AUSTRALIAN AGENCY for INTERNATIONAL DEVELOPMENT

AGRICULTURAL SYSTEMS OF PAPUA NEW GUINEA

Working Paper No. 14

EAST NEW BRITAIN PROVINCE

TEXT SUMMARIES, MAPS, CODE LISTS AND VILLAGE IDENTIFICATION

R.M. Bourke, B.J. Allen, R.L. Hide, D. Fritsch, T. Geob, R. Grau, S. Heai, P. Hobsbawn, G. Ling, S. Lyon and M. Poienou

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1. Bourke, R.M., B.J. Allen, P. Hobsbawn and J. Conway (1998) Papua New Guinea: Text Summaries (two volumes).
2. Allen, B.J., R.L. Hide, R.M. Bourke, D. Fritsch, R. Grau, E. Lowes, T. Nen, E. Nirsie, J. Risimeri and M. Woruba (2002) East Sepik Province: Text Summaries, Maps, Code Lists and Village Identification.
3. Bourke, R.M., B.J. Allen, R.L. Hide, D. Fritsch, R. Grau, E. Lowes, T. Nen, E. Nirsie, J. Risimeri and M. Woruba (2002) West Sepik Province: Text Summaries, Maps, Code Lists and Village Identification.
4. Allen, B.J., R.L. Hide, R.M. Bourke, W. Akus, D. Fritsch, R. Grau, G. Ling and E. Lowes (2002) Western Province: Text Summaries, Maps, Code Lists and Village Identification.
5. Hide, R.L., R.M. Bourke, B.J. Allen, N. Fereday, D. Fritsch, R. Grau, E. Lowes and M. Woruba (2002) Gulf Province: Text Summaries, Maps, Code Lists and Village Identification.
6. Hide, R.L., R.M. Bourke, B.J. Allen, T. Betitis, D. Fritsch, R. Grau, L. Kurika, E. Lowes, D.K. Mitchell, S.S. Rangai, M. Sakiasi, G. Sem and B. Suma (2002) Milne Bay Province: Text Summaries, Maps, Code Lists and Village Identification.
7. Allen, B.J., R.L. Hide, R.M. Bourke, D. Fritsch, R. Grau, P. Hobsbawn, M.P. Levett, I.S. Majnep, V. Mangai, T. Nen and G. Sem (2002) Madang Province: Text Summaries, Maps, Code Lists and Village Identification.
8. Bourke R.M., B.J. Allen, R.L. Hide, D. Fritsch, R. Grau, P. Hobsbawn, E. Lowes and D. Stannard (2002) Eastern Highlands Province: Text Summaries, Maps, Code Lists and Village Identification.
9. Allen, B.J., R.L. Hide, R.M. Bourke, C. Ballard, D. Fritsch, R. Grau, P. Hobsbawn, G.S. Humphreys and D. Kandasan (2002) Enga Province: Text Summaries, Maps, Code Lists and Village Identification.
10. Hide, R.L., R.M. Bourke, B.J. Allen, D. Fritsch, R. Grau, P. Hobsbawn and S. Lyon (2002) Western Highlands Province: Text Summaries, Maps, Code Lists and Village Identification.
11. Bourke, R.M., B.J. Allen, R.L. Hide, D. Fritsch, R. Grau, P. Hobsbawn, B. Konabe, M.P. Levett, S. Lyon and A. Varvaliu (2002) Southern Highlands Province: Text Summaries, Maps, Code Lists and Village Identification.
12. Hide, R.L., R.M. Bourke, B.J. Allen, D. Fritsch, R. Grau, P. Hobsbawn and S. Lyon (2002) Chimbu Province: Text Summaries, Maps, Code Lists and Village Identification.
13. Bourke, R.M., R.L. Hide, B.J. Allen, D. Fritsch, R. Grau, P. Hobsbawn, M. Levett, S. Lyon, L. Nama and T. Nen (2002) West New Britain Province: Text Summaries, Maps,Code Lists and Village Identification.
14. Bourke, R.M., B.J. Allen, R.L. Hide, D. Fritsch, T. Geob, R. Grau, S. Heai, P. Hobsbawn, G. Ling, S. Lyon and M. Poienou (2002) East New Britain Province: Text Summaries, Maps,Code Lists and Village Identification.
15. Allen, B.J., T. Nen, R.M. Bourke, R.L. Hide, D. Fritsch, R. Grau, P. Hobsbawn and S. Lyon (2002) Central Province: Text Summaries, Maps,Code Lists and Village Identification.
16. Allen, B.J., T. Nen, R.L. Hide, R.M. Bourke, D. Fritsch, R. Grau, P. Hobsbawn, S. Lyon and G. Sem (2002) Northern Province: Text Summaries, Maps, Code Lists and Village Identification.
17. Hide, R.L., R.M. Bourke, B.J. Allen, W. Akus, D. Frisch, R. Grau, P. Hobsbawn, P. Igua, R. Kameata, S. Lyon and N. Miskaram (2002) New Ireland Province: Text Summaries, Maps, Code Lists and Village Identification.
18. Hide, R.L., B.J. Allen, R.M. Bourke, D. Frisch, R. Grau, J.L. Helepet, P. Hobsbawn, S. Lyon, M. Poienou, S. Pondrilei, K. Pouru, G. Sem and B. Tewi (2002) Manus Province: Text Summaries, Maps, Code Lists and Village Identification.
19. Bourke, R.M., B.J. Allen, R.L. Hide, N. Fereday, D. Fritsch, B. Gaupu, R. Grau, P. Hobsbawn, M.P. Levett, S. Lyon, V. Mangi and G. Sem (2002) Morobe Province: Text Summaries, Maps, Code Lists and Village Identification.
20. Bourke, R.M., M. Woruba, B.J. Allen, M. Allen, R. Grau and P. Hobsbawn (2002) Bougainville Province: Text Summaries, Maps, Code Lists and Village Identification.
21. Hobsbawn, P., D. Fritsch, R. Grau, B.J. Allen, R.L. Hide and R.M. Bourke (1997) Technical Information and Methods.
22. Hobsbawn, P. and J. Conway (1998) Bibliography.
23. Stuckings, N.E., R.L. Hide, R.M. Bourke, B.J. Allen, P. Hobsbawn and J. Conway (1997) Papua New Guinea Agriculture Literature Database.

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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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Valentine's (1958) unpublished doctoral thesis contains much useful background and historical information on New Britain until the mid 1950s. This is not referred to for each individual agricultural system.

Technical advice and encouragement have been provided throughout the project by John McAlpine, Gael Keig and Sue Cuddy, Australian Commonwealth Scientific and Industrial Research Organization.

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: Dr R.D. Ghodake and Balthazar Wayi (co-ordination and planning).

LAES, Keravat: Will Akus, Jeffery Binifa, Timothy Geob, Steven Heai, Fidelis Hela, Malkinson Kokoba, Gadi Ling, Matthew Poienou and Robert Waia (field mapping).

Division of Primary Industry, Department of East New Britain: Elias Pukai and Ronald Sambai (field mapping).

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 and Stephen Lyon (research assistance); Merv Commons (technical assistance); Natalie Stuckings (editorial assistance).

Field survey

The agricultural systems on the Gazelle Peninsula were surveyed between 1970 and 1975 (about 120 survey days). In June-July 1995, a four week survey was done throughout the Province by one party. The Gazelle Peninsula and nearby islands were surveyed from a base at LAES Keravat over a two week period; and two weeks were spent on road, boat, air and walking traverses on the south coast and interior of the island.

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 and Amber Pares were responsible for the production of the revised paper.

CONTENTS

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.

References

Bellamy, J. (ed) 1986 *Papua New Guinea Inventory of Natural Resources, Population Distribution and Land Use Handbook*. CSIRO Division of Water and Land Resources, Natural Resources Series No. 6, Canberra.

Bourke, R.M. 1976 Food crop farming systems used on the Gazelle Peninsula of New Britain. In K. Willson and R.M. Bourke (eds) *Proceedings of the 1975 Papua New Guinea Food Crops Conference*, Department of Primary Industry, Port Moresby, 81-100.

Bourke, R.M., R.L. Hide, B.J. Allen, R. Grau, G.S. Humphreys and H.C. Brookfield 1993 Mapping agricultural systems in Papua New Guinea. In T. Taufa and C. Bass (eds) *Population, Family Health and Development. Volume 1 of Papers from the 19th Waigani Seminar, Port Moresby, 16-22 June 1991*. University of Papua New Guinea Press, Port Moresby, 205-224.

Brookfield, H.C. with D. Hart 1971 *Melanesia: a Geographical Interpretation of an Island World.* Methuen, London.

Cuddy, S.M. 1987 *Papua New Guinea Inventory of Natural Resources, Population Distribution and Land Use: Code Files* Parts I-VII. CSIRO Division of Water and Land Resources, Canberra.

Hackett, C. 1988 *Matching Plants and Land: Development of a General Broadscale System from a Crop Project for Papua New Guinea*. CSIRO Division of Water and Land Resources, Natural Resources Series No. 11, Canberra.

Hide, R.L. and S.M. Cuddy 1988 *Papua New Guinea Inventory of Natural Resources, Population Distribution and Land Use: Annotated and Selected Bibliography of Smallholder Farming Systems in PNG: Part I New Guinea Mainland, New Guinea Islands.* CSIRO Division of Water and Land Resources, Canberra.

National Nutrition Survey 1982/3. Provincial Tabulations. Papua New Guinea Institution of Medical Research and Nutrition Section, National Department of Health, Goroka.

Ruthenberg, H. 1980 *Farming Systems in the Tropics.* Oxford University Press, London.

Saunders, J.C. 1993 *Agricultural Land Use of Papua New Guinea* [map with explanatory notes]. Scale 1:1 000 000. PNGRIS Publication No. 1. CSIRO, Brisbane.

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.

Valentine III, C.A. 1958 An introduction to the history of changing ways of life on the island of New Britain. PhD thesis, University of Pennsylvania, Philadelphia.

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 **[SYSTIDNO]:** 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 **[SUBSYSIDNO]:** 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^{o})
2	Gentle	(2-10^{o})
3	Steep	(10-25^{o})
4	Very steep	(>25^{o})
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 (*eg. kunai < 1.5 m tall*)
2	Tall grass (*eg. Miscanthus or Saccharum > 1.5 m tall*)
3	Grass and woody regrowth *(dense short or tall grass and short woody regrowth*)
4	Short woody regrowth (*shrubs/trees < 10 m tall*)
5	Tall woody regrowth (*trees > 10 m tall*)
6	Forest (*no indication of previous use*)
7	No long fallow
8	Savanna *(Scattered woody growth with grass ground cover)*

***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 *(Musa* cvs*)*	13	Taro *(Colocasia esculenta*)
03	Breadfruit *(Artocarpus altilis)*	14	Yam *(Dioscorea alata*)
04	Cassava *(Manihot esculenta)*	15	Yam *(Dioscorea esculenta*)
05	Chinese taro *(Xanthosoma sagittifolium)*	16	Yam *(Dioscorea pentaphylla*)
06	Coconut *(Cocos nucifera)*	17	Other
07	Corn *(Zea mays)*	18	Queensland arrowroot (*Canna edulis)*
08	Potato *(Solanum tuberosum)*		
09	Sago *(Metroxylon sagu)*	19	Taro (Amorphophallus) *(Amorphophallus paeoniifolius)*
10	Swamp taro *(Cyrtosperma chamissonis)*	20	Yam *(Dioscorea bulbifera)*
11	Sweet potato *(Ipomoea batatas)*	21	Yam *(Dioscorea nummularia)*
12	Taro *(Alocasia macrorrhiza*)		

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

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

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

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

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

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

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

1	Betel nut, highland *(Areca macrocalyx)*
2	Betel nut, lowland *(Areca catechu)*
3	Betel pepper, highland (*Piper gibbilimbum*)
4	Betel pepper, lowland *(Piper betle)*
5	Tobacco *(Nicotiana tabacum)*
6	Kava *(Piper methysticum)*

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 **[VSMMOUND]:** Mounds up to 10 cm high.

54. Small Mounds **[SMMOUND]:** 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 (*Campnosperma* 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:

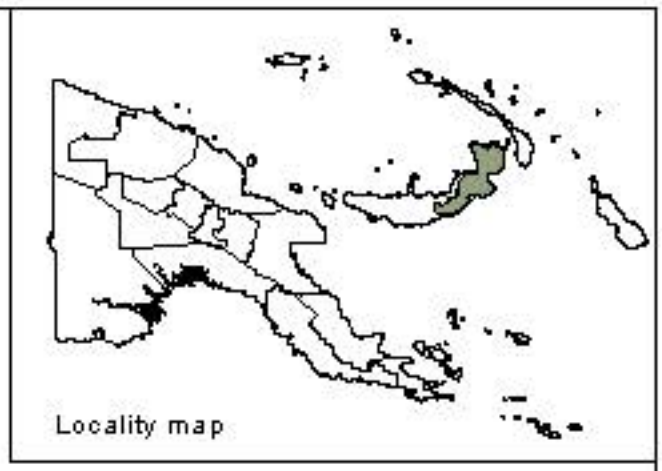
PROVINCE 15 West Sepik	**AGRICULTURAL SYSTEM No**. 3	**Subsystem No** 2 **of** 2
Districts 4 Telefomin	**Subsystem Extent** 25 %	

They contain information on Districts and subsystem extent only.

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

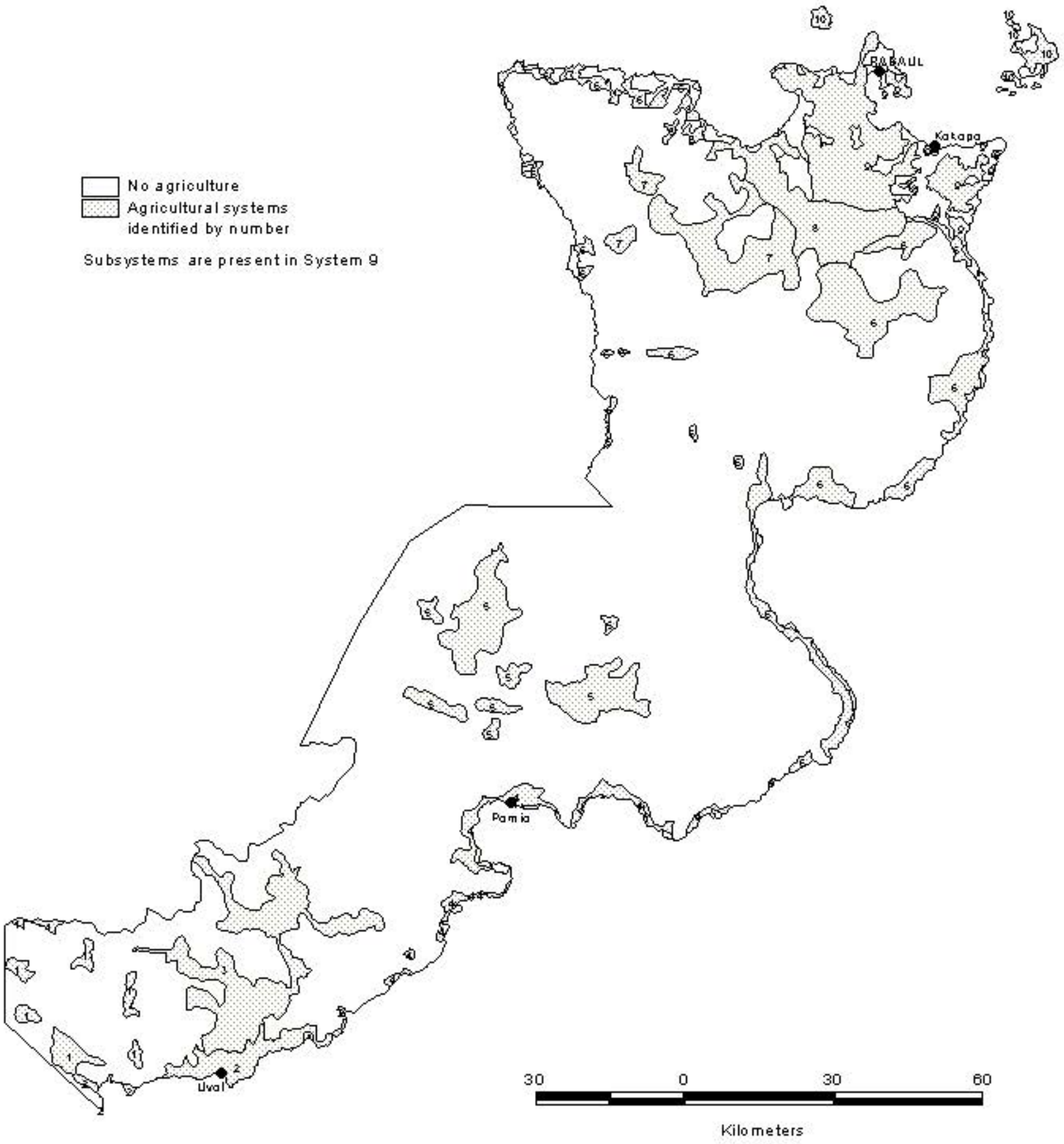
PROVINCE 15 West Sepik	**AGRICULTURAL SYSTEM No**. 1	**Subsystem No** 1 **of** 1

EAST NEW BRITAIN PROVINCE
Agricultural systems



No agriculture
Agricultural systems identified by number

Subsystems are present in System 9



Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

PROVINCE 18 East New Britain **AGRICULTURAL SYSTEM No.** 1 **Subsystem No.** 1 **of** 1

Districts 2 Pomio **Subsystem Extent** 100 % **Area (sq km)** 124
Population 558 **Population density** 5 **persons/sq km** **Population absent** 4 **%**

System Summary
Located in the interior of New Britain northeast of Kandrian in WNB and northwest of Uvol mission in ENB. Fallow vegetation is tall woody regrowth, more than 20 years old. Fallow vegetation is cut, dried and burnt. Taro is the most important crop; cassava and sweet potato are important crops; other crops are banana, Chinese taro and yam (D. alata). Only one planting is made before fallowing. Crops are usually interplanted within gardens.

