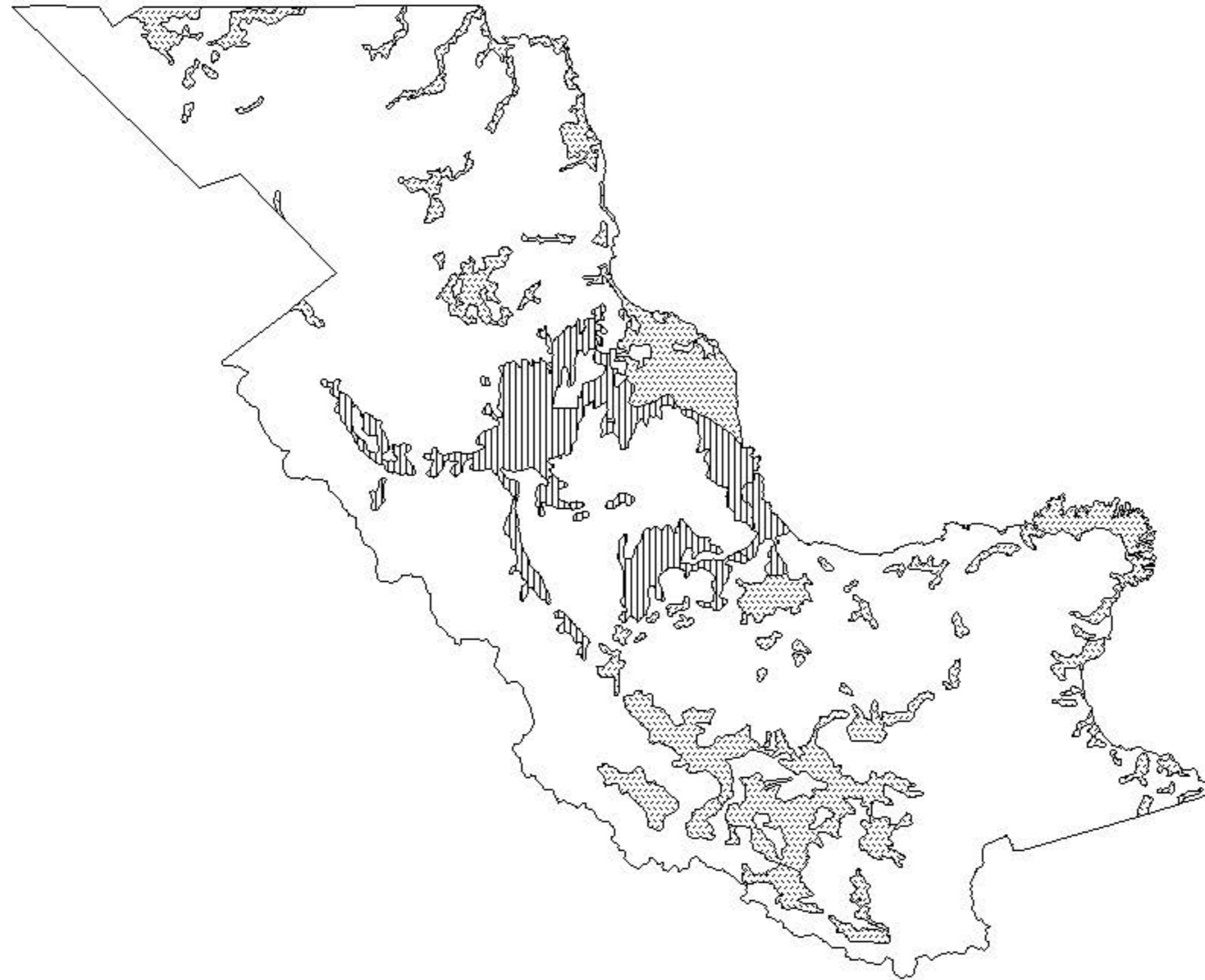


20 0 20 40 Kilometers

NORTHERN PROVINCE

Fallow vegetation

- Long fallow not used
- Short woody regrowth
- Tall woody regrowth



20 0 20 40 Kilometers

NORTHERN PROVINCE

Long fallow period

- Not significant
- 5 to 15 years
- Greater than 15 years



20 0 20 40 Kilometers

NORTHERN PROVINCE

Number of plantings before fallow

- 1 planting only
- 2 plantings
- 6 to 14 plantings



20 0 20 40 Kilometers

NORTHERN PROVINCE


Intensity of land use

Ratio of cropping period to fallow period

-  Very low
-  Low
-  Medium



20 0 20 40 Kilometers



NORTHERN PROVINCE
Crop combinations

Most important crops

Important crops



Chinese taro/sweet potato

Yam (*D. alata* and *D. esculenta*)



Sago

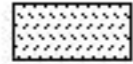
Taro

Sweet potato

Cassava/Yam (*D. esculenta*)

Sweet potato

Chinese taro/Taro



Sweet potato

Taro

Sweet potato

Banana/Taro

Sweet potato

Banana/Chinese taro/Yam (*D. alata* and *D. esculenta*)

Sweet potato

Banana/Coconut/Taro

Sweet potato

Banana/Cassava/Chinese taro

Sweet potato

Banana/Chinese taro/Coconut/Taro

Sweet potato

Banana/Chinese taro/Taro



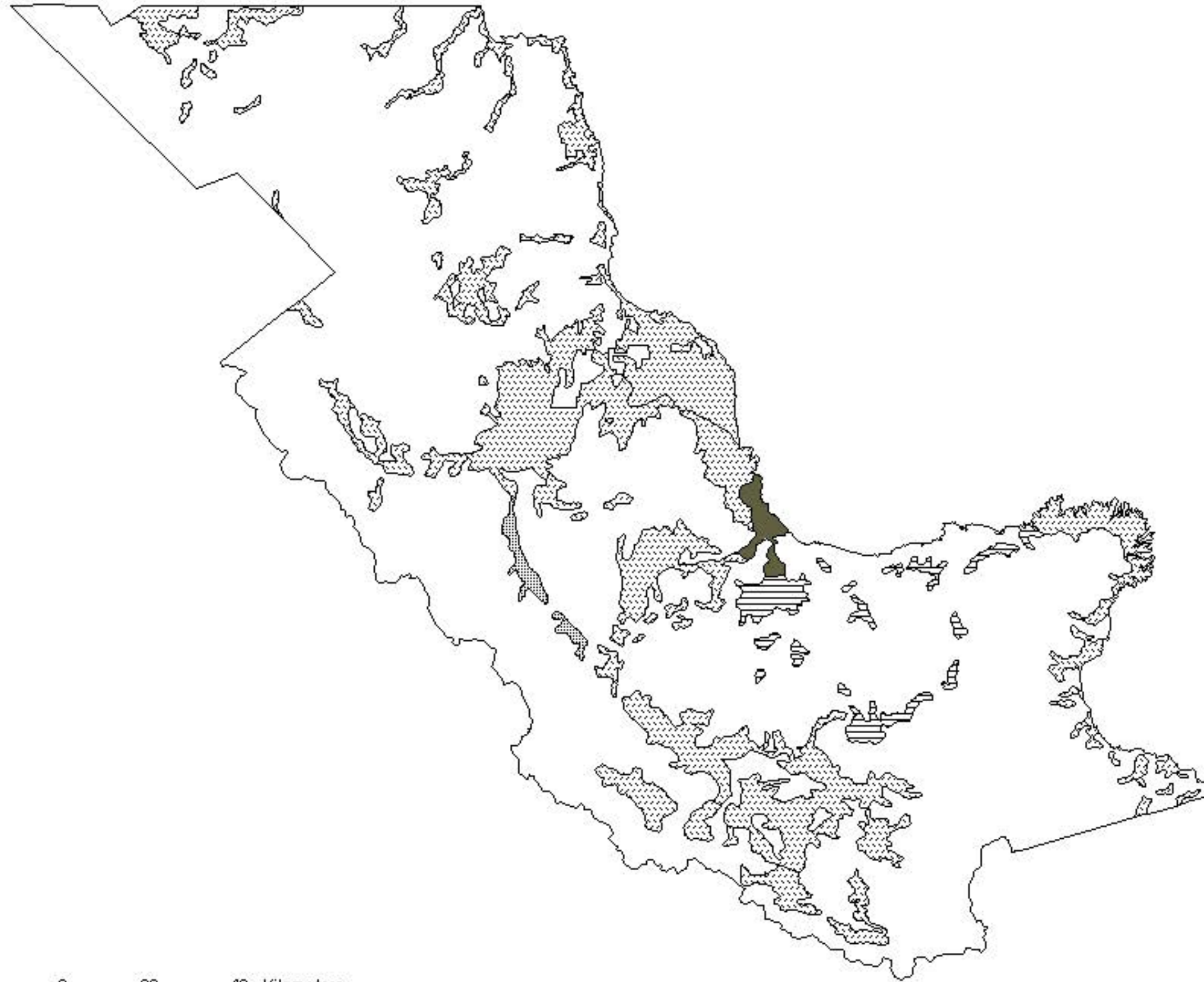
Sweet potato/Taro

Banana

NORTHERN PROVINCE

Crop combinations




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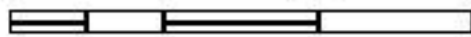
NORTHERN PROVINCE