Extends across provincial border to System(s) 1907

Altitude range (m) 50-600 **Slope** Gentle (2-10 degrees)

CROPS

STAPLES DOMINANT	Taro (Colocasia)
STAPLES SUBDOMINANT	Cassava, Sweet potato
STAPLES PRESENT	Banana, Cassava, Chinese taro, Sweet potato, Taro (Colocasia), Yam (D. alata)
OTHER VEGETABLES	Aibika, Amaranthus spp., Corn, Cucumber, Ferns, Highland pitpit, Kumu musong, Lowland pitpit, Pumpkin tips, Taro leaves
FRUITS	Malay apple, Mango, Pawpaw, Sugarcane, Ton, Parartocarpus
NUTS	Breadfruit, Coconut, Galip, Pangium edule
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	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 Tobacco	Minor
2 Pigs	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	Significant
STAKING OF CROPS	None
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	None
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION

Survey description

In February 1990, flight from Kandrian to Iombon village in WNB, walking traverse from Iombon to Moi-ia, Pomalal and Aka villages with garden observations (2 days). In June 1995, road traverse from Kandrian to Aka and Utkumbu villages in WNB, discussions and garden visits (1 day); road traverse on the trans-New Britain logging road (Galai settlement to Amio village) to Ru and Umua villages, discussions and garden visits (1 day).

Boundary definition

The western boundary with System 1906 was determined on a walking traverse from Iombon to Moi-ia, Pomalal and Aka villages; and on a road traverse from Kandrian to Aka and Utkumbu villages. The southern boundaries with System 1905 was based on vegetation classes in Saunders (1993). The southern boundary with System 1802/1908 was defined after interviews in the Uvol mission area and aerial observations of fallow vegetation in the Ania Valley. The northern boundary with System 1911 was determined on a walking traverse by W. Kupo (KGIDP) from the south coast (Johanna River) to Sarakolok Land Settlement Scheme. The northern boundary with System 1916 was based on maps of Tamba Land Settlement Schemes. This system is distinguished from System 1803/1915 to the east on the basis of a traverse on the Galai-Amio road and visits to the Melkoi River and Mamusi areas.

Notes

This system is distinguished from nearby coastal ones (Systems 1905, 1802/1908 and 1911) where fallows are shorter in length. It is similar to System 1906 to the west, except in that system sweet potato has become a more important crop and there is more cash cropping. This system is very different from System 1803/1915 to the east. There, fallow vegetation is short woody regrowth, only 3-10 years old. This system is very similar to the agricultural system used in much of New Britain before new staple crops were adopted, fallow lengths shortened and cash crops planted over the past 30-35 years.

Taro was the dominant staple until recently. Bananas were the only other staple food grown in any quantity in food gardens. In the western part of this system (Eastern Kaulong/Asengseng), some cassava and a little sweet potato is now grown. In the eastern part, Manseng people have adopted other staples since 1990, when the north coast to south coast (Galai-Amio) logging road was built. The estimated proportion of staple foods by area in the eastern part of this system in 1995 was: taro 30 per cent; cassava 25 per cent; sweet potato 20 per cent; Chinese taro 15 per cent; and banana 10 per cent. Taro blight first started to affect production in the Kaulong speaking region in 1963-64 (Goodale 1995).

Other minor garden crops include Amorphophallus taro, Chinese taro, choko tips, ginger, pawpaw, peanuts, snake bean, valangur and watermelon. Self-sown foods include Polynesian chestnut, fishtail palm, karakap and ficus fruit. The most important self-sown foods are breadfruit, Pangium edule and wild yam. Much Pangium edule seed is eaten during the harvest season in June-July.

Irregular food shortages occur when older gardens have finished producing and new ones have not yet commenced. When garden food was scarce in the past, people ate wild yams and other food including Pangium edule seed, Polynesian chestnut seed and self-sown greens such as kumu musong. Now they are more likely to depend on cassava and sweet potato.

All gardens in the Eastern Kaulong/Asengseng area have stout fences. In the Manseng language area, previously all gardens were fenced, but are now usually not fenced. Throughout the system, yams are planted seasonally; and sweet potato is sometimes planted in mounds 20-30 cm high.

Chowning (1984) reported that after steel tools were introduced (earlier this century), the Asengseng people cleared larger gardens. She claimed that as much as 50 per cent of vegetable food was obtained from self-sown plants, the most important being wild yam, supplemented by the pith of certain palms and various fruit and nuts, particularly breadfruit. No indication was obtained during the 1990-95 fieldwork that yam, breadfruit, Pangium edule and Polynesian chestnut were this important in people's diets. Rather, villagers stated that wild yams were emergency foods eaten when taro and other foods were scarce. The situation among the Asengseng appears to be similar to other groups in the inland and along the south coast of New Britain between Kandrian station in WNB and the Warangoi River in ENB. This part of New Britain is subject to extremely high rainfall (4000-7000 mm/year). The adverse effect of high rainfall during the southeast season on garden production is presumably the cause of the frequent resort to wild yams, breadfruit and Polynesian chestnut as emergency foods.

Notes continued

Sweet potato, cassava, Chinese taro and pumpkin are post-European (post-1870) introductions, but the Asengseng had obtained cassava before any direct contact with Europeans and believe it to be a traditional food (Chowning n.d.). Sweet potato was just beginning to be grown in the interior villages in 1962-66 when Chowning did her fieldwork in the Asengseng area.

Goodale (1995, 21, 67-69), who conducted fieldwork in Umbi village in 1963-64 and 1967-68, reported that Kaulong speaking people divide the year into thirds. These are identified as the time of rains (June-September), the hungry time when taro is scarce (October-January) and the time of good weather and abundant food (February-May). During the rainy period, only quick trips are made to gardens to harvest food. This is the prime time for hunting wild pigs. The second period (time of hunger) is the time for clearing new gardens, for trading and travelling. Because little garden food is available, people depend on hunting, gathering wild vegetables and collecting insects, snails and other small game. Pangium edule nuts and the roasted trunk of a wild palm are eaten at this time.

The third period identified by Goodale (1995) is the time for weeding mature taro gardens and clearing new ones; catching fish, eels and shrimps; hunting pigs and trapping cassowaries; and eating wild fruits and nuts. Towards the end of this period Kaulong people conduct major taro harvests and replant gardens. Goodale's fieldwork was done mainly in 1963-64 and 1967-68 before cassava and sweet potato were adopted as important foods. It is likely that the previously observed seasonal differences have been reduced since the more widespread adoption of sweet potato and cassava. Goodale (1995) estimated that approximately 60 per cent of food was gathered, as compared with cultivated sources, in the more remote Umbi village and approximately 70 per cent at Angelek village nearer Kandrian.

Cash income is very limited in the Eastern Kaulong/Asengseng area. Manseng people now receive substantial income from timber royalties. Prior to 1990, when timber extraction commenced, their income was also very limited. The main source of cash income is the sale of live pigs. Sale of tobacco provides some cash and very minor amounts of fresh food are sold at Kandrian station. A little cocoa has been planted and very limited quantities are sold from the northeast corner of the system. There is also some oil palm in Bereme village in that part of the system.

National Nutrition Survey 1982/83

No villages from this system were included in the survey.

Main References

Chowning, A. n.d. Changes in staple crops in West New Britain (Papua New Guinea). Unpublished paper, Department of Anthropology and Maori Studies, Victoria University of Wellington, Wellington.

Goodale, J.C. 1995 To Sing with Pigs is Human: The Concept of Person in Papua New Guinea. Seattle, University of Washington Press.

Other References

Chowning, A. 1984 Culture and biology among the Sengseng of New Britain. Journal of the Polynesian Society 89, 1, 7-31.

WS Atkins International-Touche Ross Services 1984 Pomio-Bainings area study, East New Britain Province. Draft final report.

PROVINCE 18 East New Britain **AGRICULTURAL SYSTEM No.** 2 **Subsystem No.** 1 **of** 1

Districts 2 Pomio **Subsystem Extent** 100 % **Area (sq km)** 145
Population 3,482 **Population density** 24 **persons/sq km** **Population absent** 11 **%**

System Summary
Located on the south coast of New Britain between Lula River in WNB in the west and the Torlu River in the east and centred on Uvol mission. Fallow vegetation is tall woody regrowth, typically 8-12 years old. Fallow vegetation is cut, dried and burnt. Sweet potato, cassava and taro are important crops; coconuts are used to cook most significant meals; other crops are banana and yam (D. alata). Only one planting is made before land is fallowed. Taro, sweet potato and yam are planted in separate gardens, interplanted with cassava. Sweet potato is planted in mounds approximately 30 cm high. Breadfruit (seed and flesh eaten) and Polynesian chestnut are consumed in significant quantities when garden food is scarce during the wettest months.

Extends across provincial border to System(s) 1908

Altitude range (m) 0-300 **Slope** Gentle (2-10 degrees)

CROPS

STAPLES DOMINANT	None
STAPLES SUBDOMINANT	Cassava, Coconut, Sweet potato, Taro (Colocasia)
STAPLES PRESENT	Banana, Cassava, Coconut, Sweet potato, Taro (Colocasia), Yam (D. alata)
OTHER VEGETABLES	Aibika, Corn, Cucumber, Ferns, Kumu musong, Lowland pitpit, Tulip, Valangur, Bean (snake), Taro leaves
FRUITS	Coastal pandanus, Malay apple, Mango, Pawpaw, Sugarcane, Watermelon, Parartocarpus
NUTS	Breadfruit, Galip, Java almond, Pao, Polynesian chestnut
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	5-15 years
CROPPING PERIOD	1 planting
R VALUE	9 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	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 Cocoa	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	None
STAKING OF CROPS	None
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	None
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION

Survey description

In June 1995, travel by air from Palmalmal to Uvol and to Hoskins; interviews and garden visits at two villages near Uvol mission; road traverse from Uvol mission to Maso village, discussions and garden visits (2 days).

Boundary definition

The boundary with System 1801/1907 was based on interviews in the Uvol mission area and aerial observations of fallow vegetation in the Ania Valley. The boundary with System 1905 was determined after interviews at Kandrian in WNB and Uvol mission and is not precise. The boundary with System 1803/1915 was taken as the 300 m contour. This was based on interviews in the Uvol mission area and by analogy with the System 1803/1915 boundary on the north coast. The boundary with System 1804 (the Toriu River) was based on interviews in the Uvol mission area, interviews in the Jacquinot Bay area and aerial observations of land use on the south coast.

Notes

This system contrasts with the nearby inland system (1803/1915) where the fallow vegetation is short woody regrowth and fallow periods are shorter. It is somewhat different from the adjacent coastal systems (1905 and 1804) where sweet potato has displaced taro as the most important food. It is similar to System 1801/1907 where the fallow periods tend to be longer.

More taro gardens, interplanted with cassava, were seen than sweet potato gardens. All villagers interviewed stated that sweet potato, cassava and taro are all important foods with some claiming that sweet potato and cassava are more important than taro. No one claimed that Chinese taro was a significant food source and no stands of Chinese taro were observed.

During very wet periods, garden food can be scarce. People depend on Polynesian chestnut and breadfruit for food if they are in season at the time. Other minor foods eaten include amaranthus, ginger, oranges, pomelo, coastal pandanus and introduced pao nuts (Barringtonia procera). Fish are eaten, but consumption is low.

Yam, cucumber, watermelon and tobacco are planted in September-October. Lowland pitpit is planted in April-May. When the palolo worm (Palolo viridis) appears on the sea surface each October or November, people collect and eat them. They also place them on the soil surface to reduce crop disease. Garden sites with limestone outcrops are preferred by some people as damage from taro beetle is said to be less at these sites.

Previously, copra was the main source of cash income, but only a limited number of people now make and sell it because of transport costs and constraints. The local community government at Uvol purchases small quantities of cocoa, copra and Robusta coffee with estimated values of K2200, K1300 and K1300 respectively in 1994. A little fresh food, fish, betel nut and tobacco is sold locally. In the western part of the system in the Fulleborn-Amio area in WNB, people receive some royalty payments from logging. Timber extraction will commence in the central and eastern parts of the system in 1996.

National Nutrition Survey 1982/83

113 families from 5 villages were asked in February 1983 what they had eaten the previous day. 79 per cent reported eating sweet potato, 59 per cent cassava, 42 per cent coconut, 31 per cent Chinese taro, 25 per cent taro, 12 per cent banana, 4 per cent yam and none sago. 5 per cent reported eating rice. 12 per cent reported eating fresh fish. This is similar to the crop pattern, except for the consumption of Chinese taro which has probably declined in significance since 1983.

Main References

None.

Other References

Rohatynskyj, M. 1992 A study of minor ethnic groups in East New Britain. Unpublished report, Department of East New Britain, Rabaul.

WS Atkins International-Touche Ross Services 1984 Pomio-Bainings area study, East New Britain Province. Draft final report.

PROVINCE 18 East New Britain **AGRICULTURAL SYSTEM No.** 3 **Subsystem No.** 1 **of** 1

Districts 2 Pomio **Subsystem Extent** 100 % **Area (sq km)** 476
Population 5,581 **Population density** 12 **persons/sq km** **Population absent** 10 **%**

System Summary
Located in the centre of New Britain in the Melkoi River, Mamusi Plateau and Torlu River areas, between Silanga mission on the north coast and Uvol mission on the south coast. Fallow vegetation is short woody regrowth, typically 8-10 m tall and 3-10 years old. Some tall woody regrowth is also used. Fallow vegetation is cut, dried and burnt. The most important crops are taro and sweet potato, cassava is an important crop; other crops are Chinese taro and banana. Only one planting is made before fallowing. Sweet potato and taro are generally interplanted, but they are sometimes segregated within gardens or planted in separate gardens. Sweet potato is planted without mounding. Tree branches are laid around the contours, 4-5 m apart, to delineate plots within gardens and these have some soil retention effect.

Extends across provincial border to System(s) 1915

Altitude range (m) 300-1200 **Slope** Steep (10-25 degrees)

CROPS

STAPLES DOMINANT	Sweet potato, Taro (Colocasia)
STAPLES SUBDOMINANT	Cassava
STAPLES PRESENT	Banana, Cassava, Chinese taro, Sweet potato, Taro (Colocasia)
OTHER VEGETABLES	Aibika, Amaranthus spp., Cabbage, Chinese cabbage, Corn, Ferns, Highland pitpit, Lowland pitpit, Spring onion, Karakap
FRUITS	Mango, Orange, Sugarcane, Ton
NUTS	Breadfruit
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	9 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	Minor
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 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	Significant
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	Minor
STAKING OF CROPS	None
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	None
SEASONAL SEC'DARY CROPS	None

OTHER DOCUMENTATION

Survey description

In July 1995, helicopter flight from Kimbe to Worali village (in the Melkoi River area) and Pelin village (Mamusi Plateau); discussions and garden visits (half day). Road traverse from Kimbe to Salelubu DPI station, garden visits and discussions in Umu village in WNB (1 day).

Boundary definition

The boundaries with Systems 1911 and 1802/1908 were taken as the 300 m contour. This was based on a walking traverse in the vicinity of Umu village for the northern boundary, and interviews with villagers in the Uvol mission area for the southern boundary. This system was distinguished from System 1801/1907 to the west and System 1805 to the northeast following visits to other inland locations. The boundary with System 1804 was based on interviews in the Uvol mission area, interviews in the Jacquinot Bay area and aerial observations of land use on the south coast. The boundaries with System 1917 are those of the Land Settlement Scheme.

Notes

Agriculture here is distinctive for a number of reasons. The first is the short woody regrowth fallow vegetation and relatively short fallow periods. The extensive use of plot markers laid around the slopes is also characteristic. Vegetables are common in gardens and are often planted in ash, where the fallow vegetation was burnt. The paucity of fruit and nut trees also contrasts with the nearby lowlands. In the rugged Melkoi River area, there are extensive areas of forest on very steep slopes which are not used for food gardens. The gardens are located on less steep slopes where the vegetation is short woody regrowth.

Taro is more important than sweet potato at lower altitude locations (300-600 m) in the northern and southern parts of this system. Sweet potato is more important above an altitude of 600 m. Minor foods include snake bean, kumu musong leaves, watercress and pumpkin tips. At lower altitudes, minor foods include valangur, kangkong, Malay apple, guava, galip, Polynesian chestnut, Pangium edule and coconut. Breadfruit is commonly eaten in lower altitude parts of the system. An unidentified nut, possibly Elaeocarpus pullenii, is eaten at higher altitude locations.

Logs and branches are laid around the slope 4-5 m apart. Villagers say that these are only to delineate plots within gardens, not to reduce soil erosion. However, some soil build-up occurs on the upper side of the barriers and soil erosion reduction is probably an unintended benefit.

In 1953-54, some people moved from this system to Silanga in WNB (System 1911) on the north coast plain (van Rijswijck 1966). The migration was initiated by the Catholic mission. Motives for the move were both religious and a desire for cash cropping, initially with cocoa. Up to 1959, cash crops tried without success were coconuts, peanuts, rice and sweet potato. Between 1958 and 1964, cocoa became the main cash crop. Spontaneous migration also occurred from inland locations to the Uasilau area in WNB, where cocoa production was established (van Rijswijck 1966).

Cash income is very limited. Some tobacco is sold on the north and south coasts. A few men work as labourers on oil palm settlement blocks in the Silanga area on the north coast. In the north of the system, some people in three villages use this system for food production and have oil palm and a little cocoa below 300 m in System 1911. Small quantities of cardamom are sold from some villages south of Salelubu DPI station.

National Nutrition Survey 1982/83

81 families from 3 villages were asked in February or March 1983 what they had eaten the previous day. 59 per cent reported eating sweet potato, 49 per cent Chinese taro, 33 per cent taro, 19 per cent coconut, 11 per cent banana, 5 per cent cassava, 4 per cent yam and 2 per cent sago. 6 per cent reported eating rice. 5 per cent reported eating fresh fish. This differs from the crop pattern, with lower consumption of taro and cassava and higher consumption of Chinese taro and coconut.

Main References

None.

Other References

van Rijswijck, O. 1966 The Silanga resettlement project. New Guinea Research Bulletin No. 10, Australian National University, Port Moresby and Canberra.

WS Atkins International-Touche Ross Services 1984 Pomio-Bainings area study, East New Britain Province. Draft final report.

PROVINCE 18 East New Britain **AGRICULTURAL SYSTEM No.** 4 **Subsystem No.** 1 **of** 1

Districts 2 Pomio **Subsystem Extent** 100 % **Area (sq km)** 150
Population 5,040 **Population density** 34 **persons/sq km** **Population absent** 10 **%**

System Summary
Located along the south coast of New Britain from Owen Point in the east to the Torlu River in the southwest and centered on Pomio station. Fallow vegetation is tall woody regrowth, typically 10-15 years old. It is cut, dried and burnt. Sweet potato is the most important crop; cassava is an important crop; coconuts are used to cook most significant meals; other crops are banana, Chinese taro and taro. Stout fences are constructed around all gardens prior to planting. Only one planting is made before fallowing. Sweet potato and taro may be grown in separate gardens or in separate sections of gardens or interplanted. Yam (D. alata and D. esculenta) is grown in the eastern part of the system and are grown in separate gardens. Sweet potato is planted in mounds 20-30 cm high; yams are planted in mounds 10-15 cm high.

Extends across provincial border to System(s) None

Altitude range (m) 0-500 **Slope** Multiple classes

CROPS

STAPLES DOMINANT	Sweet potato
STAPLES SUBDOMINANT	Cassava, Coconut
STAPLES PRESENT	Banana, Cassava, Chinese taro, Coconut, Sweet potato, Taro (Colocasia)
OTHER VEGETABLES	Aibika, Corn, Ferns, Highland pitpit, Kumu musong, Lowland pitpit, Pumpkin tips, Tulip, Valangur, Bean (snake)
FRUITS	Coastal pandanus, Malay apple, Mango, Pawpaw, Sugarcane, Ton, Golden apple, Parartocarpus
NUTS	Breadfruit, Galip, Pangium edule, Pao, Polynesian chestnut
NARCOTICS	Betel nut (lowland), Betel pepper (lowland)

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	5-15 years
CROPPING PERIOD	1 planting
R VALUE	9 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	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 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	None
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	None
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION

Survey description

In April 1972, brief garden visits were made on a road traverse between Pomio station and Cutarp plantation (half day). In June 1995, a road traverse and garden visits between Pomio and Gonaile airstrip (half day); interviews and garden visits at Malakur and Buka villages (2 days); aerial observations between Tol plantation, Manguna plantation and Gonaile airstrip, and between Palmalmal and Uvol airstrips.

Boundary definition

The boundaries with Systems 1802 (the Toriu River) and 1803 were based on interviews in the Uvol mission area, interviews in the Jacquinot Bay area and aerial observations of land use on the south coast. The boundary with System 1805 was based on walking traverses between Cutarp plantation on Waterfall Bay and Nutuve mission, and elsewhere it was taken as the 300 m contour. The boundary with System 1806 was based on interviews in the Waterfall Bay area and at Palmalmal.

Notes

This system is similar to the coastal system to the southeast (System 1802/1908), but taro remains a more important crop there. It is also similar to the coastal system to the east (System 1806) where a greater number of crops are important and there is more cash cropping. It is distinguished from the inland System 1805 where fallow periods are longer and taro is also a most important food.

The fallow period is typically 10-15 years, but near villages it may be shorter (5-10 years). Tall woody regrowth, more than 20 years old and growing in old coconut plantations, is also used. Gardens are made on either flat land on the narrow coastal strip or on steep (10-15 degrees) hillsides immediately inland. Logs are laid in gardens to form compartments. Panoff (1972b, 381) states that these reduce soil erosion on slopes; and villagers believe that they form boundaries which the soul of taro should not cross.

Panoff (1972a, 46) reported that fallow periods are as short as 1-5 years for some sweet potato and Chinese taro gardens. In 1970, she estimated the proportion of gardens that followed fallows of different lengths in Matong village (Panoff 1972a, 78). She estimated that 38 per cent of gardens followed short fallows (3 months-5 years), 29 per cent followed long fallows (5-15 years), 17 per cent followed longer fallows (over 15 years) and 14 per cent were made after primary forest. She also calculated that the average fallow period in 1970 in this village was 13 years.

Taro was previously the most important crop. During the 1960s, Chinese taro and sweet potato replaced taro as the main food in the Pomio-Palmalmal area (Panoff 1972b, 380-381). Chinese taro was then the most important crop; sweet potato the second most important; and taro the third most important. In the mid-1980s, Chinese taro was very severely affected by a disease, probably a root rot caused by Pythium sp. Very little Chinese taro was grown after the disease outbreak and sweet potato became the most important crop with cassava as the second most important crop. In the eastern part of the system, Chinese taro never became so important and taro was replaced directly by sweet potato in the late 1950s.

In January 1970, Panoff (1972a, 78) recorded the area devoted to each staple crop in Matong village in the eastern part of the system. The total area planted to food crops was 6.6 ha, with 2.7 ha (40 per cent) of sweet potato, 1.7 ha (21 per cent) of Chinese taro, 1.4 ha (26 per cent) of taro and 0.8 ha (12 per cent) of yam. There were 199 residents in this village at the time. The survey followed a particularly wet period which had destroyed much of the taro crop. Panoff (1972a) estimated that the mean area planted per person per year was 0.06 ha.

Yam (D. alata and D. esculenta) are reasonably important crops from Tokai village on Waterfall Bay (in this system), northeast along the coast to about Tol plantation (System 1806) and inland east of the Esis River (System 1805). Yam (D. esculenta) is usually grown on stakes and both species are planted in mounds 10-15 cm high. In the yam growing area, yam (D. alata and D. esculenta) are planted seasonally in September-November and harvested in August-October. (Panoff 1972a, 70) gives a slightly different planting period of October-December.) Yams are grown in separate gardens from other crops.

Panoff (1972b, 381) stated that the coastal Mengen people have at least 130 taro cultivars, although it is possible that some cultivars have been counted more than once under different names. Taro leaves were previously the most important green vegetable, but they have been replaced by aibika because of the decline in taro cultivation. Corn is usually planted in the drier months of January-April and harvested in April-June. Taro is planted throughout the year, except during the wettest months of July and August (Panoff 1972a, 40). An annual calendar for the coastal Mengen people is given by M. Panoff (1969, 156-157).

Notes continued

Fruit and nut trees are common and are sometimes important foods, particularly mango, breadfruit, Polynesian chestnut and galip. The traditional mango species is more important than the introduced species. The seed and flesh of breadfruit are eaten. Both the traditional type of pao nut (Barringtonia novae-hiberniae) and the introduced species (B. procera) are grown and eaten. Self-sown tree foods include tulip, kumu musong and ton. Polynesian chestnut and galip are both self-sown and planted.

Fish are commonly eaten. As well as the crops listed under staples present, vegetables, fruit and nuts, the following minor foods are eaten: Alocasia taro, snake bean, winged bean, cucumber, ginger, guava, orange, pineapple, watermelon, okari nut (recently introduced) and Java almond. Very little tobacco is grown and villagers obtain it from inland people in System 1805. The coastal villagers in this system provide cash, coconuts, pigs, salt and clothing in exchange for tobacco.

Food shortages are common, particularly during the wettest part of the year (June-August) and especially in wet years, such as occurred in 1994. When garden food is scarce, people subsist on breadfruit seed and flesh, Polynesian chestnut (Panoff 1972a, 73) and galip, if these foods are in season. Wild yams were previously eaten during food shortages but they are rarely used now. Other famine foods included cycad fruit, the pith of fishtail palm (Caryota), tulip (Gnetum) seed and fibre of Cyathea ferns (Panoff 1972a, 36).

Cash income is very limited. The main source is remittances from educated people working elsewhere in PNG. Small quantities of fresh food, and occasionally fish, are sold to public servants and to workers at logging camps but the demand exceeds the supply. Royalties from logging provide a little income to some people. A typical household income from logging would be K50-70 per year for those who are entitled to royalties.

Previously, some copra was sold from the system. Very little copra is now produced because of the cost of transporting and marketing copra in Kokopo. There are a number of copra plantations in the area, but none are now producing copra and most have been abandoned. Robusta coffee has been planted in many villages, but it is not harvested because of marketing problems. Sale of trees for the manufacture of canoes is a very minor income source. A little cocoa has been planted in the past, but black pod disease destroys virtually all pods under the extremely high rainfall conditions (Pomio receives a mean of 6500 mm/year).

National Nutrition Survey 1982/83

54 families from 3 villages were asked in February or March 1983 what they had eaten the previous day. 87 per cent reported eating coconut, 72 per cent sweet potato, 54 per cent Chinese taro, 22 per cent banana, 9 per cent taro, 4 per cent cassava and none sago or yam. 44 per cent reported eating rice. 41 per cent reported eating fresh fish. This is similar to the crop pattern, except for the higher than expected consumption of Chinese taro, which has declined in significance since 1983, and the lower than expected cassava consumption which has increased in significance since 1983.

Main References

Panoff, F. 1969 Some facets of Maenge horticulture. Oceania 40, 1, 20-31.
Panoff, F. 1972a Maenge gardens: a study of Maenge relationship to domesticates. PhD thesis, Australian National University, Canberra.

Other References

Panoff, F. 1970 Food and faeces: a Melanesian rite. Man 5, 2, 237-252.
Panoff, F. 1972b Maenge taro and cordyline: elements of a Melanesian key. Journal of the Polynesian Society 81, 375-390.
Panoff, M. 1969 The notion of time among the Maenge people of New Britain. Ethnology 8, 2, 153-166.
WS Atkins International-Touche Ross Services 1984 Pomio-Bainings area study, East New Britain Province. Draft final report.

PROVINCE 18 East New Britain **AGRICULTURAL SYSTEM No.** 5 **Subsystem No.** 1 **of** 1

Districts 2 Pomio **Subsystem Extent** 100 % **Area (sq km)** 436
Population 5,535 **Population density** 13 **persons/sq km** **Population absent** 6 **%**

System Summary
Located in the interior of New Britain, between Pomio station and Mt Ulawum. Fallow vegetation is tall woody regrowth, usually more than 15 years old, but 10-15 year old fallows are sometimes used, especially for sweet potato gardens. Fallow vegetation is cut, dried and burnt. Taro and sweet potato are the most important crops; cassava is an important crop; other crops are banana and yam (D. alata). Stout fences are constructed around all gardens prior to planting. Only one planting is made before fallowing. Sweet potato and taro are ususally planted in separate gardens, but they are sometimes grown in separate sections of the same garden. Sweet potato is planted in mounds 30-50 cm high.

Extends across provincial border to System(s) None

Altitude range (m) 300-900 **Slope** Gentle (2-10 degrees)

CROPS

STAPLES DOMINANT	Sweet potato, Taro (Colocasia)
STAPLES SUBDOMINANT	Cassava
STAPLES PRESENT	Banana, Cassava, Sweet potato, Taro (Colocasia), Yam (D. alata)
OTHER VEGETABLES	Aibika, Corn, Cucumber, Ferns, Kumu musong, Lowland pitpit, Pumpkin tips, Taro leaves
FRUITS	Malay apple, Mango, Sugarcane, Ton
NUTS	Breadfruit, Coconut, Pangium edule
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	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 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	Significant
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	Minor

OTHER DOCUMENTATION

Survey description

In April 1972, and in December 1972-January 1973, walking traverses and garden observations from Cutarp plantation to Nutuve mission and Ora village (10 days walking). In November 1978, a walking traverse and garden observations from Nutuve mission to Ire and Kupgen villages, return to Nutuve and to Cutarp plantation (4 days walking). In June 1995, a road and walking traverse from Gonaile airstrip to Nutuve mission; and a walking traverse from Nutuve to the Bakuria villages (2 days). This description is based on extensive walking traverses throughout the Kol language area. The Sui and inland Mengen language areas were not visited, but are included on the basis of interviews in the Kol language area and in the Pomio-Palmalmal area.

Boundary definition

The boundary with System 1804 was based on walking traverses between Cutarp plantation on Waterfall Bay and Nutuve mission, and elsewhere it was taken as the 300 m contour. This system was distinguished from Systems 1803 and 1806 following visits to other inland locations on New Britain.

Notes

This system is distinguished from the coastal one to the south (System 1804) where fallow periods are generally shorter and sweet potato is the single most important food. It is quite different from System 1803 to the southwest where fallow vegetation is short woody regrowth typically 3-10 years old. This system is distinguished from System 1806 where fallow periods are shorter and there is no dominant staple.

Prior to about 1960, taro was the most important crop with minor amounts of yam (D. alata) and banana. Chinese taro was adopted in the 1960s and by 1972 it was a significant food. By about 1984, Chinese taro production was devastated by a disease, probably a root rot caused by Pythium sp. Sweet potato then replaced Chinese taro as a second crop, after taro. Very little Chinese taro is now grown. Cassava was a very minor crop in the late 1970s and has increased in importance during the 1980s and 1990s.

It is estimated that taro occupies 60-70 per cent by area of food gardens and sweet potato the remaining 30-40 per cent. (Other crops are interplanted with taro or sweet potato.) Sweet potato is more important at lower altitudes (300-500 m) and less important at higher altitudes (500-900 m). Yam (D. alata) is most common in the eastern part of the system, that is, between the Esis and Bergberg Rivers. This yam growing area extends south to Waterfall Bay in System 1804 and northeast along the south coast as far as Tol plantation in System 1806.

Cassava is interplanted in both taro and sweet potato gardens. Because it grows more slowly than these two crops, it does not shade them out. After taro and sweet potato have been harvested, cassava provides a partial ground cover. Although the area planted with cassava is much less than that for sweet potato and taro, it is a significant food source because it is so high yielding. Panoff (1972b) reported that inland Mengen people plant over 200 taro cultivars, although some cultivars may have been recorded more than once under different names.

As well as the crops listed under staples present, vegetables, fruit and nuts, the following minor foods are eaten: Chinese taro, highland pitpit, ginger, tree ferns, yam (D. bulbifera and D. pentaphylla) and watermelon. Both self sown and planted ton are grown. Only the traditional species of mango is grown.

Corn suffers from severe damage from parrots. Villagers sleep near their gardens to guard maturing corn from parrot damage. Sugarcane is generally not staked and yam (D. alata) is not staked. Corn tends to be planted seasonally in January-April. Yams are planted seasonally when the leaves of the 'kulis' tree turn dry.

After fallow vegetation is cleared and burnt, stout fences are constructed prior to planting. Plot markers made from small logs delineate sections within gardens. In taro gardens, the remaining litter is swept from the soil surface prior to planting. This practice is said to reduce damage from insects.

From time to time, food shortages occur when newly planted gardens are still immature and the established gardens have ceased bearing. During the 1972 food shortage, following the severe drought earlier in the year, people survived on wild yam tubers and the pith of a wild palm. Tubers from self sown yam plants are still eaten when garden food is scarce.

Taro is affected by a disease with symptoms similar to the root rot in Chinese taro. In both taro and Chinese taro, the symptoms are: the roots and corm rot, leaves become yellow and plants are stunted. For both species, the symptoms affect plants in a rough circle around a severely affected plant or group of plants. Villagers are concerned about disease

Notes continued
problems with taro and with a tuber rot of cassava, as they have experienced the devastation of Chinese taro by disease. WS Atkins (1984, 4-5) noted that villagers around Nutuve mission associate root rot of Chinese taro with high rainfall and waterlogging.

Inland Mengen people use abandoned house sites and latrines as garden plots (Panoff 1970, 251). Panoff suggests that this probably reflects the poorer quality of their soil, as does the care that people take to protect tree species such as Albizzia falcata, Pipturus argenteus and Prosopsis insularum.

Cash income is very limited, especially in the Kol and Sui language areas. The main source of cash income is casual unskilled labouring for coastal villagers in System 1804. Inland people earn K10-20 per fortnight for this work. Tobacco is sold on the north and south coasts in the Ulamona mission and Pomio station areas respectively. This provides a little income, especially in the inland Mengen language area. Very small quantities of betel nut and fresh food are occasionally sold to coastal people. Some cardamom is grown in the Mile/Pakia area and is purchased by DPI. Cardamom was trialled at Nutuve mission, but it failed because the altitude is too low for successful production. Some Robusta coffee was planted as part of the Pomio-Baining Rural Development Project, but it is not harvested or sold.

National Nutrition Survey 1982/83
17 families from 1 village were asked in February 1983 what they had eaten the previous day. 24 per cent reported eating sweet potato, 12 per cent Chinese taro, 6 per cent banana, 6 per cent coconut, 6 per cent taro and none cassava, sago or yam. 6 per cent reported eating rice. None reported eating fresh fish. This differs from the crop pattern, with higher consumption of Chinese taro and lower consumption of taro and cassava. This reflects changes in the relative significance of Chinese taro and cassava between 1983 and 1995.

Main References
None.

Other References
Panoff, F. 1969 Some facets of Maenge horticulture. Oceania 40, 1, 20-31.
Panoff, F. 1970 Food and faeces: a Melanesian rite. Man 5, 2, 237-252.
Panoff, F. 1972a Maenge gardens: a study of Maenge relationship to domesticates. PhD thesis, Australian National University, Canberra.
Panoff, F. 1972b Maenge taro and cordyline: elements of a Melanesian key. Journal of the Polynesian Society 81, 375-390.
Rohatynskyj, M. 1992 A study of minor ethnic groups in East New Britain. Unpublished report, Department of East New Britain, Rabaul.
WS Atkins International-Touche Ross Services 1984 Pomio-Bainings area study, East New Britain Province. Draft final report.

PROVINCE 18 East New Britain	**AGRICULTURAL SYSTEM No.** 6	**Subsystem No.** 1 **of** 1
Districts 1 Kokopo, 2 Pomio, 3 Rabaul	**Subsystem Extent** 100 %	**Area (sq km)** 739
Population 7,727	**Population density** 10 **persons/sq km**	**Population absent** 12 **%**

System Summary

Located in the eastern Baining Mountains of the Gazelle Peninsula of East New Britain; on a coastal strip from the Warangoi River, south to the Rak River (Owen Point); and on a coastal strip west from Masava Bay to Cape Lambert and south to Open Bay and the Pandi River in WNB. Fallow vegetation is tall woody regrowth, typically 10-15 years old. Fallow vegetation is cut, dried and burnt. Cassava, Chinese taro, sweet potato and taro are important crops; coconuts are used to cook most significant meals in coastal locations; bananas are also grown. The relative importance of these crops varies between locations. Only one planting is made before fallowing. Chinese taro is usually grown in separate gardens from other crops. Sweet potato and taro are grown in separate sections of gardens. Sweet potato is planted in very small mounds and sometimes in mounds up to 20 cm high.