Crop and garden segregation

-  Garden segregation
-  Crop segregation
-  No segregation




20 0 20 40 Kilometers




NORTHERN PROVINCE

Soil fertility maintenance

 Long fallow only



20 0 20 40 Kilometers



NORTHERN PROVINCE

Soil tillage

None

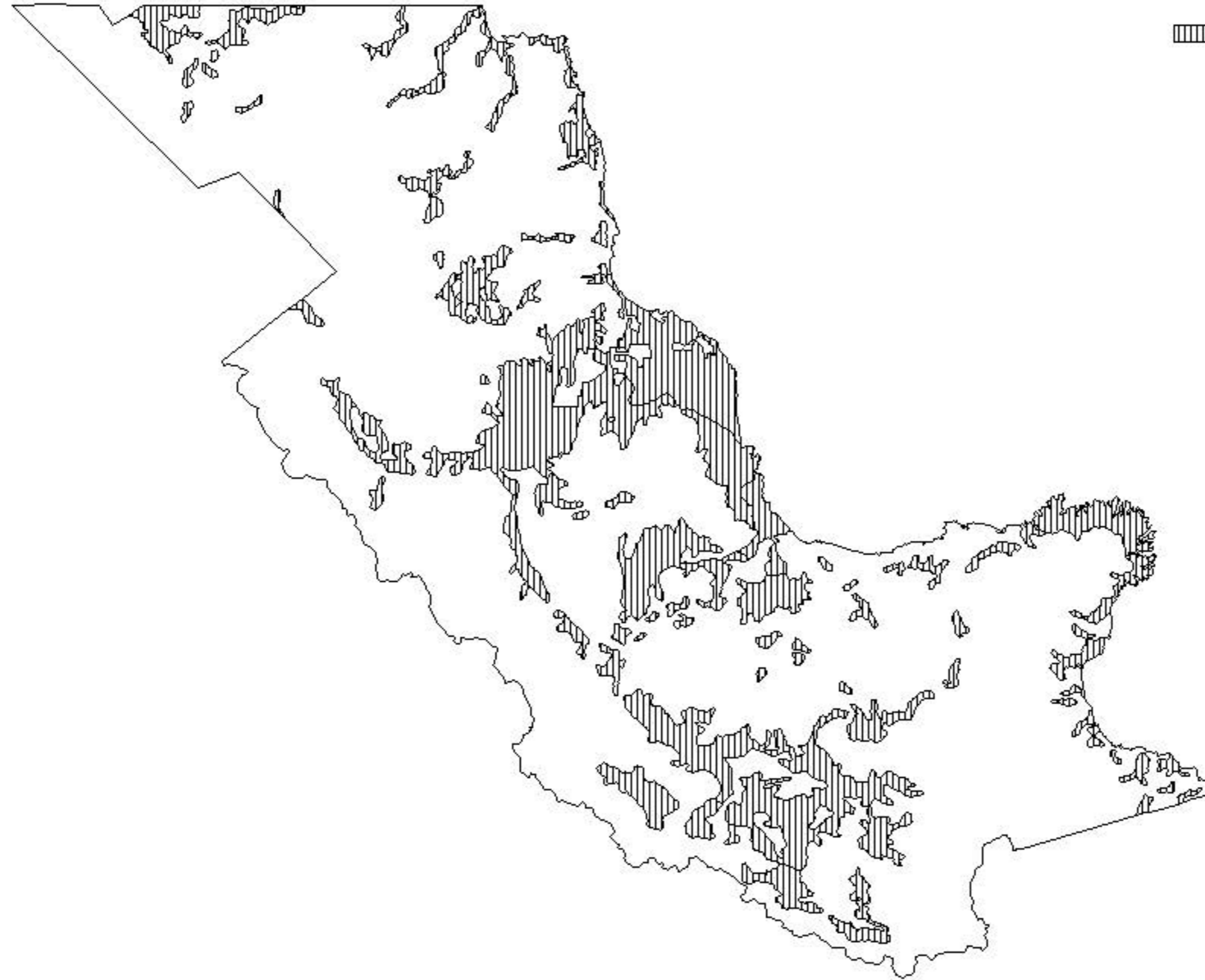


20 0 20 40 Kilometers

NORTHERN PROVINCE

Fallow clearing practices



▨ Fallow cut and burnt



20 0 20 40 Kilometers


NORTHERN PROVINCE

Soil mounds and beds

-  Mounds and beds absent
-  Small mounds present and beds absent




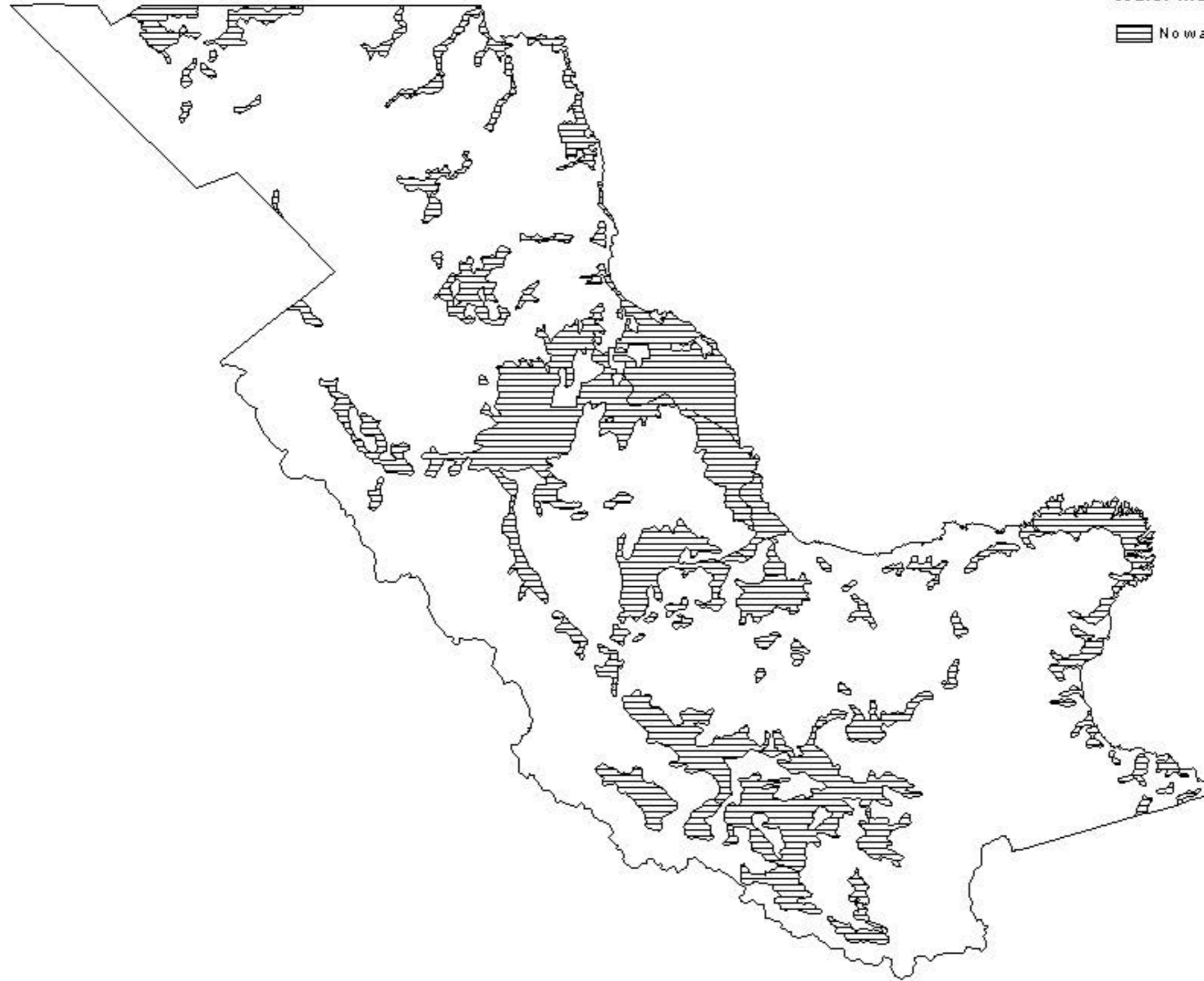
20 0 20 40 Kilometers



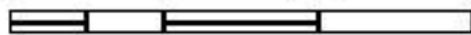
NORTHERN PROVINCE

Water management techniques

 No water control



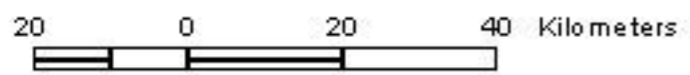
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NORTHERN PROVINCE



Cash income activities

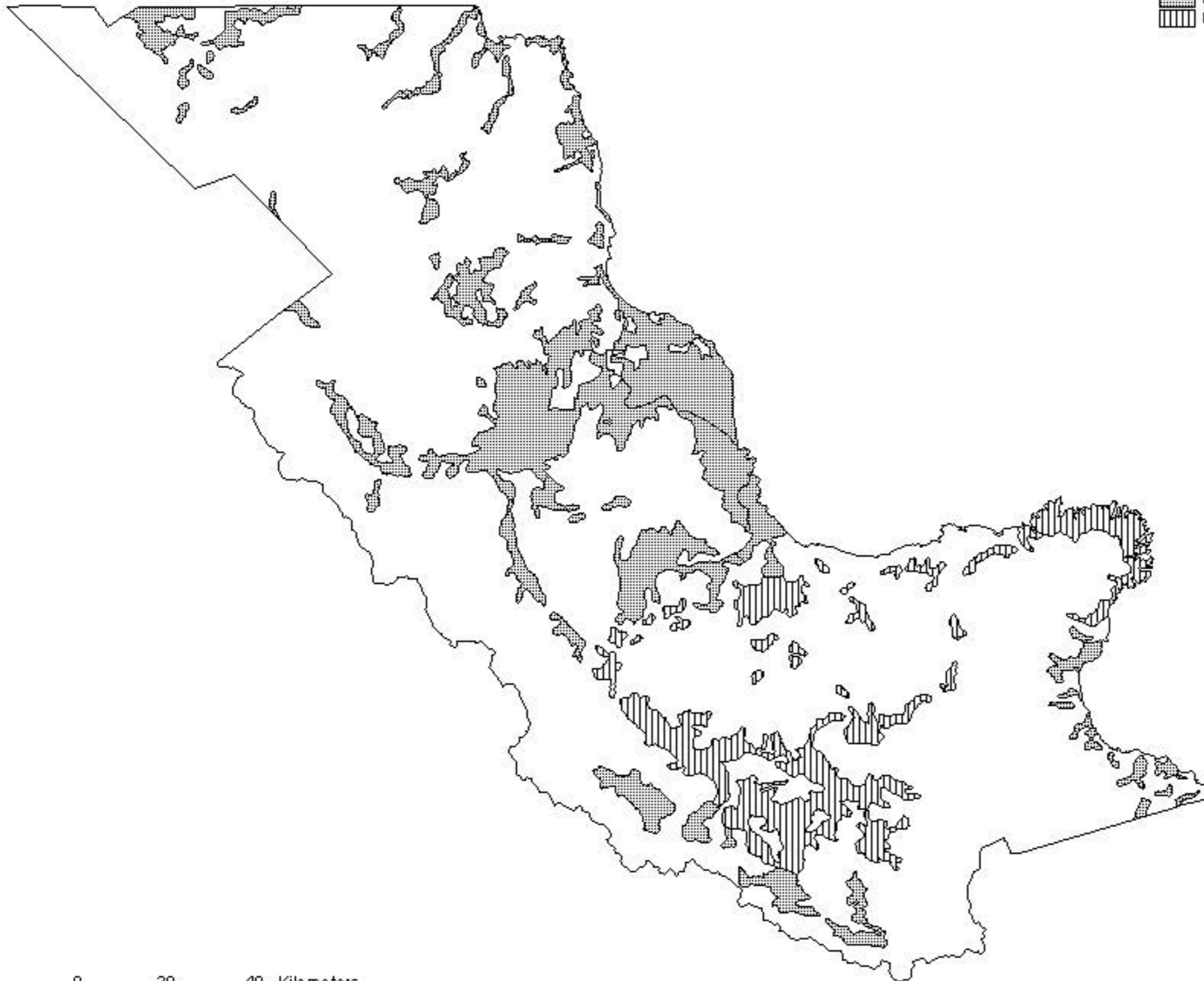
- No significant cash income
- Betel nut, fresh food
- Oil palm, fresh food
- Oil palm