Extends across provincial border to System(s) 1914

Altitude range (m) 0-600 **Slope** Steep (10-25 degrees)

CROPS

STAPLES DOMINANT	None
STAPLES SUBDOMINANT	Cassava, Chinese taro, Coconut, Sweet potato, Taro (Colocasia)
STAPLES PRESENT	Banana, Cassava, Chinese taro, Coconut, Sweet potato, Taro (Colocasia)
OTHER VEGETABLES	Aibika, Choko tips, Corn, Ferns, Kumu musong, Lowland pitpit, Pumpkin tips, Tulip, Bean (snake)
FRUITS	Malay apple, Mango, Pawpaw, Sugarcane, Ton, Parartocarpus
NUTS	Breadfruit, Galip, Pao, Polynesian chestnut
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	5-15 years
CROPPING PERIOD	1 planting
R VALUE	9 (very low)

GARDEN SEGREGATION

GARDEN SEGREGATION	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 Cocoa	Minor
2 Coconuts	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	Significant
SMALL MOUNDS	Minor
MOUNDS	None
LARGE MOUNDS	None
Garden Bed Techniques:	
BEDS SQUARE	None
BEDS LONG	None
Other Features:	
FENCES	Minor
STAKING OF CROPS	None
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	None
SEASONAL SEC'DARY CROPS	Minor

OTHER DOCUMENTATION

Survey description

In 1971 and 1972, walking traverses, with interviews and garden visits, from the western (Lassul) Baining Mountains to the north coast, throughout the eastern (Sinivit) Baining Mountains, and from the Warangoi River to Putput plantation. In June 1995, traverse on the Vudal-Vunapaladig-Lassul Bay road; interviews and garden visits at one village (1 day). In June 1995, road traverse from Toma patrol post to the Warangoi River and the east coast; interviews and garden visits at two villages (1 day). Interviews with villagers at Waterfall Bay (System 1804) and Ulamona mission area in WNB (System 1913) and with DPI staff based at Pomio and Open Bay.

Boundary definition

The western boundary with System 1913 (the Pandi River) was based on interviews in the Ulamona mission area in WNB and with DPI staff based at Open Bay. This system was distinguished from that in the western Baining Mountains (System 1807) after extensive walking traverses throughout those mountains. The boundaries with System 1808 were based on road traverses from Vudal College to Lassul Bay, road traverses through the Warangoi and Sigute Settlement Schemes, and walking traverses through the eastern Baining Mountains. The boundary with System 1809 (Warangoi River) was determined from road traverses from Toma patrol post to Sumsum plantation on the east coast of the Gazelle Peninsula. The boundary with System 1804 was based on interviews in the Waterfall Bay area and at Palmalmal.

Notes

This system is distinguished from System 1913, where fallow periods are very short and cassava is the most important crop; from System 1807, where Chinese taro is the most important crop and there is little burning of fallow vegetation; from System 1808, 1809 and 1810, where land use is more intensive and bananas are the most important crop; and from System 1804, where sweet potato is the most important crop and there is very little cash cropping. It is distingished from System 1805 where fallow periods are longer, and sweet potato and taro are the most important crops.

Prior to the 1960s, taro was the most important crop throughout this system. It has been partially replaced by cassava, sweet potato and Chinese taro. The relative importance of the staple foods varies between locations. On the west coast of the Gazelle Peninsula (Cape Lambert to the Pandi River), cassava and sweet potato are the main food crops and taro is of minor importance; on the northern coast (Lassul Bay area), taro and Chinese taro are the most important crops, sweet potato is an important crop, cassava and bananas are minor crops; in the eastern (Sinivit) Baining Mountains, taro, Chinese taro and cassava are important crops, while sweet potato and bananas are minor crops; on the eastern coast of the Peninsula, sweet potato, cassava and Chinese taro are important crops, while taro, banana and yam (D. alata and D. esculenta) are minor crops; in the Wide Bay area, sweet potato and Chinese taro are more important than cassava, taro, banana and yam (D. alata and D. esculenta).

Taro blight arrived in the Baining Mountains in 1957 and caused a major decline in taro cultivation. Taro continues to be important on the north coast Bainings, but Fajans (1985, 37) reports that yields have been reduced by the disease. In the western Baining Mountains (System 1807), Chinese taro has been adopted as a replacement for taro. Chinese taro is afflicted by a root rot in the Sinivit Baining Mountains. This disease has been present for many years. In the nearby coastal area, the disease was first noted only in 1991.

Yam (D. alata and D. esculenta) are reasonably important crops from Waterfall Bay (in System 1804), along the coast to about Tol plantation (this system) and inland east of the Esis River (System 1805). Yam (D. esculenta) is usually grown on stakes and both species are planted in mounds 10-15 cm high. In the Wide Bay area, yams (D. alata and D. esculenta) are planted seasonally in separate gardens from other crops. Schneider (1954) reported that the Sulka people in the Wide Bay area planted 32 named types of yam (D. alata), more than 20 named types of yam (D. esculenta) and a number of other wild and cultivated yam species.

Other minor foods include kangkong, valangur, self-sown karakap, amaranthus, taro leaves, golden apple, Pangium edule, Java almond and tulip seed. Coconuts are commonly used to cook food in coastal locations, but this is less common in the mountains. Both the flesh and seed of breadfruit are eaten. Choko tips are eaten in the mountains, but not in the coastal part of this system.

The east coast of the Gazelle Peninsula receives a very high rainfall (over 4000 mm per year), with May-September being the wettest months. This resulted in food shortages when taro was the most important food, that is prior to 1960. When taro was unavailable, people ate other foods including breadfruit, Parartocarpus fruit and Polynesian chestnut. Cassava, Chinese taro and sweet potato are now available throughout the year and there is less dependence on these tree crops.

Notes continued

In the eastern Gazelle Peninsula, people divide the year into a number seasons: the lowland pitpit harvesting period (January-February); the post-pitpit period when Polynesian chestnut is harvested and the weather is a mix of wet and less wet (March-May); the galip nut harvesting season and the wettest part of the year (June-August); and the drier period when breadfruit is harvested (September-December). Crops were previously not planted during the very wettest part of the year, known as 'kargingel' (about July). Since sweet potato, cassava and Chinese taro have displaced taro as the main crop, this restriction is no longer followed.

Garden fences are rarely used in this system. This is in marked contrast with other locations on the New Britain south coast, including the adjacent system (System 1804) where stout fences are the norm. Villagers say that fences are not necessary where the coastal strip is narrow because wild pigs do not thrive on very steep land. The abandoned coconut plantations elsewhere on the south coast provide abundant coconuts for wild pigs to eat. Thus pigs are common near abandoned plantations.

People still hunt cassowary, wild pig and other game in the Sinivit Baining Mountains, but hunting is now uncommon in the coastal parts of the system. On the eastern coast of the Gazelle Peninsula, some people still trap fish, wild pigs, birds and flying foxes.

Cocoa, copra and fresh food are the main cash crops with their significance varying between locations. Cocoa is most important on the Lassul Baining north coast and on the west coast of the Gazelle Peninsula as far south as Poinaku village (near Stockholm plantation). Significant areas of new plantings are still being established in these locations. In the Wide Bay area, cocoa is sold as far south as Milim village. Copra is the main source of cash income on the Gazelle Peninsula east coast and in the Wide Bay area. Here buffalo drawn carts are sometimes used to transport coconuts for processing.

Some fresh food is sold from the north coast Bainings and the eastern (Sinivit) Bainings. Food is sold at Kokopo market and to workers at logging camps. Some betel nut is sold, particularly to timber workers in the Wide Bay area. Some tobacco is sold from the eastern Baining Mountains. Some people receive minor amounts of income from logging royalties. This is most significant in the Open Bay area. On the east coast, villagers purchased Sumsum plantation using timber royalty payments. Their landowner company was named 'Maden' (mad person) reflecting their ambiguity about allowing foreign contractors to log their forest.

People in the eastern Baining Mountains participated in the Kivung cargo cult movement in the 1980s (Whitehouse 1995). One of the edicts of the cult was to discourage of agricultural work, which lead to a temporary decline in food production (pp 122, 161-162). To supplement the inadequate subsistence food supply, villagers sold cocoa and bought rice and tinned fish with the money. Eventually, people responded to the food shortage by investing considerable labour in clearing and planting new gardens. Sinivit Baining villagers, who also adhered to the Kivung beliefs, discouraged cash cropping believing that ritual instead would produce economic development. Those who did not participate in the movement, for example people in Suman village, emphasised cocoa production as the means to economic development (Whitehouse 1989; 1995).

National Nutrition Survey 1982/83

78 families from 5 villages were asked in October 1982 or February 1983 what they had eaten the previous day. 92 per cent reported eating coconut, 69 per cent sweet potato, 42 per cent banana, 33 per cent Chinese taro, 15 per cent taro, 14 per cent cassava, 3 per cent yam and none sago. 24 per cent reported eating rice. 14 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

Bourke, R.M. 1976 Food crop farming systems used on the Gazelle Peninsula of New Britain. In Willson, K. and R.M. Bourke (eds), 1975 Papua New Guinea Food Crops Conference Proceedings. Port Moresby, Department of Primary Industry, 81-100.

Fajans, J. 1985 They make themselves: life cycle, domestic cycle and ritual among the Baining. PhD thesis, Stanford University, Stanford.

Fajans, J. 1993 The alimentary structures of kinship: food and exchange among the Baining of Papua New Guinea. In Fajans, J. (ed), Exchanging Products: Producing Exchange. Sydney, University of Sydney, 59-75.

Hesse, K. and T. Aerts 1982 Baining Life and Lore. Port Moresby, Institute of Papua New Guinea Studies.

Other References continued

Laufer, P.C. 1965-67 Der Ackerbau der Baining. Leipzig Museum für Völkerkunde Jahrbuch 23, 7-25.
Rohatynskyj, M. 1992 A study of minor ethnic groups in East New Britain. Unpublished report, Department of East New Britain, Rabaul.
Schneider, J. 1954 Über den Feldbau der Sulka auf Neubritannien. Anthropos 49, 276-289.
Whitehouse, H. 1989 The oscillating equilibrium of production among the Mali Bainings. Research in Melanesia 13, 62-67.
Whitehouse, H. 1995 Inside the Cult: Religious Innovation and Transmission in Papua New Guinea. Oxford, Clarendon Press.
WS Atkins International-Touche Ross Services 1984 Pomio-Bainings area study, East New Britain Province. Draft final report.

PROVINCE 18 East New Britain **AGRICULTURAL SYSTEM No.** 7 **Subsystem No.** 1 **of** 1

Districts 3 Rabaul **Subsystem Extent** 100 % **Area (sq km)** 348
Population 3,171 **Population density** 9 **persons/sq km** **Population absent** 14 **%**

System Summary
Located in the western Baining Mountains of the Gazelle Peninsula. Fallow vegetation is tall woody regrowth, typically 8-15 years old, but fallows of more than 15 years are sometimes used, especially for Chinese taro gardens. The undergrowth of the fallow vegetation is cut and removed from the garden site, with only a small quantity burnt. In taro gardens, most trees are felled prior to planting. For Chinese taro gardens, some trees are felled prior to planting, but many are ringbarked and left standing. Some are later felled onto the growing crop. Chinese taro is the most important crop; taro is an important crop; other crops are banana, sweet potato and cassava. Only one planting is made before fallowing. Chinese taro and taro are planted in separate gardens. Within taro gardens, sweet potato and cassava are interplanted, but are grown in separate sections from taro.

Extends across provincial border to System(s) None

Altitude range (m) 100-1200 **Slope** Steep (10-25 degrees)

CROPS

STAPLES DOMINANT	Chinese taro
STAPLES SUBDOMINANT	Taro (Colocasia)
STAPLES PRESENT	Banana, Cassava, Chinese taro, Sweet potato, Taro (Colocasia)
OTHER VEGETABLES	Aibika, Bean (winged), Choko tips, Corn, Cucumber, Highland pitpit, Lowland pitpit, Karakap
FRUITS	Malay apple, Mango, Pawpaw, Sugarcane, Ton
NUTS	Breadfruit, Coconut
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	None
LONG FALLOW PERIOD	5-15 years
CROPPING PERIOD	1 planting
R VALUE	9 (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 Fresh food	Significant
2 Cardamom	Minor

OTHER AGRONOMIC PRACTICES

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

OTHER DOCUMENTATION

Survey description

Between mid-1970 and 1976, walking traverses and garden observations on most walking tracks linking Rangulit, Malasait, Alakasam, Yalom and Komgi villages and the north coast (about 30 days walking). In May 1981, visits by helicopter to Malasait, Galavit and Raunsepna villages (half day). In June 1995 and again in October 1996, a vehicle traverse and garden visits on the Vudal College-Vunapaladig settlement-Malasait village road (1 day).

Boundary definition

The boundary with System 1808 was determined on a traverse on the Vunapaladig settlement-Malasait village road and extrapolated along the 300 m contour. The boundary with System 1806 is the 400 m contour. It was determined from interviews at Malasait village (for the western boundary) and on a walking traverse from Yalum village to the north coast (for the northern boundary).

Notes

This system is distinguished from the nearby coastal one (System 1806) where Chinese taro, cassava, sweet potato and taro are all important crops and the fallow vegetation is burnt. It is distinguished from systems in the northeast lowlands of the Gazelle Peninsula and nearby islands (Systems 1808, 1809, 1810) where banana is the most important crop and land use is much more intensive.

Most fallow vegetation is not burnt. In taro gardens, fallow vegetation is cut and tree branches are removed from the garden site for firewood. Some leaves and small branches are burnt in locations intended for planting tobacco and certain vegetables. Rangai (1982, 131) reported that Baining taro gardens are established by clearing woody regrowth, planting taro without burning and then burning the dry litter when taro plants have 2-3 leaves. This practice was not noted in 1995 or 1996 fieldwork. For Chinese taro gardens, the undergrowth is removed from the site. The trees are not cut down but are ringbarked. After the Chinese taro has been planted and become established, some trees are cut on to the growing crop. Because little of the fallow vegetation is burnt, a thick mulch of leaves and twigs covers the soil surface.

Taro was the most important crop in the western Baining Mountains until the early-mid 1960s. Taro blight infested taro in 1957 and this led to the replacement of taro with Chinese taro (Fajans 1985, 36-37, 71). By 1970 Chinese taro had become the most important food and taro was less important. The relative importance of the various staples has not altered between 1970 and 1995, except for the increased planting and consumption of cassava. In the mid- 1990s, taro possibly occupied more than one third of garden area.

Chinese taro is planted only in land that had been previously used for Chinese taro before fallowing. Taro is not planted in these sites because Chinese taro sprouts after clearing and would shade the less vigorous taro. Since about 1980, a disease, probably a Pythium root rot, has been affecting the roots and cormels of Chinese taro.

Aibika and choko tips are the main green vegetables. Chokos are planted in gardens and then grow prolifically in the regrowth for some years. Few green vegetables are grown in gardens near villages because of attacks by giant African snails. More vegetables are planted in the distant gardens where wild pigs keep the snails under control. Ton trees are planted, not selfsown. Sweet potato is planted by dibbling. Wild pigs are common in the forest and villagers trap them.

Fresh food is sold at Keravat and Kokopo markets, with taro, Chinese taro and lowland pitpit being the main foods sold. Cardamom is grown in most villages. Buyers come to Malasait village from the northeast lowlands to purchase it. Some tobacco is also sold. People from Rangulit and Malasait villages have some cocoa plots at 200-400 m above sea level. People from other villages have established cocoa plots on the north and west coasts in System 1806. Many villagers have migrated permanently to near the coast; others still reside in the mountain villages and visit their cocoa blocks in System 1806 regularly. In the western part of the system, people in some lower altitude villages receive a little income from logging royalties.

National Nutrition Survey 1982/83

102 families from 3 villages were asked in October or November 1982 what they had eaten the previous day. 63 per cent reported eating Chinese taro, 53 per cent coconut, 30 per cent taro, 20 per cent sweet potato, 13 per cent banana, 2 per cent cassava and none sago or yam. 29 per cent reported eating rice. 10 per cent reported eating fresh fish. This is similar to the crop pattern, except for the higher than expected consumption of coconut.

Main References

None.

Other References

Bourke, R.M. 1976 Food crop farming systems used on the Gazelle Peninsula of New Britain. In Willson, K. and R.M. Bourke (eds), 1975 Papua New Guinea Food Crops Conference Proceedings. Port Moresby, Department of Primary Industry, 81-100.

Fajans, J. 1985 They make themselves: life cycle, domestic cycle and ritual among the Baining. PhD thesis, Stanford University, Stanford.

Fajans, J. 1993 The alimentary structures of kinship: food and exchange among the Baining of Papua New Guinea. In Fajans, J. (ed), Exchanging Products: Producing Exchange. Sydney, University of Sydney, 59-75.

Hesse, K. and T. Aerts 1982 Baining Life and Lore. Port Moresby, Institute of Papua New Guinea Studies.

Laufer, P.C. 1965-67 Der Ackerbau der Baining. Leipzig Museum für Völkerkunde Jahrbuch 23, 7-25.

Parkinson, R. 1907 Dreissig Jahre in der Südsee. Land und Leute, Sitten und Gebräuche im Bismarckarchipel und auf den Deutschen Salomoinseln. (Thirty Years in the South Seas. The Bismarck Archipelago: Land, Natives and Customs - English translation by N.C. Barry). Stuttgart, Berlag von Strecker and Schröder.

Rangai, S.S. 1982 Preliminary results of a survey of taro (Colocasia esculenta) cultivation on the Gazelle Peninsula of New Britain. In Bourke, R.M. and V. Kesavan (eds), Proceedings of the Second Papua New Guinea Food Crops Conference. Port Moresby, Department of Primary Industry, 123-133.

WS Atkins International-Touche Ross Services 1984 Pomio-Bainings area study, East New Britain Province. Draft final report.

PROVINCE 18 East New Britain **AGRICULTURAL SYSTEM No.** 8 **Subsystem No.** 1 **of** 1

Districts 3 Rabaul **Subsystem Extent** 100 % **Area (sq km)** 349
Population 1,292 **Population density** 4 **persons/sq km** **Population absent** 3 **%**

System Summary

Located on formal and informal settlement blocks on the Gazelle Peninsula of New Britain, where cocoa is the major cash crop. Fallow vegetation is usually tall woody regrowth, 8-15 years old, but short woody regrowth, previously unused forest and tall grass are also used. Fallow vegetation is cut, dried and burnt. Banana is the most important crop; sweet potato and Chinese taro are important crops; other crops include cassava and taro. There is a large range in the number of plantings made before cocoa is established or land is fallowed. A general pattern is that a food crop is interplanted with banana and, after this crop is harvested, the density of banana is increased and cocoa seedlings are planted under the banana canopy. Two to four plantings of peanuts, often in a rotation with sweet potato, are sometimes made. Sequences of one food crop followed by another food crop are common. Chinese taro, together with banana, is usually planted in separate gardens from sweet potato, peanuts or taro, but it may be planted in a separate section of the same garden. Significant areas of peanuts may be planted. These are grown in separate sections from taro and sweet potato.

Extends across provincial border to System(s) None

Altitude range (m) 0-400 **Slope** Gentle (2-10 degrees)

CROPS

STAPLES DOMINANT	Banana
STAPLES SUBDOMINANT	Chinese taro, Sweet potato
STAPLES PRESENT	Banana, Cassava, Chinese taro, Sweet potato, Taro (Colocasia)
OTHER VEGETABLES	Aibika, Amaranthus spp., Corn, Cucumber, Lowland pitpit, Peanuts, Pumpkin tips, Bean (snake), Karakap, Tomato
FRUITS	Malay apple, Mango, Pawpaw, Pineapple, Sugarcane, Ton, Guava
NUTS	Coconut, Galip, Pao
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

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

GARDEN SEGREGATION

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

SOIL FERTILITY MAINTENANCE

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

CASH EARNING ACTIVITIES

1 Cocoa	Very significant
2 Fresh food	Significant
3 Betel nut	Minor

OTHER AGRONOMIC PRACTICES

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

OTHER DOCUMENTATION

Survey description

Between mid-1970 and late 1976, numerous visits to formal and informal settlement blocks in the Vudal and Vunapaladig areas and some visits to settlement blocks in the Warangoi Valley. In June 1995, a road traverse and garden visits from Keravat township to the Vudal and Vunapaladig settlement blocks and the Baining Mountains (half day); and from Vunapaladig to New Massawa plantation and Lassul Bay (1 day). In June 1995, a road traverse from Toma station to the Warangoi River, Rugan Harbour and the Sigute settlement scheme (half day); a road traverse and garden visits from Toma station to Gaulim village and Vunapaladig settlement (1 day).

Boundary definition

The boundaries with System 1806 were based on road traverses from Vudal College to Lassul Bay, road traverses through the Warangoi and Sigute Settlement Schemes, and walking traverses through the eastern Baining Mountains. The boundary with System 1807 was determined on a traverse on the Vunapaladig settlement-Malasait village road and extrapolated along the 300 m contour. The boundaries with System 1809 are parts of the Keravat and Warangoi Rivers. They were determined from extensive road and walking traverses between the northeast lowlands of the Gazelle Peninsula and the Vudal, Vunapaladig, Gaulim, Warangoi and Sigute settlement blocks.

Notes

This system is clearly distinguished from System 1807 in the western Baining Mountains where Chinese taro is the most important crop, fallow vegetation is usually not burnt and only one planting is made before fallowing. It is similar to that used in the northeast lowlands of the Gazelle Peninsula (System 1809), but is distinguished because of the greater significance of perennial stands of bananas and the use of grasslands for some gardens there; and the emphasis on the establishment of cocoa blocks in this system. It is distinguished from System 1806 where cassava, Chinese taro, sweet potato and taro are all important crops.

The system is located on formal and informal settlement blocks at Vunapaladig, Vudal, Mandress and Japalak, west of the Keravat River as far as New Massawa plantation; in the Gaulim area between the Keravat and Warangoi Rivers; at Warangoi, Vunamami, Illugi, Sunum and Nengmutka in the Warangoi Valley; and at Sigute between the Warangoi and Sigute Rivers.

Settlers come from the northeast lowlands of the Gazelle Peninsula (System 1809) and elsewhere in PNG. Blockholders typically plant large food gardens in the early stages of clearing their blocks for cocoa planting. These provide subsistence food and significant quantities are also sold, particularly peanuts, corn, taro, Chinese taro, diploid bananas, sweet potato and aibika. The food gardens are generally converted into cocoa plots, using diploid bananas as temporary shade and gliricidia as permanent shade. Since about 1970, the settlement blocks have provided much of the food sold at Rabaul market.

Most settlers are Tolai people, who generally maintain their main residence in their home village in System 1809. In recent years, people from other parts of PNG have taken up blocks. They come from the Duke of York Islands, Watom Island, New Ireland and the New Guinea mainland (Morobe, Madang, East Sepik and West Sepik Provinces). Non-Tolai settlers are more likely to reside full-time on the blocks, particularly as their blocks tend to be further from Rabaul.

Because of the split residency pattern and the amount of food produced on blocks by people who are censused in System 1809, the population figure and population density for this system are not meaningful. The combined population (57,300 in 1980) and population density (62 persons/square kilometre) for Systems 1808 and 1809 give a truer indication of land use intensity for the combined systems. There has been a very high rate of population increase in this area and the 1995 population for the combined systems is estimated at about 130,000 people.

The first land settlement schemes were established at Vudal in 1953 (Singh 1967, 3). This was followed by the Vunamami (1958), Warangoi (1960), Illugi (1961) and Sunum (1966) schemes in the Warangoi River area and two schemes, Keravat and Tavilo (1963), in the Keravat area (Singh 1967, 3-6). The Japalik, Mandress and Vunapaladig schemes in the Vudal area and the Nengmutka scheme in the Warangoi area were established in the late 1960s and early 1970s. The primary purpose of the settlement schemes in the 1950s and 1960s was not to relieve population pressure, but rather to improve the standard of living of selected villagers through cash cropping (Singh 1967, 6-7). Trees were logged before blocks were settled on the government resettlement schemes at Vunapaladig and Warangoi.

Since about 1970, extensive areas of land have been purchased by Tolai villagers and others from Baining people west of the Keravat River and between the Keravat and Warangoi Rivers. Blocks extend as far west as New Massawa plantation on the north coast and up to an altitude of 300 m, west of the Vunapaladig settlement scheme. Formal

Notes continued
government settlement blocks are still being taken up with the Sigute scheme being settled in 1994. Some of the settlers in the Sigute scheme are villagers whose homes were destroyed by the 1994 volcanic eruption, or land-short people who benefited from the volcanic eruption and gained blocks. Land purchased in the 1980s by informal settlers from Baining villages was cheap, with K200 a typical price for a 10 ha block. By 1995, very little land was being sold and forested blocks were priced at K500-K2000. Overall, there are probably more informal settlement blocks than formal government ones.

Following the volcanic eruption at Rabaul in September 1994, some of the settlers from the New Guinea mainland have left the Gazelle Peninsula. Many have sold, or are attempting to sell, their blocks. A typical asking price is K20,000 for an established block, but this high price is inhibiting sales. The transfer of some of these blocks to Tolai villagers will provide some minor temporary relief to land pressure in System 1809.

Agricultural practices on the blocks vary greatly and are often related to the number of years since the blocks were first settled. On newly established blocks, the fallow vegetation is previously unused forest or tall woody regrowth, more than 15 years old. On the more established blocks, the most common fallow vegetation is tall woody regrowth, 5-15 years old. On blocks settled before 1970, the area devoted to food gardens is usually small to very small and most land is planted with cocoa. These settlers obtain their food from permanent banana stands on the blocks, small areas devoted mainly to vegetables, from gardens on other blocks that they own, or from gardens on other settlers' blocks.

There is considerable variation in the number of plantings made before fallowing or the establishment of cocoa, and in the sequence of crops planted. Usually only one planting of Chinese taro, interplanted with banana, is made before cocoa is planted or land is fallowed. Two to four plantings of peanuts, often grown in a rotation with sweet potato, may be made before cocoa is interplanted with banana and gliricidia. Sweet potato or taro may be planted after a fallow, followed by cocoa and bananas. Some other sequences noted were: sweet potato followed by Chinese taro; vegetables such as aibika, peanuts and snake bean followed by cocoa and banana; peanuts followed by aibika and then banana; peanuts followed by sweet potato and then Chinese taro; a number of plantings of peanuts followed by sweet potato. Peanuts are sometimes the first crop planted after fallow vegetation is cleared. This contrasts with the rotation employed in the Eastern Highlands where peanuts are rarely the first crop planted after a fallow. The soil is tilled completely for peanuts, but not for other crops.

Aibika is the most common green vegetable grown. As well as the crops listed under staples present, vegetables, fruit and nuts, the following minor foods are eaten: kumu musong, tulip, valangur, eggplant, choko tips, ferns, kalava, capsicum, Chinese cabbage, spring onion, five corner, rambutan and pomelo. Sweet potato is usually dibbled into the soil's surface, but mounds about 30 cm high are sometimes formed.

Cocoa is the most important source of cash income and extensive areas of cocoa have been established under gliricidia or banana shade. Sales of fresh food provide a significant income source. This is particularly so when blocks are first settled, before the cocoa commences to bear (Singh 1967, 24-25). Some betel nut and betel pepper are sold from the more established blocks and some is sent by air to Port Moresby for sale. A little vanilla has also been planted, but it is not being sold.

National Nutrition Survey 1982/83
No villages from this system were included in the survey.

Main References
Singh, S. 1967 A benefit cost analysis of resettlement in the Gazelle Peninsula. New Guinea Research Bulletin No. 19, Australian National University, Port Moresby and Canberra.

Other References
Bourke, R.M. 1976 Food crop farming systems used on the Gazelle Peninsula of New Britain. In Willson, K. and R.M. Bourke (eds), 1975 Papua New Guinea Food Crops Conference Proceedings. Port Moresby, Department of Primary Industry, 81-100.
Cheetham, R.J. 1962-63 The development of indigenous agriculture, land settlement, and rural credit facilities in Papua and New Guinea. Papua and New Guinea Agricultural Journal 15, 3-4, 67-78.
Fenbury, D.M. 1972 Early land settlement schemes in post-war Papua New Guinea. Man in New Guinea 4, 2-9.
Fingleton, J.S. 1985 Changing land tenure in Melanesia: the Tolai experience. PhD thesis, Australian National University, Canberra.

Other References continued

Healy, A.M. 1972 Early land settlement schemes in post-war Papua New Guinea. Man in New Guinea 4, 9-14.
Hulme, D. 1982 Land settlement schemes in Papua New Guinea: an overview. Land Reform, Land Settlement and Cooperatives 1, 2, 21-42.
Irwin, P.G. 1965 Re-settlement schemes in the Gazelle Peninsula of New Britain. Australian Geographer 9, 6, 349-358.
Lolo, M. 1982 A survey of traditional vegetables in the Gazelle Peninsula, East New Britain. In Bourke, R.M. and V. Kesavan (eds), Proceedings of the Second Papua New Guinea Food Crops Conference. Port Moresby, Department of Primary Industry, 148-159.
Spinks, G.R., T.W. Langton and E.C.G. Gray 1964 Appraisal of two land settlement schemes in the Gazelle Peninsula-New Britain. Papua and New Guinea Agricultural Journal 16, 4, 189-200.

PROVINCE 18 East New Britain **AGRICULTURAL SYSTEM No.** 9 **Subsystem No.** 1 **of** 2

Districts 1 Kokopo, 3 Rabaul **Subsystem Extent** 75 % **Area (sq km)** 571
Population 56,040 **Population density** 98 **persons/sq km** **Population absent** 8 **%**

System Summary

Located in the northeast lowlands of the Gazelle Peninsula between Blanche Bay and the Keravat and Warangoi Rivers. Two subsystems are identified on the basis of fallow vegetation and fallow period. For the entire system, banana is the most important crop; Chinese taro and sweet potato are important crops; coconuts are used to cook most significant meals. Other crops are cassava, taro and Alocasia taro. This subsystem occupies an estimated 80 per cent of garden area. Fallow vegetation is tall woody regrowth, typically 5-10 years old. Gardens are also made after older regrowth, growing under coconuts or old cocoa, leucaena and coconuts, has been cleared. Fallow vegetation is cut, dried and burnt. One or two plantings of peanuts or vegetables are commonly followed by Chinese taro interplanted with bananas. Chinese taro, usually interplanted with banana, is located in separate sections of gardens or in separate gardens from sweet potato, peanuts or vegetables. Banana stands persist for more than 20 years. Sweet potato is planted without mounding or sometimes in small mounds.

Extends across provincial border to System(s) None

Altitude range (m) 0-500 **Slope** Gentle (2-10 degrees)

CROPS

STAPLES DOMINANT	Banana
STAPLES SUBDOMINANT	Chinese taro, Coconut, Sweet potato
STAPLES PRESENT	Banana, Cassava, Chinese taro, Coconut, Sweet potato, Taro (Alocasia), Taro (Colocasia)
OTHER VEGETABLES	Aibika, Corn, Cucumber, Kumu musong, Lowland pitpit, Peanuts, Pumpkin tips, Valangur, Bean (snake), Karakap
FRUITS	Malay apple, Mango, Pawpaw, Pineapple, Sugarcane, Ton, Watermelon, Guava
NUTS	Breadfruit, Galip, Java almond, Pao, Polynesian chestnut
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall woody regrowth
SHORT FALLOW	Minor
LONG FALLOW PERIOD	5-15 years
CROPPING PERIOD	2 plantings
R VALUE	74 (high)

GARDEN SEGREGATION

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

SOIL FERTILITY MAINTENANCE

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

CASH EARNING ACTIVITIES

1 Cocoa	Very significant
2 Betel nut	Significant
3 Coconuts	Significant
4 Fresh food	Significant
5 Tobacco	Minor
6 Balsa	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	Minor
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	None
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	None
SEASONAL SEC'DARY CROPS	None

OTHER DOCUMENTATION

Survey description

Between mid-1970 and late 1976, transects were made on all public vehicle roads; formal surveys were done on over 100 food gardens; and observations made on numerous other gardens. In June 1995, road traverses and garden visits were made on the Kokopo-Vunamami village-Warangoi River roads; Toma station-Gaulim village-Keravat township roads; Keravat-Bulup village-Iatapol mission-Reimber village-Kurakakaul village roads; Rabaul-Nonga hospital-Nordup village roads; Rabaul-Raluana village-Kokopo road (3 days).

Boundary definition

The boundary with System 1806 (Warangoi River) was determined from road traverses from Toma patrol post to Sumsum plantation on the east coast of the Gazelle Peninsula. The boundaries with System 1808 are parts of the Keravat and Warangoi Rivers. They were determined from extensive road and walking traverses between the northeast lowlands of the Gazelle Peninsula and the Vudal, Vunapaladig, Gaulim, Warangoi and Sigute settlement blocks. The Duke of York Islands and Watom Island were allocated to System 1810 after visits there and extensive traverses throughout the Gazelle Peninsula.

Notes

This system is clearly distinguished from low intensity systems elsewhere on the Gazelle Peninsula (Systems 1806, 1807). It is similar to that used on the settlement blocks (System 1808), but grasslands are not used in that system and there is more emphasis on the establishment of cocoa blocks there. It is also similar to that used on the nearby islands (System 1810), but fallow vegetation there is short woody regrowth, only 2-4 years old.

The system's boundaries coincide, more or less, with the traditional extent of land occupied by Tolai speakers in the early 1960s. Much of the northeast lowlands of the Gazelle Peninsula is devoted to perennial stands of coconuts, cocoa, triploid bananas and betel nut. Plots of perennial bananas are common between cocoa and coconut plots, along roads and tracks, and near houses. Much of the land alienated for plantations has now been returned to Tolai control. On some of these plantations, food gardens are grown under old coconut and cocoa plantings. Overall, the area available for food gardens and fallows is considerably less than the 571 square kilometres indicated above.

Many people in this system have sought land additional to their traditional village land in formal and informal settlement blocks beyond the traditional Tolai area in System 1808. Blockholders typically plant large food gardens after the forest or regrowth is cleared. These provide subsistence food and significant quantities are also sold, particularly peanuts, taro, diploid bananas, sweet potato and aibika. These food gardens are generally converted into cocoa plots. This has reduced population pressure on land in this system. The combined population (57,300 in 1980) and population density (62 persons/square kilometre) for Systems 1808 and 1809 give a truer indication of land use intensity for the combined systems. However, much of the land in these two systems is devoted to tree crops and hence the real density is greater than 62 persons per square kilometre. There has been a very high rate of population increase in this area (5.8 per cent per annum between 1980 and 1990) and the 1995 population for the combined systems is estimated at about 130,000 people.

Population pressure is intense. Since the 1950s a number of factors have operated to reduce this, including:

1. A change of the most important crop from taro (with some banana and yam) to triploid banana, Chinese taro and sweet potato.

2. Adoption of new cultivars of food crops, particularly triploid bananas, but also sweet potato.

3. An extension of the cropping period before land is fallowed from 1 planting to 2-5 plantings.

4. A shortening of fallow periods. This has resulted in conversion of mixed species woody regrowth to mostly West African tulip (Spathodea campanulata) and tall grasslands, with Sorghum propinquum being the most common species.

5. Farming beyond the Keravat and Warangoi Rivers on formal and informal settlement blocks in System 1808.

6. Acquiring land previously sold for expatriate owned plantations. Some food gardens are interplanted with old coconut stands and some gardens are established from overgrown cocoa plots prior to cocoa being replanted. Triploid bananas are also planted on unused land.

Tall woody regrowth is the most common fallow vegetation in the western and southwestern part of the system where the area of individual gardens tends to be larger. In much of the system, garden plots are small to very small. They often consist of small areas reserved for vegetables, such as aibika, snake bean and sweet potato, and perennial stands of banana or banana and Chinese taro. Between Raluana Point, Rabaul and Vuvu on the north coast, there is very little arable agriculture. Virtually all land is devoted to tree crops and bananas.