NORTHERN PROVINCE

Seasonality of main crops

-  No seasonal planting
-  Planted seasonally

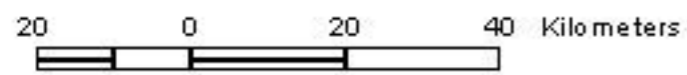
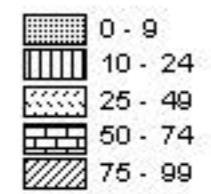


20 0 20 40 Kilometers



NORTHERN PROVINCE

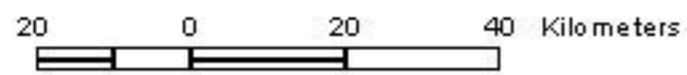
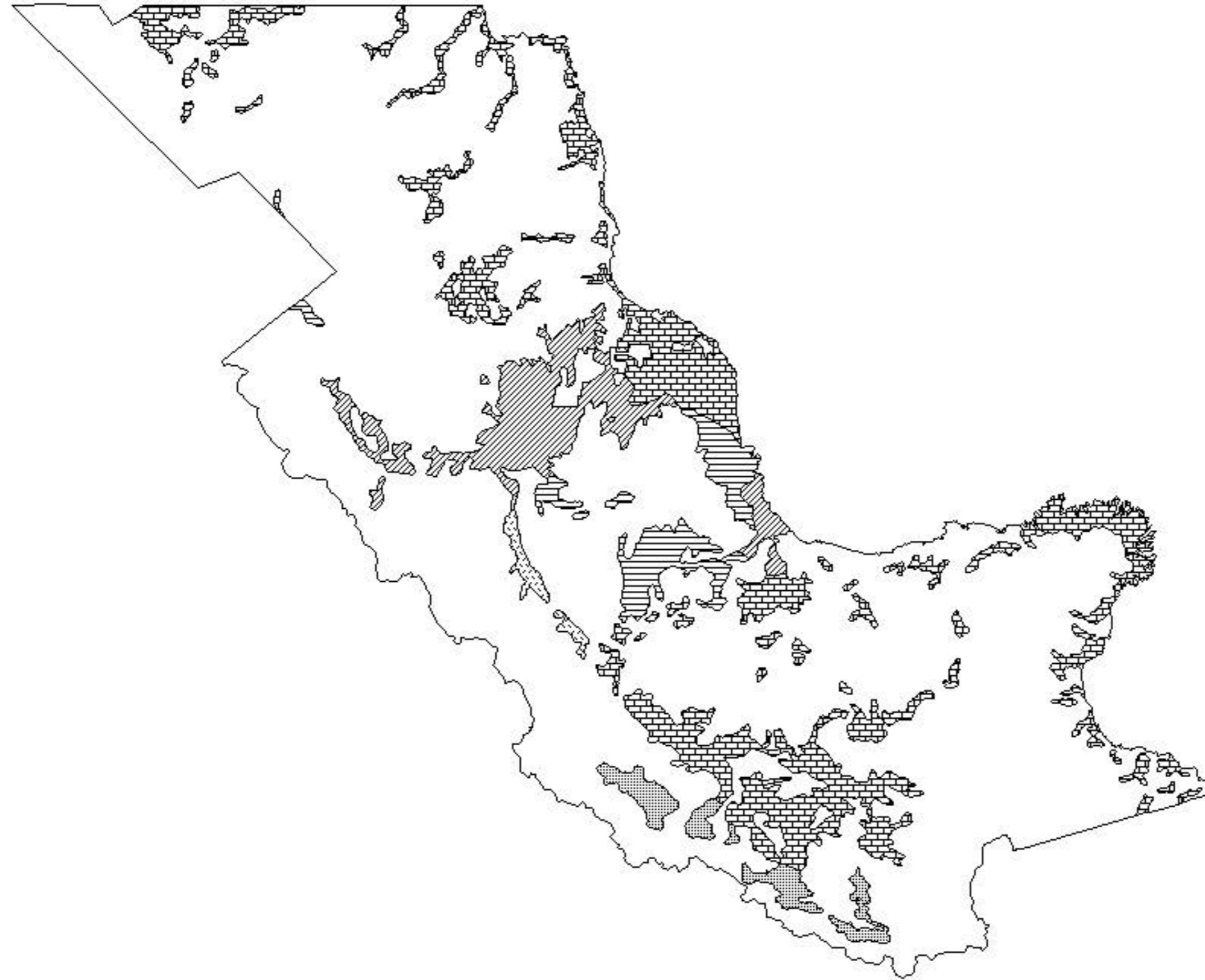
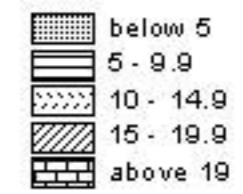
Population density Persons per square kilometre



NORTHERN PROVINCE

Population absent

Percentage



5. AGRICULTURAL SYSTEMS: DATA LISTING BY CODES

The following tables list all of the information contained within the database in coded form. The codes are contained in Section 2, Database Structure, Definitions and Codes.

AGRICULTURAL SYSTEM DATA LISTING - CODES

Province: 06 Northern

System	Sub sys	No. of subsys	Subsys extent	Same sys oth prov	Districts	Census Divisions
601	1	1	4	1239	2	75
602	1	1	4	0305	1	01
603	1	1	4	1240	2	
604	1	1	4		2	06-07-08-09
605	1	2	3		2	09-10
605	2	2	1		2	09-10
606	1	1	4		2	12
607	1	1	4		2	11
608	1	1	4		2	04
609	1	1	4		2-3	13-14-15-16
610	1	1	4		3	13
611	1	1	4	0530	3	16
612	1	1	4		3	16
613	1	1	4		3	13

KEY

Subsys Subsystem
 Same sys Same system in
 oth prov other province

AGRICULTURAL SYSTEM DATA LISTING - CODES

Province: 06 Northern

System	Sub sys	Area km ²	Population			Altitude range m		Slope	Fallows		
			Total	Abs	Den	Low	High		Veg	Sht	Per
601	1	190	2032	24	11	500	1100	3	5	0	3
602	1	23	168	8	7	100	1400	4	5	0	3
603	1	449	8255	23	18	0	100	1	5	0	3
604	1	839	18435	17	22	100	800	2	4	0	2
605	1	456	5835	20	13	0	100	2	5	0	3
605	2	0	0	0	0	0	100	2	1	0	3
606	1	500	8809	7	18	0	1000	3	4	0	3
607	1	102	1150	19	11	10	100	2	4	0	3
608	1	93	1475	13	16	800	1200	4	4	0	2
609	1	344	2082	22	6	0	600	5	5	0	3
610	1	852	1920	27	2	100	600	5	5	0	3
611	1	141	2389	30	17	0	40	1	5	3	3
612	1	225	3233	38	14	10	200	2	5	2	2
613	1	308	0	0	0	600	1200	4	5	0	3

KEY

Subsys Subsystem
 Area km² Area of System

Population

Total Resident population 1980
 Abs Absent population (%)
 Den Population density (persons/km²)

Fallows

Veg Type of Fallow vegetation
 Sht Short fallows
 Per Long fallow period

AGRICULTURAL SYSTEM DATA LISTING - CODES Province: 06 Northern

System	Sub sys	Staple crops			Narcotic crops
		Most import	Important	Present	
601	1	11	13	02-04-05-09-11-13	2-4-5
602	1	11	02-05-13	02-04-05-11-13-14-15	2-4-5
603	1	11	02-13	02-04-05-09-11-13-14-15-17	2-4-5
604	1	11	05-13	02-04-05-09-11-13-14-15	2-4-5
605	1	11	02-06-13	02-04-05-06-09-11-13-14-15	2-4-5
605	2	11	02-06-13	02-04-06-09-11-13-14-15	2-4-5
606	1	11	02-05-14-15	02-04-05-11-13-14-15	2-4-5
607	1	11-13	02	02-04-09-11-13-15	2-4-5
608	1	05-11	14-15	02-04-05-11-13-14-15	1-2-4-5
609	1	09	13	02-04-09-11-13-14-15	2-4-5
610	1	11	04-15	02-04-11-13-14-15	2-4-5
611	1	11	02-06-13	02-04-06-09-11-12-13-14-15	2-4-5
612	1	11	02-05-06-13	02-04-05-06-09-11-13-14	2-4-5
613	1	11	02-04-05	02-04-05-11-13-14-15-19	1-2-4-5

KEY

Subsys Subsystem

AGRICULTURAL SYSTEM DATA LISTING - CODES Province: 06 Northern

System	Sub sys	Vegetable crops	Fruit crops	Nut crops
601	1	01-02-03-05-09-10-13-16-19-21	01-05-06-08-13-15-17-23	04-09-10
602	1	01-02-05-08-09-15-16-21-23-27	06-07-08-12-13-15-17-30	01-04-10-13
603	1	01-02-09-10-15-16-19-21-23-27	07-08-09-12-13-15-17	01-04-06-10
604	1	01-02-09-10-15-16-19-21-23-27	07-05-08-09-12-13-15-17	01-04-06-10
605	1	01-02-09-10-15-16-19-21-23-27	07-09-12-13-15-17-23	01-06-10
605	2	01-02-09-16-19-21-27-28	07-09-12-13-15-17-23	01-06-10
606	1	01-02-05-08-09-10-13-16-21-27	06-07-08-12-13-15-17-23	01-04-10-11
607	1	01-09-16-21- 27-44	07-08-12-13-15-17	01-04-10
608	1	01-02-08-09-13-15-16-21-23-27	01-05-06-07-08-12-13-15	01-04-09-10
609	1	01-02-09-10-15-16-21	07-08-12-13-15-17	01-04-10
610	1	01-02-09-10-15-16-19-21-23	07-08-09-12-13-15-17-2	01-04-06-10
611	1	01-02-09-10-16-21-23-27	05-07-12-13-15-16-17	01-06-10
612	1	01-02-05-09-10-11-14-16-21-27	04-07-09-12-13-15-17	01-07-10
613	1	01-02-09-13-16-21-23-27-29	05-07-08-09-12-13-15-23	01-04-06-08-10