Notes continued

One or two plantings of peanuts or vegetable crops are commonly made before banana (often interplanted with Chinese taro) is planted. Otherwise only one planting of banana is made before land is fallowed, but perennial stands persist for more than 20 years. The main cultivars of bananas are Tukuru, Kalapua and Yawa. New triploid cultivars are still being adopted, for example, 'Papua' and 'Sepik'.

Crop sequences are common, particularly peanuts or vegetables followed by banana with Chinese taro. Other examples of crop sequences recorded include: peanuts followed by sweet potato and then Chinese taro; Alocasia taro followed by sweet potato; and peanuts followed by taro. Irwin (1965, 195) noted that the onset of the dry season in about May is gauged by the defoliation of a Ficus species and that new gardens are planted between June and February. However, there was no indication in current fieldwork that gardens are planted seasonally. Analysis of the prices of food in Rabaul market recorded for the CPI between 1971 and 1992 indicated that there is less seasonal variation in the price of 15 food crops in Rabaul than in 4 other urban areas of PNG (Bourke et al., in prep.)

As well as the crops listed under staples present, vegetables, fruit and nuts, the following minor foods are eaten: tomato, eggplant, choko tips, ferns, tulip, pomelo, carambola (five corner), soursop and rambutan. Galip is the most important nut tree crop. Both the flesh and seed of breadfruit are eaten. Java almond ('talis') is grown throughout the system, but the nuts are only eaten near the coast. Barringtonia procera is the most important species of pao nut.

Extensive areas of peanuts are planted each year, particularly in grassland areas (Subsystem 2). They are grown for subsistence use and for sale, being sold for both cash and traditional shell money ('tambu'). Peanuts are generally the first crop planted after a fallow. This contrasts with the practice in the Eastern Highlands where they are rarely the first crop after a fallow. Soil is tilled completely prior to planting peanuts but not other crops. Snake bean is the only crop grown on stakes.

Villagers' cash income levels are amongst the highest in PNG. Cocoa is the most important cash crop and new plantings are still being made. Much land is devoted to coconuts, often with an understorey of cocoa. Copra is a very significant cash crop in coastal locations and on the central plateau. It is less important in the Keravat and Warangoi Valleys and in the southern part of the system. Fresh food is an important source of cash income with large quantities sold at Kokopo, and previously Rabaul, market, and to institutions such as high schools. Other food markets exist at Keravat, Vunakunau and Vunapope; as well as more than 60 roadside markets (Ghodake et al 1995, 37). A new large market was established after the 1995 eruption at Vunavutung village near Kurakakaul station. People in the Talwat and Raluana villages area sell a lot of mangos during the harvesting season and ship some to Lae (K. Neumann, pers. comm. 1996). People near Tavurvur volcano, mainly from Matupit Island, harvest and sell megapod eggs.

Betel nut and betel pepper are also significant income sources. Some people send them to Port Moresby, Lae and the Highlands by air. Some tobacco is grown and sold, but mostly by people from the New Guinea mainland, rather than by Tolai people. Balsa is being grown and sold to three sawmills for processing.

In September 1994, Tavurvur and Vulcan volcanoes erupted. Much of Rabaul town was destroyed by ash fall, mudflows and looting. The 1995 fieldwork was done 9 months after the eruption commenced and some observations are presented here on the impact on agricultural production.

Extensive damage occurred to property, coconut, cocoa and bananas in a number of communities near Vulcan, particularly Tavana, Valaur and parts of Rapolo village; and a number of villages near Rabaul, particularly Rakunat, Nodup, Talwat and Matalau. The greatest destruction was at Tavana and Valaur villages which are immediately adjacent to Vulcan. There was some damage to property and agriculture caused by mudflows, for example, in the Vuvu area on the north coast. However, there were very few food gardens, apart from perennial stands of banana, fruit and nut trees in these locations. Mud flows damaged food gardens in the Reimber area south of Vuvu village.

Nine months after the eruption, coconuts were recovering everywhere in the affected area (except adjacent to Vulcan, and immediately north and east of Tavurvur) where they had been killed. Even adjacent to Tavurvur at Rapindik, most palms had survived and were starting to produce again. Even in the worst affected areas adjacent to Vulcan, coconuts were sprouting from selfsown nuts. Bananas began to regrow within a few months of the eruption.

In locations west of Rabaul and Vulcan, the eruption caused extensive defoliation. There was significant variation in the effect on crop species, with taro least affected and often not defoliated. In contrast, many balsa trees were killed, even on Kabaira Bay, 15 kilometres west of Vulcan. The defoliation affected production of most crops including cocoa, coconuts and bananas. However, by June 1995, most cocoa and coconut production had recovered and there were few visible signs of the eruption on agricultural production. Betel nut fronds were bent but not badly damaged by ash fall and production was generally unaffected. Some villagers maintained their cash income by selling betel nut when cocoa production ceased.

Notes continued

There was very little or no damage to agriculture south and east of a line between Karavia Bay (just south of Vulcan volcano) and Keravat township. Thus, agriculture on much of the Gazelle Peninsula was unaffected by ash fall.

An extensive literature on land use and agriculture exists for this system, more so than for any other location in PNG. A brief and incomplete review follows.

There are references to agriculture, land use and food from the 1870s to the present. Early observations include those by Brown (1908; 1910), who settled in the Duke of York Islands in 1875 and visited the New Britain mainland frequently; Parkinson (1907) who established plantations on the Gazelle Peninsula in 1882; and the missionaries Danks (1887; 1933) and Schnee (1904). Short term visitors who commented on food and land use include Powell (1883), Romilly (1887), Cayley-Webster (1898), Pullen-Burry (1909) and Cameron (1923). Peekel (1984) studied the flora of New Ireland and the Gazelle Peninsula between 1904 and the Pacific War. Another Catholic priest, Futcher (1943), described agriculture on the Gazelle Peninsula between 1925 and 1942. A government agriculturalist, Green (1941), who was based at the Keravat Demonstration Plantation, commented briefly on village agriculture.

A number of major surveys of land use and agriculture have been conducted. The first of these was done by Irwin (1965; 1966). Carman (1980) made a study of agriculture at Vunamami village in 1968. She gave extensive lists of cultivated and wild plants used for food, medicine, building, traditional practices and poisons. Granger (1970) presented a series of maps of land use, land tenure and population distribution. These were mainly based on 1968 aerial photography with some limited fieldwork. Bourke (1976) surveyed agricultural systems between 1970 and 1975. He reconstructed the systems at the time of European contact in the late 1800s and described changes over the 100 years to 1975. He concluded that most of the system changes occurred after the Pacific War. The major period of change occurred between about 1945 and the mid-1960s. Fieldwork in 1995 revealed few changes over the past 25 years, although the area devoted to food gardens had decreased, plantings of coconuts and cocoa had increased, and there were more areas of tall grass fallow.

A team of 13 researchers and agricultural extension staff conducted a rapid rural appraisal on the Gazelle in October 1988 (Ghodake et al. 1995). Most villagers interviewed did not consider soil erosion to be a major problem. Where population densities were greatest, firewood supply was considered inadequate. The team estimated that over K2 million worth of produce was traded at Rabaul market each year with over 25 per cent of this being betel nut, betel pepper and lime (Ghodake et al. 1995, 35-36).

Another team conducted surveys in March-May 1988 with the focus on potential for agroforestry projects (Levett 1992). They reported the major food crops as banana, Chinese taro, sweet potato and cassava (pp 48-49), suggesting that cassava is more important than the present survey would indicate. Levett (1992, 64-67) recorded that firewood shortages were most acute in communities closest to Rabaul where the population densities were greatest.

Three major academic studies, published as books, contain much information on agriculture and land use. Salisbury (1970) conducted research in Vunamami village in 1961. He gives much detailed information on land use, historical change, subsistence agriculture, cash cropping, labour inputs and food markets. T.S. Epstein (1968) spent 15 months in the inland village of Rapitok in 1959-61. Her book contains sections on traditional markets, land use, cash cropping and subsistence agriculture. A.L. Epstein (1969) worked in the peri-urban village of Matupit in 1959-61 and his book has some discussion on cash cropping and subsistence agriculture.

Soil erosion has been studied by Carman (1989) and Dixie (1981). Carman recorded soil erosion from a clean weeded crop and an adjacent plot with soil retention barriers. Over a 16 month period, soil loss was significant (38 t/ha/year) in the former plot, but negligible in the latter plot (0.2 t/ha/year). After a brief visit, Dixie (1981) made a series of recommendations on methods to reduce erosion on agricultural land, on roads and in Rabaul town. Peni (1982) described traditional conservation of vegetation in Napapar village.

Food markets, where coastal people exchanged sea foods for root crops and other garden food, were a pre-European institution in parts of the Gazelle (Danks 1887, 315; Romilly 1887, 14). By about 1915, a food market had been established in Rabaul (Overell 1923, 9). A series of major studies of Rabaul, Kokopo and Vunapope markets were made in the 1960s by T.S. Epstein (1961, 1969, 1982).

Much research has been conducted at the Lowlands Agricultural Experiment Station at Keravat and elsewhere in this system by LAES staff over the past 60 years. A listing of agronomic food trials on food crops conducted up to 1978 are presented by Bourke (1982). Numerous experiments have also been conducted on actual and potential export crops including cocoa (see Harvest volume 9, numbers 3 and 4), coconuts (eg, Sumbak 1972), vanilla, Japanese mint, Manila hemp and pepper. Recent research includes work on Asian fruit (Woodhouse 1991), long term rotation and fertiliser trials (Humphrey 1992), intercropping, sweet potato cultivation and cash crop diversification (Akus, 1995). Surveys of taro cultivation (Rangai 1982) and traditional vegetables (Lolo 1982) have also been conducted.

Notes continued

A number of studies of cash cropping on the Gazelle have been published, including those by T.S. Epstein (1970, 1971), Jones and Stent (1971), Godyn (1974) and Nicholls (1989). Aspects of cocoa and copra marketing in a number of locations, including the Gazelle Peninsula, have been studied by Livingstone (1989) and Gimbol (1989). Women's associations amongst the Tolai were reported on by Schoeffel (1983). Bradley (1982), in her study of Tolai women and development, focussed on changes in male-female relations over the 100 years since European occupation. She presented some data on land use at Pilapila village. A diet and food expenditure survey was conducted in 1955 at Malaguna village by Hamilton and Wilson (1957).

National Nutrition Survey 1982/83

519 families from 20 villages were asked in September or October 1982 what they had eaten the previous day. 75 per cent reported eating coconut, 58 per cent banana, 36 per cent sweet potato, 31 per cent Chinese taro, 22 per cent cassava, 4 per cent taro, 1 per cent sago and 1 per cent yam. 82 per cent reported eating rice. 13 per cent reported eating fresh fish. This is similar to the crop pattern.

Main References

Bourke, R.M. 1976 Food crop farming systems used on the Gazelle Peninsula of New Britain. In Willson, K. and R.M. Bourke (eds), 1975 Papua New Guinea Food Crops Conference Proceedings. Port Moresby, Department of Primary Industry, 81-100.

Ghodake, R.D., K.E. Cook, L. Kurika, G. Ling, J.E. Moxon and T. Nevenimo 1995 A rapid rural appraisal of the cocoa and coconut based farming systems in the north east lowlands of the Gazelle Peninsula of East New Britain Province. Technical Report 95/1, Department of Agriculture and Livestock, Port Moresby.

Granger, K.J. 1970 Land use in the Gazelle Peninsula. BA thesis, Geography Department, University of Papua New Guinea, Port Moresby.

Other References

Akus, W.L. 1995 The 1993 LAES Annual Report. Keravat, Lowlands Agricultural Experiment Station.

Bourke, R.M. 1982 Agronomic field trials on food crops in Papua New Guinea: 1928 to 1978. Technical Report 82/3, Department of Primary Industry, Port Moresby.

Bourke, R.M., C. Camarotto, E.J. D'Souza, K. Nema, T.N. Tarepe and S. Woodhouse In press. Production patterns of 180 crops in Papua New Guinea. Research Bulletin No. 54, Department of Agriculture and Livestock, Port Moresby.

Bradley, S.C. 1982 Tolai women and development. PhD thesis, University College, London.

Brown, G. 1908 George Brown, D.D. Pioneer-Missionary and Explorer: An Autobiography. London, Charles H. Kelly.

Brown, G. 1910 Melanesians and Polynesians: Their Life-Histories Described and Compared. London, Macmillan.

Cameron, C. 1923 Two Years in Southern Seas. London, Fisher Unwin.

Carman, K. 1980 A study in subsistence agriculture. Extension Bulletin No. 12, Department of Primary Industry, Port Moresby.

Carman, K. 1989 Soil loss and runoff from demonstration gardens in Matalau Village, East New Britain Province. Technical Report 89/4, Department of Agriculture and Livestock, Port Moresby.

Cayley-Webster, H. 1898 Through New Guinea and the Cannibal Countries. London, T. Fisher Unwin.

Danks, B. 1887 On the shell money of New Britain. Journal of the Anthropological Institute of Great Britain and Ireland 17, 305-317.

Danks, B. 1933 In Wild New Britain: The Story of Benjamin Danks, Pioneer Missionary. Sydney, Angus and Robertson.

Dixie, R.C. 1981 Soil erosion as it affects the town of Rabaul and the agricultural and roading systems in the Gazelle Peninsula, Province of East New Britain, Papua New Guinea. Consultants report, Water and Soil Division, Ministry of Works and Development, Wellington.

Epstein, A.L. 1969 Matupit: Land, Politics, and Change among the Tolai of New Britain. Canberra, Australian National University.

Epstein, T.S. 1961 A study of Rabaul market. Australian Journal of Agricultural Economics 5, 49-66.

Epstein, T.S. 1968 Capitalism, Primitive and Modern: Some Aspects of Tolai Economic Growth. Canberra, Australian National University.

Epstein, T.S. 1969 Buyers and prices at indigenous produce markets in T.P.N.G. Industrial Review 7, 2, 18-30.

Epstein, T.S. 1970 Innovation of cash crops in New Guinea subsistence economies. Economic Record 46, 114, 182-196.

Epstein, T.S. 1971 Cocoa cash cropping: a reply. Economic Record 47, 117, 135-137.

Epstein, T.S. 1982 Urban Food Marketing and Third World Rural Development: The Structure of Producer-Seller Markets. London, Croom Helm.

Other References continued

Fingleton, J.S. 1985 Changing land tenure in Melanesia: the Tolai experience. PhD thesis, Australian National University, Canberra.
Futscher, O. 1943 Verzeichnis der Pflanzen im Gunantuna-Gebiet, Gazellehalbinsel, New Britain. Unpublished manuscript, Catholic Mission, Vunapope.
Gimbol, C.K. 1989 A survey of cocoa wet bean marketing in Papua New Guinea. Designing Monitoring Systems for Smallholder Agriculture in Papua New Guinea, Working Paper No. 13, Australian Centre for International Agricultural Research, Canberra.
Godyn, D.L. 1974 An Economic Survey of Cocoa in Papua New Guinea. Port Moresby, Department of Agriculture, Stock and Fisheries.
Granger, K.J. 1971 Population and land in the Gazelle Peninsula. In, Population growth and socio-economic change. New Guinea Research Bulletin No. 42. Port Moresby and Canberra, Australian National University, 108-121.
Green, E.C. 1941 The cultivation of native food crops. New Guinea Agricultural Gazette 7, 44-49, 225-233.
Hamilton, L. and W. Wilson 1957 Dietary survey in Malaguna village, Rabaul. South Pacific 9, 399.
Humphrey, W. 1992 Long term rotation and fertilizer trials with sweet potato, groundnut, sorghum, taro and maize on volcanic soil in humid tropical lowlands. Sustainable Agriculture Series Technical Bulletin 9/92, Lowlands Agricultural Experiment Station, Keravat.
Irwin, P.G. 1965 Land use in the Blanche Bay area of New Britain. MA thesis, Department of Geography, Newcastle University College, University of New South Wales, Newcastle.
Irwin, P.G. 1966 Land use and tenure in the Blanche Bay district of New Britain. Australian Geographer 10, 2, 95-104.
Jones, A.P. and W.R. Stent 1971 Cocoa cash cropping: a comment. Economic Record 47, 117, 130-134.
Levett, M.P. 1992 A survey of the north-east lowlands of the Gazelle Peninsula of East New Britain Province with particular reference to the potential and acceptability of new agroforestry projects. Research Bulletin No. 53, Department of Agriculture and Livestock, Port Moresby.
Livingstone, I. 1989 The marketing of cocoa and copra in Papua New Guinea with case studies of East New Britain and East and West Sepik. Discussion Paper No. 37, Institute of National Affairs, Port Moresby.
Lolo, M. 1982 A survey of traditional vegetables in the Gazelle Peninsula, East New Britain. In Bourke, R.M. and V. Kesavan (eds), Proceedings of the Second Papua New Guinea Food Crops Conference. Port Moresby, Department of Primary Industry, 148-159.
Nicholls, D. 1989 Case studies of cocoa growers in East New Britain. Designing Monitoring Systems for Smallholder Agriculture in Papua New Guinea, Working Paper No. 11, Australian Centre for International Agricultural Research, Canberra.
Overell, L. 1923 A Woman's Impressions of German New Guinea. London, John Lane.
Parkinson, R. 1907 Dreissig Jahre in der Südsee. Land und Leute, Sitten und Gebräuche im Bismarckarchipel und auf den Deutschen Salomoinseln. (Thirty Years in the South Seas. The Bismarck Archipelago: Land, Natives and Customs - English translation by N.C. Barry). Stuttgart, Berlag von Strecker and Schröder.
Peekel, P.G. 1984 Flora of the Bismarck Archipelago for Naturalists. Lae, Office of Forests, Division of Botany.
Peni, L. 1982 Traditional conservation of vegetation in East New Britain. In Morauta, L., J. Pernetta and W. Heaney (eds), Traditional Conservation in Papua New Guinea: Implications for Today. Monograph No. 16. Port Moresby, Institute of Applied Social and Economic Research, 139-141.
Powell, W. 1883 Wanderings in a Wild Country; or, Three Years amongst the Cannibals of New Britain. London, Sampson Low, Marston, Searle and Rivington
Romilly, H.H. 1887 The islands of the New Britain group. Proceedings of the Royal Geographical Society 9, 1-18.
Rural Statistics Section 1992 Report on Food Crop Market Survey 1988: Rabaul Market. Port Moresby, Department of Agriculture and Livestock.
Salisbury, R.F. 1970 Vunamami: Economic Transformation in a Traditional Society. Berkeley, University of California Press.
Schnee, H. 1904 Bilder aus der Südsee: Unter den Kannibalischen Stämmen des Bismarck-Archipels (Scenes from the South Seas). Berlin, Dietrich Reimer.
Schoeffel, P. 1983 Women's associations in the rural economy of the South Pacific: case studies from Western Samoa and East New Britain Province, Papua New Guinea. Occasional Paper No. 19, South Pacific Commission, Noumea.
Sumbak, J.H. 1972 Use of fertilizer in coconut seedling establishment in a grassland area of New Britain. Papua New Guinea Agricultural Journal 23, 3-4, 73-79.
Woodhouse, S. 1991 Asian fruit in Papua New Guinea. In Bala, A.A. (ed), Proceedings of First Papua New Guinea International Fruit Conference. Port Moresby, Department of Agriculture and Livestock, 161-168.

PROVINCE 18 East New Britain **AGRICULTURAL SYSTEM No.** 9 **Subsystem No.** 2 **of** 2

Districts 1 Kokopo, 3 Rabaul **Subsystem Extent** 25 %

System Summary

This subsystem occupies an estimated 20 per cent of gardens. Fallow vegetation is tall grass, with Sorghum propinquum ('karapau') being the most common species. Fallow periods are typically 2-4 years. Fallow vegetation is cut, dried and burnt. Banana is the most important crop; Chinese taro and sweet potato are important crops; coconuts are used to cook most significant meals; and cassava is also grown. The soil is tilled completely prior to planting peanuts, but not for other crops. Between 2 and 5 plantings are made before land is fallowed. Peanuts are generally the first crop after fallow. One or more plantings of peanuts are then followed by sweet potato, or less commonly, Chinese taro and banana. Short fallows of up to several months duration are common between plantings. Peanuts, sweet potato, vegetables and Chinese taro/banana are planted in separate sections of gardens or, less commonly, in separate gardens. Sweet potato is planted in mounds about 30 cm high.

Extends across provincial border to System(s) None

Altitude range (m) 0-500 **Slope** Gentle (2-10 degrees)

CROPS

STAPLES DOMINANT	Banana
STAPLES SUBDOMINANT	Chinese taro, Coconut, Sweet potato
STAPLES PRESENT	Banana, Cassava, Chinese taro, Coconut, Sweet potato
OTHER VEGETABLES	Aibika, Corn, Cucumber, Kumu musong, Lowland pitpit, Peanuts, Pumpkin tips, Valangur, Bean (snake), Karakap
FRUITS	Malay apple, Mango, Pawpaw, Pineapple, Sugarcane, Ton, Watermelon, Guava
NUTS	Breadfruit, Galip, Java almond, Pao, Polynesian chestnut
NARCOTICS	Betel nut (lowland), Betel pepper (lowland), Tobacco

FALLOW & CROPPING PERIOD

FALLOW TYPE	Tall grass
SHORT FALLOW	Significant
LONG FALLOW PERIOD	1-4 years
CROPPING PERIOD	3-5 plantings
R VALUE	50 (medium)

GARDEN SEGREGATION

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

SOIL FERTILITY MAINTENANCE

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

CASH EARNING ACTIVITIES

1 Cocoa	Very significant
2 Betel nut	Significant
3 Coconuts	Significant
4 Fresh food	Significant
5 Tobacco	Minor
6 Balsa	Minor

OTHER AGRONOMIC PRACTICES

Water Management:	
DRAINAGE	None
IRRIGATION	None
Soil Management:	
PIGS PLACED IN GARDENS	None
BURN FALLOW VEGETATION	Very significant
TILLAGE	Significant
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	None
STAKING OF CROPS	Minor
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	None
SEASONAL SEC'DARY CROPS	None

OTHER DOCUMENTATION

Notes

Grass fallows are used on the central plateau in the Vunakanau area, in the Bitapaka, Vunamami and north coast areas. Small areas of grassland are also used in numerous other locations throughout the northeast lowlands of the Gazelle Peninsula.

Ghodake et al. (1995, 53) reported that only 4 per cent of cultivated land followed grass fallows, compared with 40 per cent after woody regrowth and 55 per cent being perennial banana, cocoa and coconut stands. Thus, Ghodake et al. (1995) found that 9 per cent of food gardens followed grass fallows and 91 per cent were made after woody regrowth. This suggests that the present estimate of 20 per cent of food gardens following grass fallows may be an overestimate.

PROVINCE 18 East New Britain **AGRICULTURAL SYSTEM No.** 10 **Subsystem No.** 1 **of** 1

Districts 3 Rabaul **Subsystem Extent** 100 % **Area (sq km)** 52
Population 7,500 **Population density** 144 **persons/sq km** **Population absent** 12 **%**

System Summary
Located on islands in the Duke of York Group, the Credner Islands and on Watom Island, near the northern Gazelle Peninsula. Fallow vegetation is short woody regrowth, typically 2-4 years old. It is cut, dried and burnt. Banana is the most important crop; sweet potato, Chinese taro and cassava are important crops; coconuts are used to cook most significant meals; other crops are Alocasia taro and taro. Banana, interplanted with Chinese taro, is planted only once before fallowing, but banana stands may bear for up to 40 years, if weeded. Sweet potato and cassava are planted 2-3 times before fallowing. Where sweet potato is grown in a rotation with peanuts, up to 6 plantings of either peanuts or sweet potato may be made. Banana is interplanted with Chinese taro and is usually grown in separate gardens from sweet potato, cassava and peanuts. Less commonly, banana/Chinese taro are planted in separate sections from sweet potato, cassava and peanuts within the same garden. Sweet potato is planted in mounds 20-40 cm high.

Extends across provincial border to System(s) None

Altitude range (m) 0-300 **Slope** Flat (<2 degrees)

CROPS

STAPLES DOMINANT	Banana
STAPLES SUBDOMINANT	Cassava, Chinese taro, Coconut, Sweet potato
STAPLES PRESENT	Banana, Cassava, Chinese taro, Coconut, Sweet potato, Taro (Alocasia), Taro (Colocasia)
OTHER VEGETABLES	Aibika, Ferns, Kumu musong, Lowland pitpit, Peanuts, Pumpkin tips, Valangur, Bean (snake), Kalava
FRUITS	Bukabuk, Malay apple, Mango, Pawpaw, Pineapple, Sugarcane, Ton, Guava
NUTS	Breadfruit, Galip, Java almond, Pao, Polynesian chestnut
NARCOTICS	Betel nut (lowland), Betel pepper (lowland)

FALLOW & CROPPING PERIOD

FALLOW TYPE	Short woody regrowth
SHORT FALLOW	Minor
LONG FALLOW PERIOD	1-4 years
CROPPING PERIOD	3-5 plantings
R VALUE	83 (high)

GARDEN SEGREGATION

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

SOIL FERTILITY MAINTENANCE

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

CASH EARNING ACTIVITIES

1 Coconuts	Very significant
2 Fish	Significant
3 Betel nut	Minor
4 Cocoa	Minor
5 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	Minor
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	None
STAKING OF CROPS	None
FALLOW CUT ONTO CROPS	None
SEASONAL MAIN CROPS	None
SEASONAL SEC'DARY CROPS	None

OTHER DOCUMENTATION

Survey description

In September 1971, garden visits in the Mioko area on Duke of York Island (half day). In June 1995, interviews and garden visits on Kerewara Island and Kumaira village on Duke of York Island (1 day). In June 1995, interviews and garden visits at Nunga and Vunatu villages on Watom Island and a walking traverse across the island (1 day).

Boundary definition

These islands were allocated to a separate system after visits there and extensive traverses throughout the Gazelle Peninsula (System 1809).

Notes

This system contrasts with System 1809 on the nearby New Britain mainland in a number of ways, although land use here is similar to that on the narrow peninsula from Praed Point to the Malaguna village-Ratung village isthmus on the Gazelle Peninsula. The main distinguishing features here are the short woody regrowth fallows only 2-4 years old, the greater importance of cassava and the dependence on tree crops as food sources.

The following islands in the Duke of York group are included in this system: Duke of York, Makada, Ulu, Utuan, Mioko, Kerawara, Kabakon and Tonwalik. Also included are Watom Island, located northwest of Rabaul, and two small islands in the Credner group (Pigeon and Big Pigeon Islands), located between the Duke of York group and Kokopo. The Duke of York and Credner groups are low lying raised coral atolls and most land is flat. Watom Island is formed from volcanic rock and raises to a peak of 340 m. Food gardens and tree crops on Watom are located on steeper slopes, typically 2-10 degrees.

Land pressure is intense, particularly in the Duke of York group, where over 80 per cent of people in the system reside. The 1996 system population is estimated at 12,000, giving a density on agricultural land of 230 persons/square kilometre. A high proportion of land on all islands is devoted to perennial stands of coconuts, bananas, fruit and nut trees. Cocoa also occupies significant areas on Watom Island. Thus the density of land available for food gardens is even higher than the calculated figure of 144 persons/ square kilometre in 1980.

Many people have migrated to other locations in the New Guinea Islands Region, including the west coast of New Ireland where some Duke of York people have land rights; Warangoi and Vunapaladig settlement schemes on the Gazelle Peninsula; and oil palm blocks in West New Britain.

Garden plots are small. Many people in the Duke of York group do not plant food gardens. Rather, they buy food locally and purchase significant quantities of rice, flour and tinned meat at Kokopo (previously Rabaul). A survey of agroforestry potential included some villages in this system. In both the Duke of York group and on Watom Island, timber for firewood and building material was reported to be scarce (Levett 1992, 65-67).

Short woody regrowth is the most common fallow vegetation in the Duke of York islands, but some gardens follow tall grass fallows (Sorghum propinquum). Some gardens are also cleared from ferns growing under semi-permanent stands of triploid bananas. Here the pattern is as follows: banana and Chinese taro are planted and bear; after some years the Chinese taro dies out; the bananas persist and continue bearing as ferns grow as an understorey; after some years, probably 5-15, the ferns and other regrowth are cleared and Chinese taro is planted under the bananas. Where peanuts and sweet potato are grown in a rotation, land is occasionally left in fallow for some months before the next planting.

Sweet potato and peanuts are sometimes grown in a rotation, particularly after a sorghum grass fallow. Either sweet potato or peanuts is planted after the fallow and up to four plantings of peanuts and up to three plantings of sweet potato may be made before land is again fallowed. Villagers say that if one species is yielding poorly, they plant the other. This sequence continues until yields of both sweet potato and peanuts become unacceptably low, and land is then fallowed. The soil is tilled completely prior to planting peanuts, but not for other crops.

Some banana gardens persist for decades, particularly the triploid cultivars, Kalapur, Yawa and Katkatur. The cultivar Tukuru will persist for long periods only if stands are weeded and fertilised with organic matter, otherwise this cultivar is said to yield for only about 5 years.

The crops grown are very similar in both the Duke of York group and on Watom Island, with some minor differences. Cassava is less important on Watom. Pumpkin tips are the main green vegetable in the Duke of York group and are less significant on Watom. A little tobacco is grown but it is uncommon.

Notes continued

At the time of contact with Europeans, the most important foods in the islands differed somewhat from the nearby Gazelle Peninsula (Bourke 1976, 83). In the Duke of York group, taro was the most important food, with some banana, yam and Alocasia taro grown. On Watom Island, banana, taro and yam were grown but none was dominant (Bourke 1976, 83). Villagers on Watom in 1995 stated that some taro was previously grown, but people also lived on banana, wild yam, fruits and nuts, and animal food including crabs, lizards, stick insects and pythons.

On all islands, the number of fruit and nut trees is striking. The most important are mango, ton, galip, Polynesian chestnut, breadfruit and pao (Barringtonia procera and B. novae-hiberniae). Galip is cooked with grated cassava, taro and Alocasia taro to make cakes for feasts in the Duke of York group. As well as the crops listed under fruit and nuts, the following minor foods are eaten: Parartocarpus, mon, carambola (five corner) and rambutan. Pineapple is also very common in the Duke of York group. Fruits and nuts were probably more important in villagers' diets before the adoption over the past 120 years of sweet potato, cassava, introduced triploid banana cultivars and Chinese taro.

Some household gardens containing aibika, cassava, valangur and lowland pitpit were noted in the Duke of York group. Gardens are not fenced. On Watom Island, pigs are kept in pens.

Fish are an important part of people's diet in the Duke of York group. On Watom Island, some fishing is done by coastal villagers, depending on seasonal wind conditions. Inland people exchange bananas, cassava, sweet potato and Chinese taro for fish from the coastal people.

Copra is the most important source of cash income on all islands. Duke of York people sell copra at the local depot established in 1995. Since its establishment, the amount of copra sold has increased, with many men claiming to sell 10-15 tonnes per year (K3000-K4500 per household per year). Caribou (water buffalo) are commonly used to pull carts to transport coconuts and copra. They were introduced by a provincial DPI project.

Duke of York people sell significant quantities of fish at Kokopo (previously Rabaul), but the amount sold is limited by inadequate marketing arrangements. Watom islanders sell very little fish. Some cocoa is grown in the Duke of York group, however it does not yield well. Cocoa is a more important source on Watom Island where it is grown in the valleys in the centre of the island.

Fresh food is sold locally and at Kokopo. Watom people also sell food at Vunavutung on the north coast of the Gazelle. A snack food made from grated cassava, coconut and fish is a specialty of Duke of York people. A cassava and coconut dish, and fruit and nuts are also sold by Watom people. Some betel nut is sold within the islands. Other minor income sources include the sale of mats, raincoats and baskets made from woven pandanus leaves. Some trees are sold for making canoes. A little vanilla is grown on Watom Island.

National Nutrition Survey 1982/83

161 families from 7 villages were asked in December 1982, or January or February 1983 what they had eaten the previous day. 76 per cent reported eating sweet potato, 72 per cent coconut, 56 per cent banana, 10 per cent Chinese taro, 6 per cent cassava, 2 per cent taro, 2 per cent yam and 1 per cent sago. 59 per cent reported eating rice. 43 per cent reported eating fresh fish. This is similar to the crop pattern, except for the higher than expected consumption of sweet potato and the somewhat lower than expected consumption of Chinese taro and cassava.

Main References

None.

Other References

Bourke, R.M. 1976 Food crop farming systems used on the Gazelle Peninsula of New Britain. In Willson, K. and R.M. Bourke (eds), 1975 Papua New Guinea Food Crops Conference Proceedings. Port Moresby, Department of Primary Industry, 81-100.

Brown, G. 1908 George Brown, D.D. Pioneer-Missionary and Explorer: An Autobiography. London, Charles H. Kelly.

Levett, M.P. 1992 A survey of the north-east lowlands of the Gazelle Peninsula of East New Britain Province with particular reference to the potential and acceptability of new agroforestry projects. Research Bulletin No. 53, Department of Agriculture and Livestock, Port Moresby.

Woruba, M. and W. Humphrey 1993 A survey report of cropping practices on atolls in Papua New Guinea. Sustainable Agriculture Series Workshop Paper 1/93, Lowlands Agricultural Experiment Station, Department of Agriculture and Livestock, Keravat.

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.

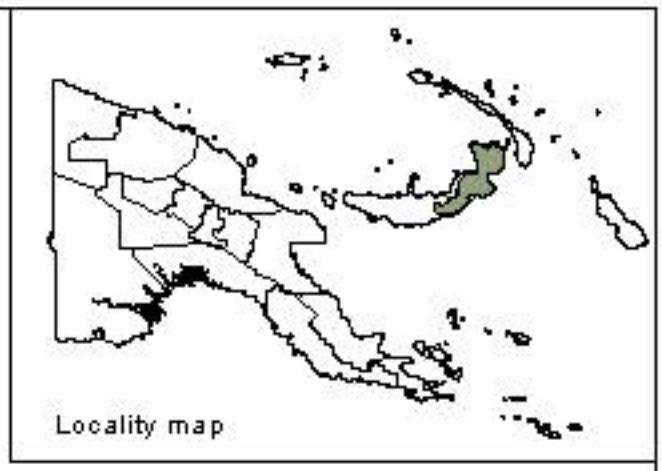
Map title	Notes
1. Agricultural Systems	Boundaries and identification numbers (eg. 1 = System 1401). See key for subsystem occurrences.
2. Fallow vegetation	The vegetation cleared from garden sites at the beginning of a new period of cultivation (8 classes).
3. Long fallow period	An estimate of the length 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 = (Number of years of cultivation x 100) / (Number of years of cultivation + 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).