KEY

Subsys Subsystem

AGRICULTURAL SYSTEM DATA LISTING - CODES

Province: 06 Northern

System	Sub sys	Segregation		Crop Seq	Gard types		Soil fertility maintenance techniques							
		Gar	Crp		Mix	H'ld	Leg	Tre	Com	Man	Isl	Sil	Fer	
601	1	3	1	0	0	0	0	0	0	0	0	0	0	0
602	1	1	2	0	0	0	0	0	0	0	0	0	0	0
603	1	3	0	1	0	0	0	0	0	0	0	0	1	0
604	1	3	1	1	0	0	0	0	0	0	0	0	0	0
605	1	3	1	1	0	1	0	0	0	0	0	0	0	0
605	2	0	2	1	0	1	0	0	0	0	0	0	0	0
606	1	3	1	1	0	0	0	0	0	0	0	0	0	0
607	1	0	3	3	0	2	0	0	0	0	0	0	0	0
608	1	3	0	0	0	1	0	0	0	0	0	0	0	0
609	1	0	3	0	0	1	0	0	0	0	0	0	0	0
610	1	0	3	2	0	1	0	0	0	0	0	0	0	0
611	1	1	3	2	0	0	0	0	0	0	0	0	3	0
612	1	1	3	2	0	1	0	0	0	0	0	0	0	0
613	1	0	0	0	0	0	0	0	0	0	0	0	0	0

KEY

Subsys Subsystem

Segregation

Gar Garden

Crp Crop

Crop seq Crop sequences

Gard types Garden types

Mix Mixed vegetable gardens

H'ld Household gardens

Soil fertility maintenance techniques

Leg Legume rotation

Tre Planted tree fallow

Com Compost

Man Animal manure

Isl Island bed

Sil Silt from floods

Fer Inorganic fertilizer

AGRICULTURAL SYSTEM DATA LISTING - CODES

Province: 06 Northern

System	Sub sys	Management techniques											
		Water		Soil						Fallow		Other	
		Irr	Drn	Pig	Till	Hol	Bar	Mul	Mec	Brn	Cut	Fen	Stk
601	1	0	0	0	0	0	0	0	0	3	1	0	0
602	1	0	0	0	0	0	0	0	0	3	0	3	1
603	1	0	0	0	0	0	0	0	0	3	0	3	1
604	1	0	0	0	0	0	0	0	0	3	0	2	1
605	1	0	0	0	0	0	0	0	0	3	0	3	1
605	2	0	0	0	0	0	0	0	0	3	0	1	1
606	1	0	0	0	0	1	0	0	0	3	0	1	1
607	1	0	0	0	0	0	0	0	0	3	0	3	1
608	1	0	0	0	0	1	0	0	0	2	0	2	1
609	1	0	0	0	0	0	0	0	0	3	0	3	1
610	1	0	0	0	0	0	0	0	0	3	0	0	1
611	1	0	0	0	0	0	0	0	0	2	0	3	1
612	1	0	0	0	0	0	0	0	0	3	0	1	1
613	1	0	0	0	0	0	0	0	0	3	0	3	0

KEY

Subsys Subsystem

Management techniques

Water management

Irr Irrigation

Drn Drainage

Soil management

Pig Pigs placed in gardens

Till Tillage

Hol Deep holing (for yams)

Bar Soil retention

Mul Mulching

Mec Mechanized soil tillage

Fallow management

Brn Burning of cut vegetation

Cut Fallow cut onto crops

Other

Fen Fencing

Stk Staking of crops

AGRICULTURAL SYSTEM DATA LISTING - CODES

Province: 06 Northern

System	Sub sys	Management techniques						Crop planting seasonality		Cropping intensity	R value
		Soil mounds				Garden beds		Maj	Min		
		Vsm	Sm	Md	Lge	Sq	Lg				
601	1	0	3	0	0	0	0	1	1	1	5
602	1	0	3	0	0	0	0	0	1	1	5
603	1	0	2	0	0	0	0	1	1	2	9
604	1	0	3	0	0	0	0	1	1	2	17
605	1	0	3	0	0	0	0	1	1	2	9
605	2	0	3	0	0	0	0	1	1	2	9
606	1	0	2	0	0	0	0	1	1	1	16
607	1	0	2	0	0	0	0	1	1	2	9
608	1	0	2	0	0	0	0	1	1	1	33
609	1	0	1	0	0	0	0	2	2	1	5
610	1	0	0	0	0	0	0	2	2	2	9
611	1	0	3	0	0	0	0	1	1	4	33
612	1	0	3	0	0	0	0	3	2	2	17
613	1	0	0	0	0	0	0	0	0	1	5

KEY

Subsys Subsystem
Management techniques
Soil mounds
Vsm Very small
Sm Small
Md Medium
Lge Large

Garden beds
Sq Square
Lg Long
Crop planting seasonality
Maj Dominant
Min Other crops

AGRICULTURAL SYSTEM DATA LISTING - CODES

Province: 06 Northern

System	Sub sys	Cash income sources											
		An	Bet	Crd	Cat	Chi	Coc	Cnt	CfA	CfR	Crc	Fwd	Fsh
601	1	1	0	0	0	0	0	0	0	0	0	0	0
602	1	0	2	0	0	0	0	0	1	0	0	0	0
603	1	0	1	0	0	0	0	0	0	0	0	0	1
604	1	0	1	0	0	0	1	0	0	0	0	1	0
605	1	0	1	0	0	0	1	0	0	0	0	0	0
605	2	0	1	0	0	0	1	0	0	0	0	0	0
606	1	0	1	0	0	0	0	0	1	0	0	1	0
607	1	0	0	0	0	0	0	0	0	0	0	0	1
608	1	1	0	0	0	0	0	0	1	0	0	0	0
609	1	0	0	0	0	0	0	0	0	0	0	0	1
610	1	0	0	0	1	0	0	0	0	0	0	0	0
611	1	0	0	0	0	0	0	0	0	0	0	0	1
612	1	0	1	0	0	0	0	0	0	0	0	0	1
613	1	0	0	0	0	0	0	0	0	0	0	0	0

KEY

Subsys Subsystem

Cash Income Sources

An Animal skins
 Bet Betel nut
 Crd Cardamom
 Cat Cattle

Chi Chillie
 Coc Cocoa
 Cnt Coconut
 CfA Coffee Arabica

CfR Coffee Robusta
 Crc Crocodile
 Fwd Firewood
 Fsh Fish

AGRICULTURAL SYSTEM DATA LISTING - CODES **Province: 06 Northern**

System	Sub sys	Cash income sources										
		Fod	Op	Pot	Pyr	Ric	Rub	Shp	Tea	Tob	Ot1	Ot2
601	1	1	0	0	0	0	0	0	0	0	0	0
602	1	2	0	0	0	0	1	0	0	0	0	0
603	1	1	1	0	0	0	0	0	0	0	0	0
604	1	2	3	0	0	0	0	0	0	1	0	0
605	1	1	2	0	0	0	0	0	0	0	0	0
605	2	1	2	0	0	0	0	0	0	0	0	0
606	1	1	0	0	0	0	0	0	0	0	0	0
607	1	1	0	0	0	0	0	0	0	0	0	0
608	1	1	0	0	0	0	0	0	0	0	0	0
609	1	1	0	0	0	0	0	0	0	0	0	0
610	1	1	0	0	0	0	0	0	0	0	0	0
611	1	1	0	0	0	0	0	0	0	0	0	0
612	1	1	0	0	0	0	0	0	0	0	0	0
613	1	1	0	0	0	0	0	0	0	0	0	0

KEY

Subsys Subsystem
Cash Income Sources
Fod Fresh food
Op Oil Palm
Pot Potato
Pyr Pyrethrum

Ric Rice
Rub Rubber
Shp Sheep
Tea Tea

Tob Tobacco
Ot1 Other 1
Ot2 Other 2

AGRICULTURAL SYSTEM DATA LISTING - CODES

Province: 06 Northern

System	Sub sys	Survey 1				Survey 2				Survey 3			
		Date mth yr	Period yrs	Sv tp	Sv in	Date mth yr	Period yrs	Sv tp	Sv in	Date mth yr	Period yrs	Sv tp	Sv in
601	1	09 95	-	2	BJA	09 95	-	3	BJA	--	-	-	
602	1	08 95	-	3	TN	--	-	-		--	-	-	
603	1	09 95	-	3	A/N	--	-	-		--	-	-	
604	1	03 82	-	3	B/A	09 95	-	3	BJA	--	-	-	
605	1	09 95	-	3	BJA	--	-	-		--	-	-	
605	2	09 95	-	3	BJA	--	-	-		--	-	-	
606	1	03 82	-	3	B/A	09 95	-	3	BJA	--	-	-	
607	1	09 95	-	2	BJA	--	-	-		--	-	-	
608	1	09 95	-	2	BJA	--	-	-		--	-	-	
609	1	01 94	-	3	A/S	02 96	-	3	GS	--	-	-	
610	1	09 95	-	3	A/N	--	-	-		--	-	-	
611	1	01 94	-	3	A/S	--	-	-		--	-	-	
612	1	01 94	-	3	A/S	02 96	-	3	GS	--	-	-	
613	1	--	-	-		--	-	-		--	-	-	

KEY

Subsys	Subsystem	A/N	B.J. Allen/T. Nen
Sv tp	Survey type	A/S	B.J. Allen/G. Sem
Sv in	Surveyor initials	B/A	R.M. Bourke/W. Akus
		BJA	B.J. Allen
		GS	G. Sem
		TN	T. Nen

6. LISTINGS OF RURAL VILLAGES (CENSUS UNITS) INDEXED TO AGRICULTURAL SYSTEMS

All rural village Census Units in the 1980 National Population Census which are locatable on either the 1980 or 1990 Census Maps are assigned to an Agricultural System. The village name, National Population Census identification codes (Province, District, Census Division, Census Unit), population and Agricultural System number for each village is held as a single record in a population database (AGPOP). District and Census Division codes for this Province are listed in Appendix A.2.

This section provides three different listings from that database of rural villages indexed by Agricultural Systems:

6.1 Rural villages listed in census order (District, Census Division).

6.2 Rural villages listed in alphabetical order.

6.3 Rural villages listed by Agricultural System number (alphabetically within agricultural systems) with PNGRIS Resource Mapping Unit (RMU) numbers.

Abbreviations used are:

Dist	District name and number (see Appendix A.2)
Div	Census Division number (see Appendix A.2)
Population	1980 National Population Census count of population in a Unit
RMU	Provincial Resource Mapping Unit number (PNGRIS)
System	Agricultural System number
Village	Census Unit name
Unit	Census Unit number

6.1 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN CENSUS ORDER

Province: 6 Northern

Village	Population	System	Village	Population	System
DISTRICT 1 Kokoda			DISTRICT 2 Popondetta		
Division 1 Chirima			Division 7 Sohe		
1 ASIMBA	97	0602	3 DIVINOKOVARI	262	0604
2 KANGA	70	0604	4 GIRIGIRITA	144	0604
3 KARUKARU	71	0602	6 HORAU	136	0604
Division 2 Hujara			7 HURURU	215	0604
1 AJEKA	222	0604	8 HUJAVASUSU	267	0604
2 AMADA	69	0604	9 HUNGIRI	109	0604
3 AMBENE	224	0604	11 JAJAU	161	0604
4 ASAPA	306	0606	12 KANARI	94	0604
5 ASISI	171	0604	13 KIPORE	104	0604
6 BOTHU	116	0604	14 OERE	119	0604
7 DIAPA	76	0606	15 ONGOHO	168	0604
8 ENJORA	82	0606	16 PAPOGA	241	0604
9 EVASUSU	142	0604	17 PEROMBATURU	245	0604
10 HAKI 1	62	0604	18 POHA	281	0604
11 HAKI 2	58	0604	20 SEREMBE	284	0604
12 HAMARA	108	0604	21 TOGAHO	85	0604
13 HANJIRI	213	0604	22 TUNANA	155	0604
14 HAVAKI	88	0604	23 URARISUSU	34	0604
16 HOJAVAHAMBO	104	0604	Division 8 Saiho		
17 ILIMO	147	0604	1 AGENAHEMBO	361	0604
18 KAMONDO	57	0604	2 AWALA	544	0604
19 KANANDARA	104	0604	3 BARAVATURU	796	0604
20 KEPARA	159	0604	4 BORU	107	0604
21 KOKODA	75	0604	5 DUVE	238	0605
22 MAUJETA	150	0604	6 GAROMBI	192	0604
23 OMBISUSU	274	0604	7 HAMBURATA	133	0604
24 PAPAKI	206	0604	8 HANDARITURU	356	0604
25 PIJA HAMARA NO 2	46	0604	10 ISOGE	138	0604
26 PIRIVE	186	0604	11 KENDATA	559	0604
27 PUTEMO	156	0604	12 KIOROTA	800	0604
28 SAGA	109	0604	14 KOROPATA 1	244	0604
29 SAIROPE	437	0604	15 KOROPATA 2	527	0604
30 SAVAIA	230	0604	16 MUMUNI	520	0604
31 SENGI	257	0604	17 POPONDOTA	108	0604
32 SIRORATA	250	0604	18 SASEMBATA	206	0604
33 SISIRETA	237	0604	19 SINGI	268	0604
34 SORAPE	63	0604	20 SIVEPI	241	0604
35 WAJU	221	0604	21 SOROPUTA	249	0604
15 HOJAKI	53	0604	22 SUI	319	0604
Division 3 Biage			23 TOROGOTA	173	0604
1 ABUARI	65	0604	24 TUNANA	170	0604
2 ALOLA	58	0604	25 UHITA	147	0604
3 HAGUTAVA	48	0604	26 URARITURU	241	0604
4 ISURAVA	60	0604	27 WASETA	202	0604
5 KAILE	58	0604	Division 9 Popondetta		
6 KOVELO 1&2	196	0604	1 AJORO	61	0604
7 PELAI	52	0604	2 DOBUDURU	119	0604
Division 4 Wawonga			3 GEWOTO	179	0605
1 AWOMA	268	0608	4 HOHOTA	101	0604
2 EJARO	148	0608	5 HUVIVI	178	0604
3 EMO	240	0608	6 INONDA	61	0604
4 KOVIO	160	0608	8 JEGARATA	313	0604
5 MANAGUBE	112	0608	10 MONGI	94	0604
6 NAMANAIA	254	0608	11 MOSOU	64	0604
7 TETEBEDI	86	0608	12 SEWA	223	0604
8 UJILO	76	0608	13 SOPUTA	146	0605
9 IAURE	131	0608	14 HOHORITA	444	0604

6.1 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN CENSUS ORDER

Province: 6 Northern

Village	Population	System	Village	Population	System
15 KOIPA	289	0604	30 KOPURE	147	0606
16 IVORE	105	0604	31 LEMBADI	52	0609
17 SEHORO	77	0604	32 MENGADI	74	0607
19 BEURU	233	0605	33 NATATU	62	0605
20 AHORA	279	0605	34 PONGANI	175	0607
Division 10 North Coast			35 PUIN	11	0607
1 AMBASI	116	0603	36 REIBAI	172	0606
2 AURE	226	0603	37 SANANANDA	123	0605
3 BAKUBARI	169	0605	38 SARIRI	104	0609
4 BATARI	118	0603	39 SEBODA	60	0607
5 BEKABARI	240	0603	40 SIREMI	175	0605
6 BINDARI	225	0603	41 SONGADI	53	0607
7 DEVATUTU	173	0603	42 TOGOFU	65	0606
8 FUFUDA	203	0605	43 URIO	258	0605
9 GARARA	407	0605	44 WAIWA	103	0607
10 GONA	249	0605			
11 IWAIA	153	0603	DISTRICT 3 Tufi		
12 JINENA	19	0603	Division 14 Dyke Ackland Bay		
13 JITAMI	73	0603	1 AKO	141	0609
14 KAINDE	149	0603	2 BADAIDE	58	0609
15 KATUNA	280	0603	3 BAKO	69	0609
16 KOIRA	85	0603	4 BENDORODA	44	0609
17 KONJE	344	0605	5 DOVE	60	0609
18 KUREREDA	116	0603	6 EMBESSA	258	0609
19 KUROU	165	0605	7 FORU NO 1	55	0609
20 MOMONGA	58	0603	8 FORU NO 2	81	0609
21 ONONDA	174	0605	9 GOBE	243	0609
22 OURE	92	0603	10 GURUGURU	98	0609
24 SEBU	46	0603	11 KARAIISA	169	0609
Division 11 Oro Bay			12 KARISOA	97	0609
1 ANGO	115	0605	13 KINJAKI	78	0609
2 BABERADA	143	0605	14 KURUAKU	37	0609
3 BANDERI	335	0606	15 MAFUIA	111	0612
4 BARISARI	370	0605	16 MOIAVI	102	0609
5 BEAMA	187	0606	17 MOMOIGO	63	0609
6 BEAMATU	62	0606	18 TUMINA	25	0609
7 BOREARA	44	0606	Division 15 Cape Nelson		
8 BORANGOVE	32	0605	1 AMUIOAN	14	0612
9 BORIO	61	0605	2 ANGOROGO	76	0612
10 BOROU	92	0606	3 BAGA	43	0612
11 BUNA	332	0605	4 BAI'ATA	30	0612
12 BUSEGA	116	0605	5 BAMBITI	44	0612
13 DOBUDURU	208	0605	6 BARABARA	82	0612
14 DOMBADA	201	0605	7 BAUWAME	84	0612
15 DOROMUSA	112	0607	8 BEKOIANA	64	0612
16 EMBI	82	0605	9 BERUBONA	118	0612
17 EMBOGO	214	0605	10 FODUMA	164	0612
18 EMO	206	0607	11 FOFOMA	47	0612
19 ENDABURU	97	0607	12 FONIBARU	34	0612
20 GARURU	121	0605	13 FOUNA	87	0612
21 GOMBARA	40	0609	14 GAVIDE	74	0612
22 GUNIMBA	29	0607	15 GEBARA	13	0612
23 HANAHIRO	304	0606	17 IAGIRUA	39	0612
24 HANAU	189	0605	18 ILAMARORO	24	0612
25 HARIGO	81	0605	19 ITONOMATA	16	0612
26 IWUJI	147	0607	20 IUBADI	7	0612
27 JEGARAKAMBO	29	0607	21 JEBO	80	0612
28 KENDATA	166	0605	22 JIKUATAIA	33	0612
29 KEVI	54	0607	23 KABUBU	45	0612

6.1 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN CENSUS ORDER

Province: 6 Northern

Village	Population	System	Village	Population	System		
24	KABUNI	70	0612	10	KAURA	245	0606
25	KANAVETU	33	0612	11	KAWOWOKI	168	0606
26	KAPWARURU	30	0612	12	KERO	150	0606
27	KARIKARI	36	0612	13	KIARA	239	0606
28	KASIAWA	55	0612	14	KOKORO	206	0606
29	KATOKATO	65	0612	15	KORUWO	352	0606
30	KIKITA	22	0612	16	KUAI	138	0606
31	KOJE	120	0612	17	KWENO	340	0606
32	KONABU	24	0612	18	MARASI	151	0606
33	KONEDOBU	54	0612	19	NATANGA	377	0606
34	KORUWE	90	0612	20	NINIURI	178	0606
35	KURIRIKA	30	0612	21	NUMBA	470	0606
36	KWAPULINA	109	0612	22	ONDORO	74	0606
37	KWAVE	33	0612	23	SEMAHARA	108	0606
38	LELIOA	64	0612	24	SILA	137	0606
39	MANAGA	35	0612	25	SILIBU	312	0606
40	MARASA	54	0612	26	TABUANE	260	0606
41	NATUKWABA	19	0612	27	TAHAMA	270	0606
42	OROTOABA	79	0612	28	TOMA	174	0606
43	RABADE	31	0612	29	UFIA	237	0606
44	SIMUMU	14	0612	30	UMBWARA	479	0606
45	SINEI	68	0612	31	UMWATA	77	0606
46	SIU	34	0612	32	YOIVI	179	0606
47	TAINABUNA	106	0612	Division	13 Musa		
48	TENIARU	62	0612	1	AIARE	172	0610
49	TUFI	29	0612	2	ASAGA	72	0610
50	TUMARI	105	0612	3	AVEKARO	85	0610
51	UTUKWAF	144	0612	4	AWALA	311	0610
Division	16 Collingwood Bay			5	BIRIRA NO 1	99	0610
1	AIRARA	128	0611	6	BIRIRA NO 2	92	0610
2	GANJIJA	179	0611	7	DOMARA	70	0610
3	GIGORI	81	0612	8	GOBERA	35	0610
4	ITOTO	69	0612	9	JARI	135	0610
5	IU'AI'IU	103	0611	10	KOIRA	164	0610
6	KEWANSASAP	169	0611	11	MORO	134	0610
7	KOMABUN	212	0611	12	NAMUDI	170	0610
8	KOREAF	83	0611	13	OBEA	119	0610
9	LAKO	132	0611	14	SAFIA	86	0610
10	LEAGA	87	0611	15	SIBIA	69	0610
11	MARUA	105	0611	16	SILIMIDI	52	0610
12	NAUKWATE	80	0611	17	UMAUMA	55	0610
13	ORERESAN	211	0611	DISTRICT	5 Ioma		
14	RAINU	298	0611	Division	5 Binandere		
15	SINAPA	100	0611	1	AINSI	108	0603
16	SINAPARA	210	0611	2	BARARA	121	0603
17	UIAKU	292	0611	3	BATARI	111	0603
18	UWE	139	0612	4	BOKE	43	0603
DISTRICT	4 Afore			5	BOVERA	276	0603
Division	12 Mangalas			6	DEBOIN	277	0603
1	AFORE	184	0606	7	EWORE	255	0603
2	AWARU	257	0606	8	IAUDARI NO 1	184	0603
3	BUABORO AND BUA	86	0606	9	IAUDARI NO 2	241	0603
4	DAREKI	106	0606	10	INA AND DABARI	99	0603
5	DEA	370	0606	11	KARUDE	93	0603
6	GEWOIA	208	0609	12	KOTAURE	153	0603
7	GORA	213	0606	13	KUREREDA	234	0603
8	GORABUNA	161	0606	14	MAMBATUTU	178	0603
9	ITOKAMA	239	0606	15	MANAU	168	0603

6.1 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN CENSUS ORDER

Province: 6 Northern

Village	Population	System	Village	Population	System
16 NINDEWARI	129	0603	12 PETEKIARI	53	0603
17 ONOMBATUTU	94	0603	13 POHO 1&2	101	0603
18 SIA	199	0603	14 SAGERE	129	0603
19 TABARA	102	0603	15 SIAI	150	0603
20 TAIRE	150	0603	16 USUINDARI	161	0603
21 TAUTUTU	113	0603	17 UTUKEARI	92	0603
22 TAVE	167	0603	DISTRICT 6 Kira		
23 TUBI	42	0603	Division 17 Papuan Waria		
24 WADE	35	0603	1 AGUTAMI	222	0601
25 WAGADARI	151	0603	2 AVIHASA	162	0601
Division 6 Aeka			3 GIMINE	65	0601
1 BORUGASUSU	246	0603	4 GOBE	117	0601
2 DEUNIA	69	0603	5 JUWERA	171	0601
3 DIROU	39	0603	6 KIRA	214	0601
4 DOWAIA	59	0603	7 OIBO	93	0601
5 GORISATA	222	0603	8 OROUBA	105	0601
6 HURATA	249	0603	9 SEDEMA	150	0601
7 KAIARI	88	0603	10 UPUPORO	75	0601
8 KIKINONDA	260	0603	11 YEMA	274	0601
9 KONINDA	29	0603	12 PEMA	319	0601
10 OSAKO	267	0603	13 TIWA	65	0601
11 OITATANDI	149	0603			

6.2 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN ALPHABETICAL ORDER

Province: 6 Northern

Village	Dist	Div	Unit	System	Village	Dist	Div	Unit	System
ABUARI	1	3	1	0604	BORIO	2	11	9	0605
AFORE	4	12	1	0606	BOROU	2	11	10	0606
AGENAHEMBO	2	8	1	0604	BORU	2	8	4	0604
AGUTAMI	6	17	1	0601	BORUGASUSU	5	6	1	0603
AHORA	2	9	20	0605	BOTHU	1	2	6	0604
AIARE	4	13	1	0610	BOVERA	5	5	5	0603
AINSI	5	5	1	0603	BUABORO AND BUA	4	12	3	0606
AIRARA	3	16	1	0611	BUNA	2	11	11	0605
AJEKA	1	2	1	0604	BUSEGA	2	11	12	0605
AJORO	2	9	1	0604					
AKO	3	14	1	0609	DAREKI	4	12	4	0606
ALOLA	1	3	2	0604	DEA	4	12	5	0606
AMADA	1	2	2	0604	DEBOIN	5	5	6	0603
AMBASI	2	10	1	0603	DEUNIA	5	6	2	0603
AMBENE	1	2	3	0604	DEVATUTU	2	10	7	0603
AMUIOAN	3	15	1	0612	DIAPA	1	2	7	0606
ANGO	2	11	1	0605	DIROU	5	6	3	0603
ANGOROGO	3	15	2	0612	DIVINOKOVARI	2	7	3	0604
ASAGA	4	13	2	0610	DOBUDURU	2	9	2	0604
ASAPA	1	2	4	0606	DOBUDURU	2	11	13	0605
ASIMBA	1	1	1	0602	DOMARA	4	13	7	0610
ASISI	1	2	5	0604	DOMBADA	2	11	14	0605
AURE	2	10	2	0603	DOROMUSA	2	11	15	0607
AVEKARO	4	13	3	0610	DOVE	3	14	5	0609
AVIHASA	6	17	2	0601	DOWAIA	5	6	4	0603
AWALA	2	8	2	0604	DUVE	2	8	5	0605
AWALA	4	13	4	0610					
AWARU	4	12	2	0606	EJARO	1	4	2	0608
AWOMA	1	4	1	0608	EMBESSA	3	14	6	0609
					EMBI	2	11	16	0605
BABERADA	2	11	2	0605	EMBOGO	2	11	17	0605
BADAIDE	3	14	2	0609	EMO	1	4	3	0608
BAGA	3	15	3	0612	EMO	2	11	18	0607
BAI'ATA	3	15	4	0612	ENDABURU	2	11	19	0607
BAKO	3	14	3	0609	ENJORA	1	2	8	0606
BAKUBARI	2	10	3	0605	EVASUSU	1	2	9	0604
BAMBITI	3	15	5	0612	EWORE	5	5	7	0603
BANDERI	2	11	3	0606					
BARABARA	3	15	6	0612	FODUMA	3	15	10	0612
BARARA	5	5	2	0603	FOFOMA	3	15	11	0612
BARAVATURU	2	8	3	0604	FONIBARU	3	15	12	0612
BARISARI	2	11	4	0605	FORU NO 1	3	14	7	0609
BATARI	5	5	3	0603	FORU NO 2	3	14	8	0609
BATARI	2	10	4	0603	FOUNA	3	15	13	0612
BAUWAME	3	15	7	0612	FUFUDA	2	10	8	0605
BEAMA	2	11	5	0606					
BEAMATU	2	11	6	0606	GANJIJA	3	16	2	0611
BEKABARI	2	10	5	0603	GARARA	2	10	9	0605
BEKOIANA	3	15	8	0612	GAROMBI	2	8	6	0604
BENDORODA	3	14	4	0609	GARURU	2	11	20	0605
BERUBONA	3	15	9	0612	GAVIDE	3	15	14	0612
BEURU	2	9	19	0605	GEBARA	3	15	15	0612
BINDARI	2	10	6	0603	GEWOIA	4	12	6	0609
BIRIRA NO 1	4	13	5	0610	GEWOTO	2	9	3	0605
BIRIRA NO 2	4	13	6	0610	GIGORI	3	16	3	0612
BOKE	5	5	4	0603	GIMINE	6	17	3	0601
BORANGOVE	2	11	8	0605	GIRIGIRITA	2	7	4	0604
BOREARA	2	11	7	0606	GOBE	3	14	9	0609

6.2 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN ALPHABETICAL ORDER

Province: 6 Northern

Village	Dist	Div	Unit	System	Village	Dist	Div	Unit	System
GOBE	6	17	4	0601	JITAMI	2	10	13	0603
GOBERA	4	13	8	0610	JUWERA	6	17	5	0601
GOMBARA	2	11	21	0609	KABUBU	3	15	23	0612
GONA	2	10	10	0605	KABUNI	3	15	24	0612
GORA	4	12	7	0606	KAIARI	5	6	7	0603
GORABUNA	4	12	8	0606	KAILE	1	3	5	0604
GORISATA	5	6	5	0603	KAINDE	2	10	14	0603
GUNIMBA	2	11	22	0607	KAMONDO	1	2	18	0604
GURUGURU	3	14	10	0609	KANANDARA	1	2	19	0604
HAGUTAVA	1	3	3	0604	KANARI	2	7	12	0604
HAKI 1	1	2	10	0604	KANAVETU	3	15	25	0612
HAKI 2	1	2	11	0604	KANGA	1	1	2	0604
HAMARA	1	2	12	0604	KAPWARURU	3	15	26	0612
HAMBURATA	2	8	7	0604	KARAIISA	3	14	11	0609
HANAKIRO	2	11	23	0606	KARIKARI	3	15	27	0612
HANAU	2	11	24	0605	KARISOA	3	14	12	0609
HANDARITURU	2	8	8	0604	KARUDE	5	5	11	0603
HANJIRI	1	2	13	0604	KARUKARU	1	1	3	0602
HARIGO	2	11	25	0605	KASIAWA	3	15	28	0612
HAVAKI	1	2	14	0604	KATOKATO	3	15	29	0612
HOHORITA	2	9	14	0604	KATUNA	2	10	15	0603
HOHOTA	2	9	4	0604	KAURA	4	12	10	0606
HOJAKI	1	2	15	0604	KAWOWOKI	4	12	11	0606
HOJAVAHAMBO	1	2	16	0604	KENDATA	2	8	11	0604
HORAU	2	7	6	0604	KENDATA	2	11	28	0605
HUJAVASUSU	2	7	8	0604	KEPARA	1	2	20	0604
HUNGIRI	2	7	9	0604	KERO	4	12	12	0606
HURATA	5	6	6	0603	KEVI	2	11	29	0607
HURURU	2	7	7	0604	KEWANSASAP	3	16	6	0611
HUVIVI	2	9	5	0604	KIARA	4	12	13	0606
IAGIRUA	3	15	17	0612	KIKINONDA	5	6	8	0603
IAUDARI NO 1	5	5	8	0603	KIKITA	3	15	30	0612
IAUDARI NO 2	5	5	9	0603	KINJAKI	3	14	13	0609
IAURE	1	4	9	0608	KIOROTA	2	8	12	0604
ILAMARORO	3	15	18	0612	KIPORE	2	7	13	0604
ILIMO	1	2	17	0604	KIRA	6	17	6	0601
INA AND DABARI	5	5	10	0603	KOIPA	2	9	15	0604
INONDA	2	9	6	0604	KOIRA	2	10	16	0603
ISOGE	2	8	10	0604	KOIRA	4	13	10	0610
ISURAVA	1	3	4	0604	KOJE	3	15	31	0612
ITOKAMA	4	12	9	0606	KOKODA	1	2	21	0604
ITONOMATA	3	15	19	0612	KOKORO	4	12	14	0606
ITOTO	3	16	4	0612	KOMABUN	3	16	7	0611
IU'AI'IU	3	16	5	0611	KONABU	3	15	32	0612
IUBADI	3	15	20	0612	KONEDOBU	3	15	33	0612
IVORE	2	9	16	0604	KONINDA	5	6	9	0603
IWAIA	2	10	11	0603	KONJE	2	10	17	0605
IWUJI	2	11	26	0607	KOPURE	2	11	30	0606
JAJAU	2	7	11	0604	KOREAF	3	16	8	0611
JARI	4	13	9	0610	KOROPATA 1	2	8	14	0604
JEBO	3	15	21	0612	KOROPATA 2	2	8	15	0604
JEGARAKAMBO	2	11	27	0607	KORUWE	3	15	34	0612
JEGARATA	2	9	8	0604	KORUWO	4	12	15	0606
JIKUATAIA	3	15	22	0612	KOTAURE	5	5	12	0603
JINENA	2	10	12	0603	KOVELO 1&2	1	3	6	0604
					KOVIO	1	4	4	0608
					KUAI	4	12	16	0606

6.2 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN ALPHABETICAL ORDER

Province: 6 Northern

Village	Dist	Div	Unit	System	Village	Dist	Div	Unit	System
KUREREDA	5	5	13	0603	PAPOGA	2	7	16	0604
KUREREDA	2	10	18	0603	PELAI	1	3	7	0604
KURIRIKA	3	15	35	0612	PEMA	6	17	12	0601
KUROU	2	10	19	0605	PEROMBATURU	2	7	17	0604
KURUAKU	3	14	14	0609	PETEKIARI	5	6	12	0603
KWAPULINA	3	15	36	0612	PIJA HAMARA NO 2	1	2	25	0604
KWAVE	3	15	37	0612	PIRIVE	1	2	26	0604
KWENO	4	12	17	0606	POHA	2	7	18	0604
LAKO	3	16	9	0611	POHO 1&2	5	6	13	0603
LEAGA	3	16	10	0611	PONGANI	2	11	34	0607
LELIOA	3	15	38	0612	POPONDOTA	2	8	17	0604
LEMBADI	2	11	31	0609	PUIN	2	11	35	0607
MAFUIA	3	14	15	0612	PUTEMO	1	2	27	0604
MAMBATUTU	5	5	14	0603	RABADE	3	15	43	0612
MANAGA	3	15	39	0612	RAINU	3	16	14	0611
MANAGUBE	1	4	5	0608	REIBAI	2	11	36	0606
MANAU	5	5	15	0603	SAFIA	4	13	14	0610
MARASA	3	15	40	0612	SAGA	1	2	28	0604
MARASI	4	12	18	0606	SAGERE	5	6	14	0603
MARUA	3	16	11	0611	SAIROPE	1	2	29	0604
MAUJETA	1	2	22	0604	SANANANDA	2	11	37	0605
MENGADI	2	11	32	0607	SARIRI	2	11	38	0609
MOIABI	3	14	16	0609	SASEMBATA	2	8	18	0604
MOMOIGO	3	14	17	0609	SAVAIA	1	2	30	0604
MOMONGA	2	10	20	0603	SEBODA	2	11	39	0607
MONGI	2	9	10	0604	SEBU	2	10	24	0603
MORO	4	13	11	0610	SEDEMA	6	17	9	0601
MOSOU	2	9	11	0604	SEHORU	2	9	17	0604
MUMUNI	2	8	16	0604	SEMAHARA	4	12	23	0606
NAMANAIA	1	4	6	0608	SENGI	1	2	31	0604
NAMUDI	4	13	12	0610	SEREMBE	2	7	20	0604
NATANGA	4	12	19	0606	SEWA	2	9	12	0604
NATATU	2	11	33	0605	SIA	5	5	18	0603
NATUKWABA	3	15	41	0612	SIAI	5	6	15	0603
NAUKWATE	3	16	12	0611	SIBIA	4	13	15	0610
NINDEWARI	5	5	16	0603	SILA	4	12	24	0606
NINIURI	4	12	20	0606	SILIBU	4	12	25	0606
NUMBA	4	12	21	0606	SILIMIDI	4	13	16	0610
OBEA	4	13	13	0610	SIMUMU	3	15	44	0612
OERE	2	7	14	0604	SINAPA	3	16	15	0611
OIBO	6	17	7	0601	SINAPARA	3	16	16	0611
OITATANDI	5	6	11	0603	SINEI	3	15	45	0612
OMBISUSU	1	2	23	0604	SINGI	2	8	19	0604
ONDORO	4	12	22	0606	SIREMI	2	11	40	0605
ONGOHO	2	7	15	0604	SIRORATA	1	2	32	0604
ONOMBATUTU	5	5	17	0603	SISIRETA	1	2	33	0604
ONONDA	2	10	21	0605	SIU	3	15	46	0612
ORERESAN	3	16	13	0611	SIVEPI	2	8	20	0604
OROTOABA	3	15	42	0612	SONGADI	2	11	41	0607
OROUBA	6	17	8	0601	SOPUTA	2	9	13	0605
OSAKO	5	6	10	0603	SORAPE	1	2	34	0604
OURE	2	10	22	0603	SOROPUTA	2	8	21	0604
PAPAKI	1	2	24	0604	SUI	2	8	22	0604
					TABARA	5	5	19	0603
					TABUANE	4	12	26	0606

6.2 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN ALPHABETICAL ORDER

Province: 6 Northern

Village	Dist	Div	Unit	System	Village	Dist	Div	Unit	System
TAHAMA	4	12	27	0606	UJILO	1	4	8	0608
TAINABUNA	3	15	47	0612	UMAUMA	4	13	17	0610
TAIRE	5	5	20	0603	UMBWARA	4	12	30	0606
TAUTUTU	5	5	21	0603	UMWATA	4	12	31	0606
TAVE	5	5	22	0603	UPUPORO	6	17	10	0601
TENIARU	3	15	48	0612	URARISUSU	2	7	23	0604
TETEBEDI	1	4	7	0608	URARITURU	2	8	26	0604
TIWA	6	17	13	0601	URIO	2	11	43	0605
TOGAHO	2	7	21	0604	USUINDARI	5	6	16	0603
TOGOFU	2	11	42	0606	UTUKEARI	5	6	17	0603
TOMA	4	12	28	0606	UTUKWAF	3	15	51	0612
TOROGOTA	2	8	23	0604	UWE	3	16	18	0612
TUBI	5	5	23	0603					
TUFI	3	15	49	0612	WADE	5	5	24	0603
TUMARI	3	15	50	0612	WAGADARI	5	5	25	0603
TUMINA	3	14	18	0609	WAIWA	2	11	44	0607
TUNANA	2	7	22	0604	WAJU	1	2	35	0604
TUNANA	2	8	24	0604	WASETA	2	8	27	0604
UFIA	4	12	29	0606	YEMA	6	17	11	0601
UHITA	2	8	25	0604	YOIVI	4	12	32	0606
UIAKU	3	16	17	0611					

6.3 RURAL VILLAGES LISTED BY AGRICULTURAL SYSTEM
Province: 6 Northern

Village	Dist	Div	Unit	RMU	Village	Dist	Div	Unit	RMU
SYSTEM 0601					OITATANDI	5	6	11	63
AGUTAMI	6	17	1	20	ONOMBATUTU	5	5	17	38
AVIHASA	6	17	2	15	OSAKO	5	6	10	64
GIMINE	6	17	3	30	OURE	2	10	22	303
GOBE	6	17	4	20	PETEKIARI	5	6	12	64
JUWERA	6	17	5	30	POHO 1&2	5	6	13	64
KIRA	6	17	6	15	SAGERE	5	6	14	63
OIBO	6	17	7	17	SEBU	2	10	24	131
OROUBA	6	17	8	12	SIA	5	5	18	52
PEMA	6	17	12	20	SIAM	5	6	15	64
SEDEMA	6	17	9	6	TABARA	5	5	19	38
TIWA	6	17	13	12	TAIRE	5	5	20	38
UPUPORO	6	17	10	12	TAUTUTU	5	5	21	52
YEMA	6	17	11	20	TAVE	5	5	22	36
					TUBI	5	5	23	38
SYSTEM 0602					USUINDARI	5	6	16	64
ASIMBA	1	1	1	85	UTUKEARI	5	6	17	64
KARUKARU	1	1	3	86	WADE	5	5	24	38
					WAGADARI	5	5	25	45
SYSTEM 0603					SYSTEM 0604				
AINSI	5	5	1	38	ABUARI	1	3	1	87
AMBASI	2	10	1	51	AGENAHEMBO	2	8	1	114
AURE	2	10	2	51	AJEKA	1	2	1	115
BARARA	5	5	2	48	AJORO	2	9	1	114
BATARI	5	5	3	38	ALOLA	1	3	2	87
BATARI	2	10	4	54	AMADA	1	2	2	103
BEKABARI	2	10	5	51	AMBENE	1	2	3	109
BINDARI	2	10	6	51	ASISI	1	2	5	111
BOKE	5	5	4	36	AWALA	2	8	2	114
BORUGASUSU	5	6	1	64	BARAVATURU	2	8	3	114
BOVERA	5	5	5	33	BORU	2	8	4	114
DEBOIN	5	5	6	42	BOTHU	1	2	6	111
DEUNIA	5	6	2	54	DIVINOKOVARI	2	7	3	114
DEVATUTU	2	10	7	51	DOBUDURU	2	9	2	114
DIROU	5	6	3	64	EVASUSU	1	2	9	121
DOWAIA	5	6	4	54	GAROMBI	2	8	6	114
EWORE	5	5	7	309	GIRIGIRITA	2	7	4	114
GORISATA	5	6	5	64	HAGUTAVA	1	3	3	87
HURATA	5	6	6	63	HAKI 1	1	2	10	111
IAUDARI NO 1	5	5	8	48	HAKI 2	1	2	11	311
IAUDARI NO 2	5	5	9	48	HAMARA	1	2	12	311
INA AND DABARI	5	5	10	36	HAMBURATA	2	8	7	114
IWAIA	2	10	11	42	HANDARITURU	2	8	8	114
JINENA	2	10	12	51	HANJIRI	1	2	13	108
JITAMI	2	10	13	51	HAVAKI	1	2	14	109
KAIARI	5	6	7	64	HOHORITA	2	9	14	114
KAINDE	2	10	14	303	HOHOTA	2	9	4	114
KARUDE	5	5	11	38	HOJAKI	1	2	15	111
KATUNA	2	10	15	55	HOJAVAHAMBO	1	2	16	111
KIKINONDA	5	6	8	64	HORAU	2	7	6	59
KOIRA	2	10	16	303	HUJAVASUSU	2	7	8	114
KONINDA	5	6	9	64	HUNGIRI	2	7	9	305
KOTAURE	5	5	12	37	HURURU	2	7	7	60
KUREREDA	5	5	13	48	HUVIVI	2	9	5	114
KUREREDA	2	10	18	56	ILIMO	1	2	17	111
MAMBATUTU	5	5	14	44	INONDA	2	9	6	131
MANAU	5	5	15	44	ISOGE	2	8	10	114
MOMONGA	2	10	20	51	ISURAVA	1	3	4	86
NINDEWARI	5	5	16	38					

6.3 RURAL VILLAGES LISTED BY AGRICULTURAL SYSTEM
Province: 6 Northern

Village	Dist	Div	Unit	RMU	Village	Dist	Div	Unit	RMU
IVORE	2	9	16	114	SYSTEM 0605				
JAJAU	2	7	11	114	AHORA	2	9	20	131
JEGARATA	2	9	8	114	ANGO	2	11	1	131
KAILE	1	3	5	87	BABERADA	2	11	2	130
KAMONDO	1	2	18	104	BAKUBARI	2	10	3	57
KANANDARA	1	2	19	104	BARISARI	2	11	4	131
KANARI	2	7	12	114	BEURU	2	9	19	131
KANGA	1	1	2	85	BORANGOVE	2	11	8	131
KENDATA	2	8	11	115	BORIO	2	11	9	131
KEPARA	1	2	20	104	BUNA	2	11	11	126
KIOROTA	2	8	12	116	BUSEGA	2	11	12	130
KIPORE	2	7	13	131	DOBUDURU	2	11	13	131
KOIPA	2	9	15	114	DOMBADA	2	11	14	129
KOKODA	1	2	21	104	DUVE	2	8	5	115
KOROPATA 1	2	8	14	113	EMBI	2	11	16	131
KOROPATA 2	2	8	15	114	EMBOGO	2	11	17	129
KOVELO 1&2	1	3	6	103	FUFUDA	2	10	8	60
MAUJETA	1	2	22	115	GARARA	2	10	9	125
MONGI	2	9	10	116	GARURU	2	11	20	131
MOSOU	2	9	11	131	GEWOTO	2	9	3	131
MUMUNI	2	8	16	114	GONA	2	10	10	131
OERE	2	7	14	114	HANAU	2	11	24	131
OMBISUSU	1	2	23	115	HARIGO	2	11	25	131
ONGOHO	2	7	15	114	KENDATA	2	11	28	131
PAPAKI	1	2	24	111	KONJE	2	10	17	131
PAPOGA	2	7	16	114	KUROU	2	10	19	131
PELAI	1	3	7	104	NATATU	2	11	33	130
PEROMBATURU	2	7	17	114	ONONDA	2	10	21	131
PIJA HAMARA NO 2	1	2	25	111	SANANANDA	2	11	37	125
PIRIVE	1	2	26	104	SIREMI	2	11	40	131
POHA	2	7	18	114	SOPUTA	2	9	13	131
POPONDOTA	2	8	17	114	URIO	2	11	43	131
PUTEMO	1	2	27	115	SYSTEM 0606				
SAGA	1	2	28	104	AFORE	4	12	1	146
SAIROPE	1	2	29	121	ASAPA	1	2	4	137
SASEMBATA	2	8	18	115	AWARU	4	12	2	144
SAVAIA	1	2	30	103	BANDERI	2	11	3	123
SEHORO	2	9	17	131	BEAMA	2	11	5	123
SENGI	1	2	31	107	BEAMATU	2	11	6	136
SEREMBE	2	7	20	114	BOREARA	2	11	7	136
SEWA	2	9	12	116	BOROU	2	11	10	136
SINGI	2	8	19	115	BUABORO AND BUA	4	12	3	146
SIRORATA	1	2	32	109	DAREKI	4	12	4	146
SISIRETA	1	2	33	108	DEA	4	12	5	144
SIVEPI	2	8	20	114	DIAPA	1	2	7	137
SORAPE	1	2	34	111	ENJORA	1	2	8	121
SOROPUTA	2	8	21	114	GORA	4	12	7	138
SUI	2	8	22	114	GORABUNA	4	12	8	137
TOGAHO	2	7	21	114	HANAKIRO	2	11	23	123
TOROGOTA	2	8	23	114	ITOKAMA	4	12	9	144
TUNANA	2	7	22	114	KAURA	4	12	10	144
TUNANA	2	8	24	114	KAWOWOKI	4	12	11	114
UHITA	2	8	25	114	KERO	4	12	12	138
URARISUSU	2	7	23	114	KIARA	4	12	13	144
URARITURU	2	8	26	114	KOKORO	4	12	14	144
WAJU	1	2	35	108	KOPURE	2	11	30	123
WASETA	2	8	27	114	KORUWO	4	12	15	144
					KUAI	4	12	16	144

6.3 RURAL VILLAGES LISTED BY AGRICULTURAL SYSTEM
Province: 6 Northern

Village	Dist	Div	Unit	RMU	Village	Dist	Div	Unit	RMU
KWENO	4	12	17	144	KARISOA	3	14	12	174
MARASI	4	12	18	133	KINJAKI	3	14	13	171
NATANGA	4	12	19	144	KURUAKU	3	14	14	187
NINIURI	4	12	20	146	LEMBADI	2	11	31	171
NUMBA	4	12	21	134	MOIAVI	3	14	16	178
ONDORO	4	12	22	165	MOMOIGO	3	14	17	178
REIBAI	2	11	36	123	SARIRI	2	11	38	171
SEMAHARA	4	12	23	146	TUMINA	3	14	18	271
SILA	4	12	24	144					
SILIBU	4	12	25	144	SYSTEM 0610				
TABUANE	4	12	26	144	AIARE	4	13	1	154
TAHAMA	4	12	27	144	ASAGA	4	13	2	223
TOGOFU	2	11	42	136	AVEKARO	4	13	3	216
TOMA	4	12	28	148	AWALA	4	13	4	217
UFIA	4	12	29	144	BIRIRA NO 1	4	13	5	223
UMBWARA	4	12	30	144	BIRIRA NO 2	4	13	6	223
UMWATA	4	12	31	312	DOMARA	4	13	7	223
YOIVI	4	12	32	146	GOBERA	4	13	8	223
					JARI	4	13	9	222
SYSTEM 0607					KOIRA	4	13	10	223
DROMUSA	2	11	15	167	MORO	4	13	11	223
EMO	2	11	18	167	NAMUDI	4	13	12	217
ENDABURU	2	11	19	123	OBEA	4	13	13	223
GUNIMBA	2	11	22	167	SAFIA	4	13	14	223
IWUJI	2	11	26	171	SIBIA	4	13	15	159
JEGARAKAMBO	2	11	27	167	SILIMIDI	4	13	16	224
KEVI	2	11	29	167	UMAUMA	4	13	17	223
MENGADI	2	11	32	167					
PONGANI	2	11	34	167	SYSTEM 0611				
PUIN	2	11	35	167	AIRARA	3	16	1	291
SEBODA	2	11	39	170	GANJIJA	3	16	2	288
SONGADI	2	11	41	174	IU'AI'U	3	16	5	286
WAIWA	2	11	44	123	KEWANSASAP	3	16	6	292
					KOMABUN	3	16	7	281
SYSTEM 0608					KOREAF	3	16	8	281
AWOMA	1	4	1	112	LAKO	3	16	9	291
EJARO	1	4	2	112	LEAGA	3	16	10	291
EMO	1	4	3	112	MARUA	3	16	11	291
IAURE	1	4	9	142	NAUKWATE	3	16	12	280
KOVIO	1	4	4	112	ORERESAN	3	16	13	281
MANAGUBE	1	4	5	112	RAINU	3	16	14	281
NAMANAIA	1	4	6	236	SINAPA	3	16	15	291
TETEBEDI	1	4	7	112	SINAPARA	3	16	16	291
UJILO	1	4	8	112	UIAKU	3	16	17	300
SYSTEM 0609					SYSTEM 0612				
AKO	3	14	1	187	AMUIOAN	3	15	1	270
BADAIDE	3	14	2	178	ANGOROGO	3	15	2	270
BAKO	3	14	3	174	BAGA	3	15	3	270
BENDORODA	3	14	4	174	BAI'ATA	3	15	4	270
DOVE	3	14	5	185	BAMBITI	3	15	5	270
EMBESSA	3	14	6	221	BARABARA	3	15	6	270
FORU NO 1	3	14	7	183	BAUWAME	3	15	7	270
FORU NO 2	3	14	8	183	BEKOIANA	3	15	8	270
GEWOIA	4	12	6	161	BERUBONA	3	15	9	269
GOBE	3	14	9	174	FODUMA	3	15	10	270
GOMBARA	2	11	21	171	FOFOMA	3	15	11	270
GURUGURU	3	14	10	280	FONIBARU	3	15	12	271
KARAISA	3	14	11	176	FOUNA	3	15	13	270

6.3 RURAL VILLAGES LISTED BY AGRICULTURAL SYSTEM**Province: 6 Northern**

Village	Dist	Div	Unit	RMU	Village	Dist	Div	Unit	RMU
GAVIDE	3	15	14	270	LELIOA	3	15	38	270
GEBARA	3	15	15	270	KONEDOBU	3	15	33	270
GIGORI	3	16	3	270	KORUWE	3	15	34	270
IAGIRUA	3	15	17	270	KURIRIKA	3	15	35	270
ILAMARORO	3	15	18	270	KWAPULINA	3	15	36	270
ITONOMATA	3	15	19	271	MAFUIA	3	14	15	270
ITOTO	3	16	4	308	MANAGA	3	15	39	270
IUBADI	3	15	20	270	MARASA	3	15	40	270
JEBO	3	15	21	270	NATUKWABA	3	15	41	270
JIKUATAIA	3	15	22	270	OROTOABA	3	15	42	270
KABUBU	3	15	23	270	RABADE	3	15	43	270
KABUNI	3	15	24	270	SIMUMU	3	15	44	270
KANAVETU	3	15	25	270	SINEI	3	15	45	270
KAPWARURU	3	15	26	270	SIU	3	15	46	270
KARIKARI	3	15	27	270	TAINABUNA	3	15	47	270
KASIAWA	3	15	28	270	TENIARU	3	15	48	270
KATOKATO	3	15	29	270	TUFI	3	15	49	270
KIKITA	3	15	30	270	TUMARI	3	15	50	270
KOJE	3	15	31	270	UTUKWAF	3	15	51	270
KONABU	3	15	32	270	UWE	3	16	18	271
KWAVE	3	15	37	270					

APPENDIX A.1

NATIONAL POPULATION CENSUS PROVINCIAL CODES

Province	Abbreviation	Code
Western	WES	01
Gulf	GUL	02
Central	CEN	03
National Capital District	NCD	04
Milne Bay	MBP	05
Oro (Northern)	ORO	06
Southern Highlands	SHP	07
Enga	ENG	08
Western Highlands	WHP	09
Simbu (Chimbu)	SIM	10
Eastern Highlands	EHP	11
Morobe	MOR	12
Madang	MAD	13
East Sepik	ESP	14
West Sepik (Sandaun)	WSP	15
Manus	MAN	16
New Ireland	NIP	17
East New Britain	ENB	18
West New Britain	WNB	19
Bougainville	NSP	20

APPENDIX A.2

NATIONAL POPULATION CENSUS CODES FOR DISTRICTS AND CENSUS DIVISIONS, NORTHERN PROVINCE¹

Code	Division	Code	Division
01	Kokoda	03	Tufi
01	Chirima	14	Dyke Ackland Bay
02	Hujara	15	Cape Nelson
03	Biage	16	Cape Collingwood
04	Wawonga		
02	Popondetta		
05	Binandere		
06	Aeka		
07	Sohe		
08	Saiho		
09	Popondetta		
10	North Coast		
11	Oro Bay		
12	Mangalas		
13	Musa		

¹ The Census Division names and codes are from the 1980 National Population Census. However, because the district definitions in some provinces changed between the 1980 and 1990 censuses, and because districts are important for provincial administrative purposes, the district names and codes are from the 1990 National Population Census. Some provinces have further changed district definitions since 1990 but these are not shown.

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