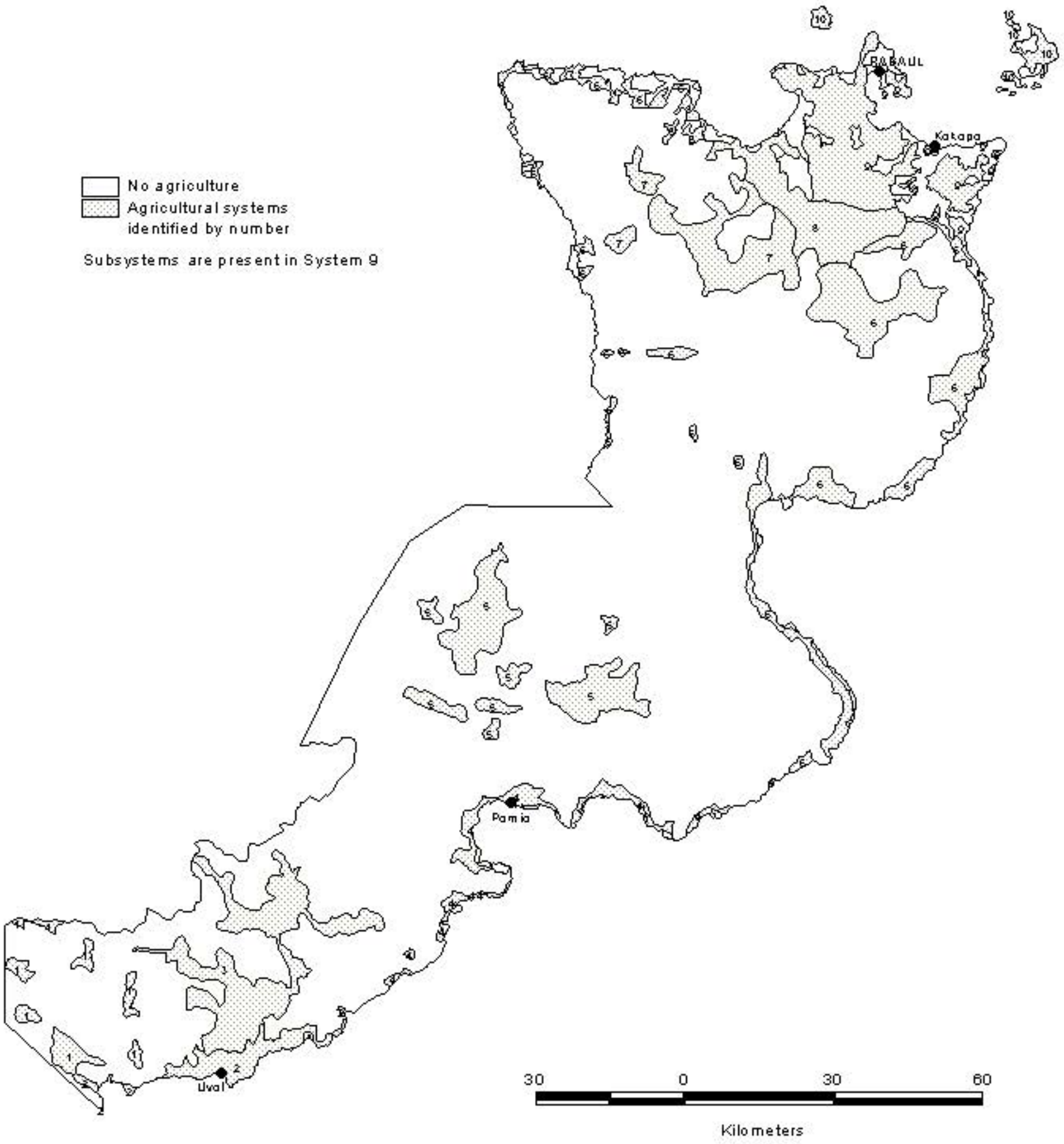
Map title	Notes
13. Cash income activities	Combinations of cash earning activities specific to this province. For all activities, 'nil' and 'minor or insignificant' are defined as 'absent'; and 'significant' and 'very significant' as 'present'.
14. Seasonality of the main food crops	Whether the dominant 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.

EAST NEW BRITAIN PROVINCE
Agricultural systems



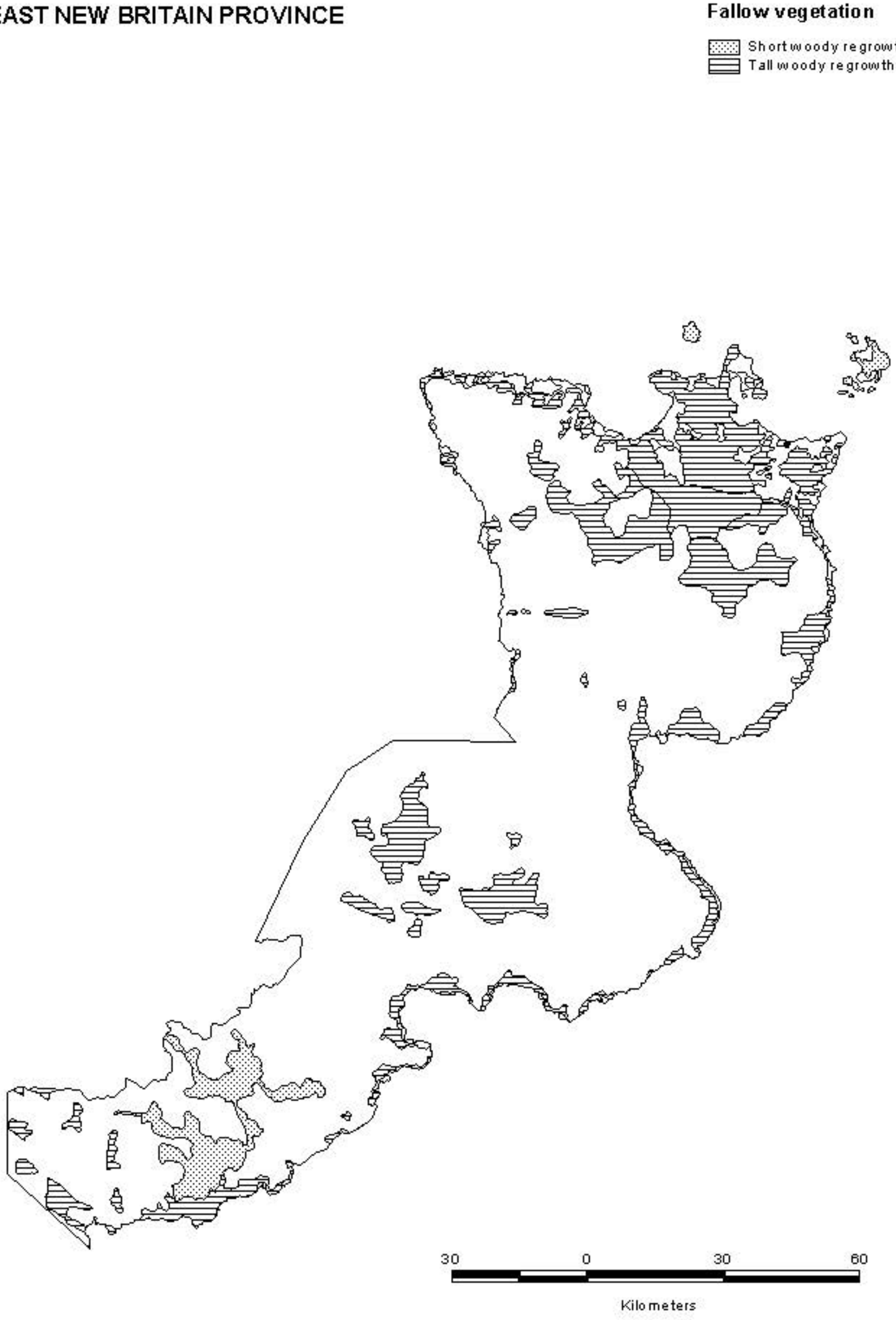
No agriculture
Agricultural systems identified by number

Subsystems are present in System 9



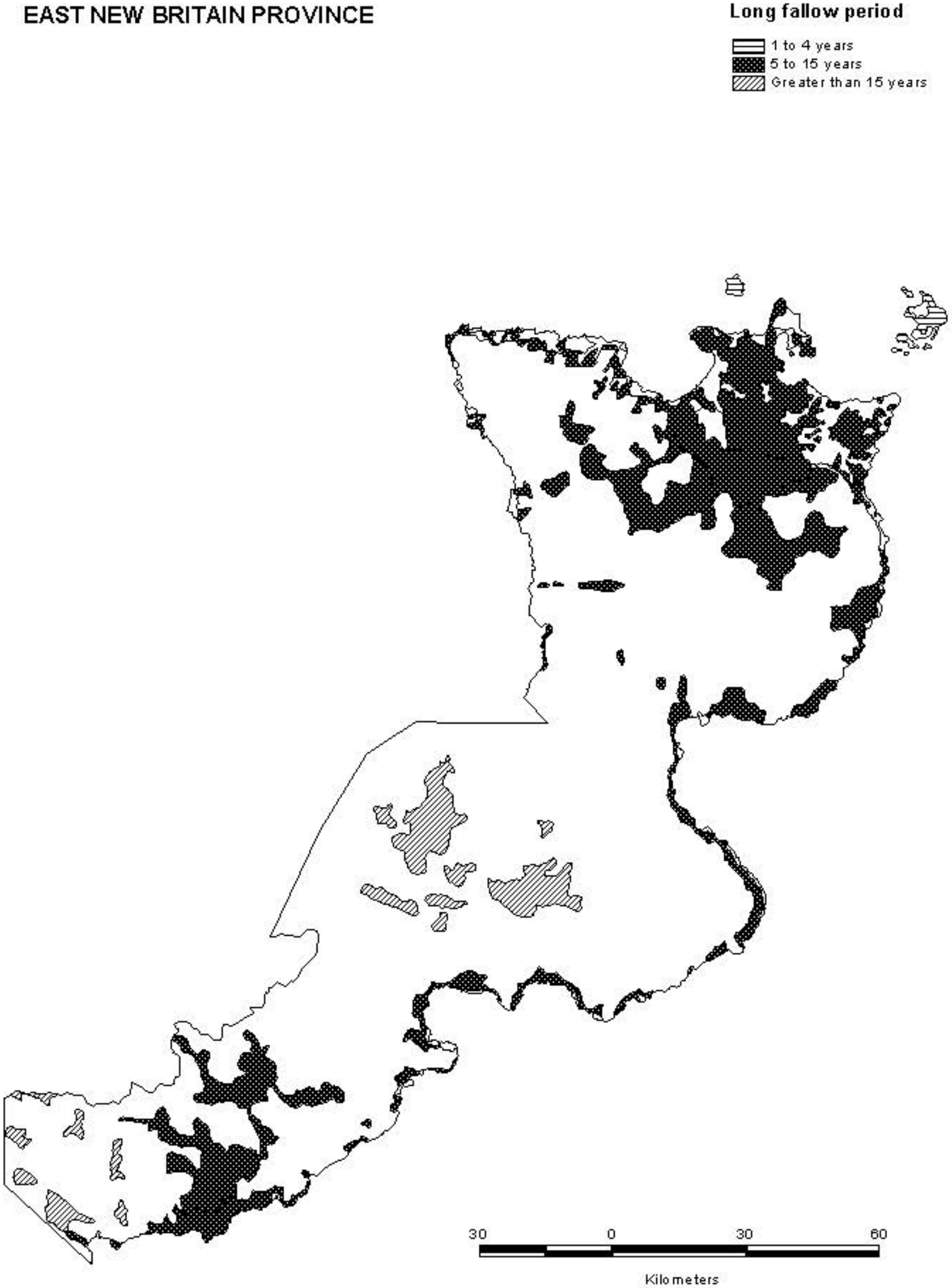
Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE



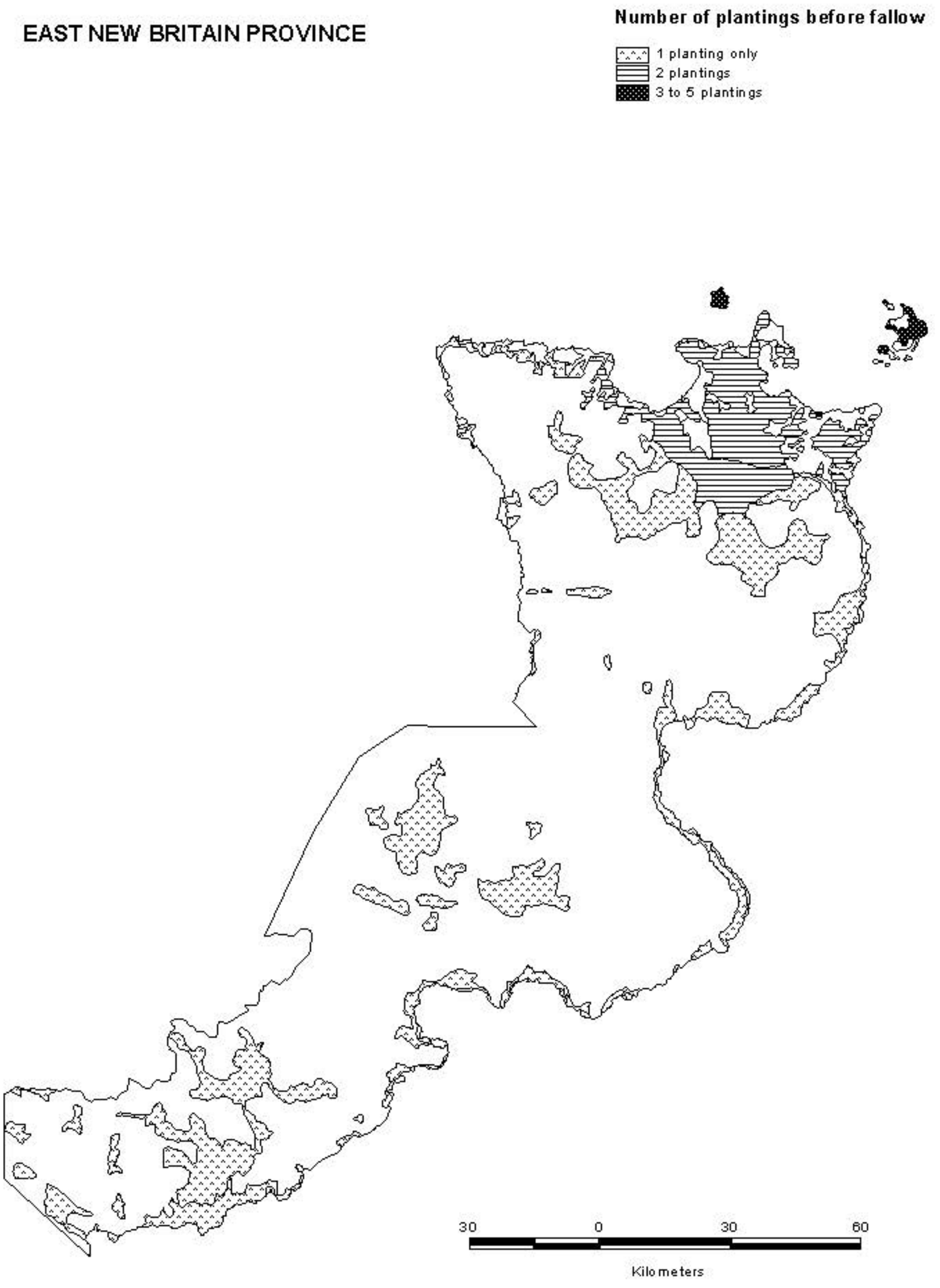
Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE



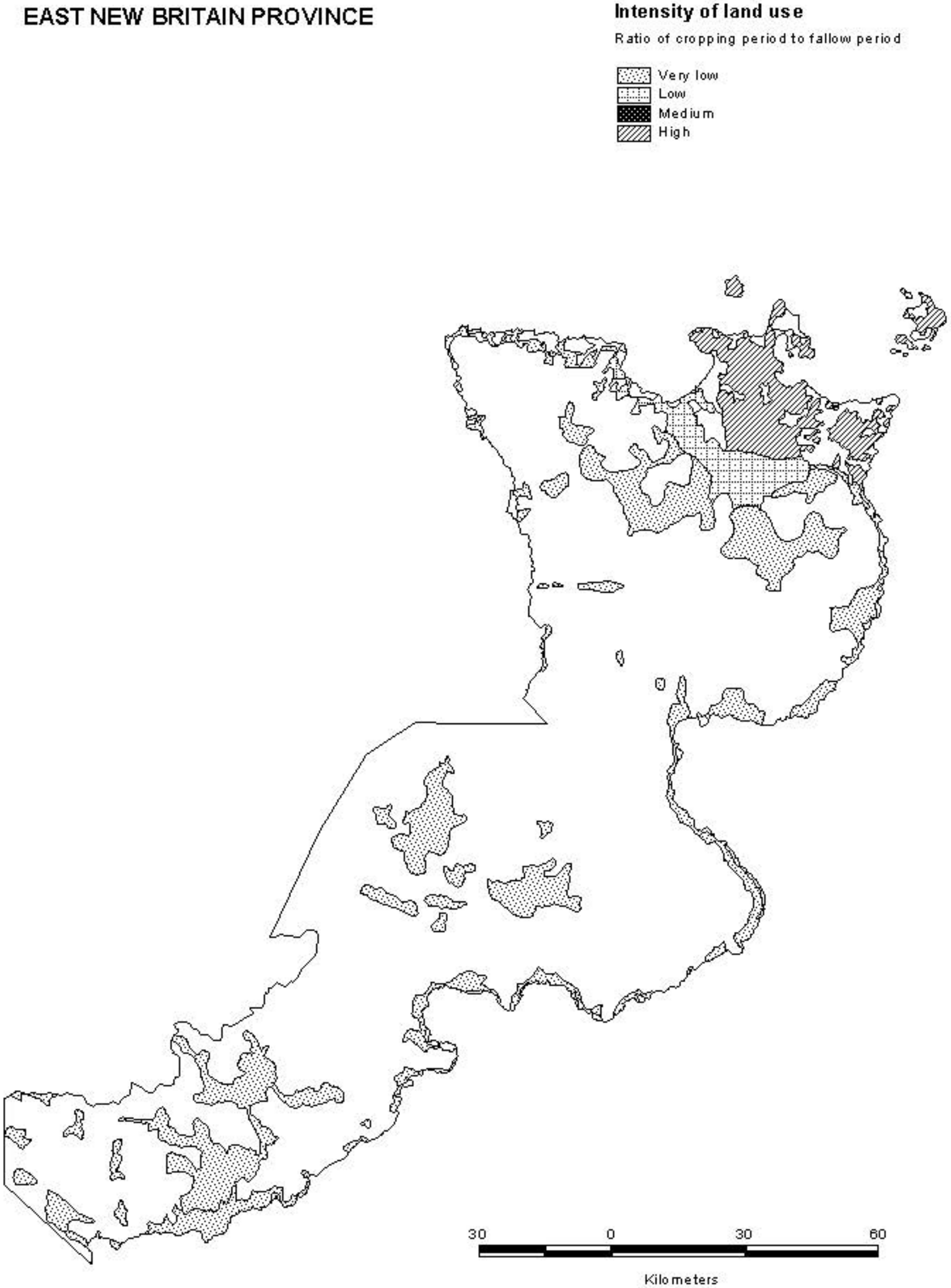
Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE



Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE

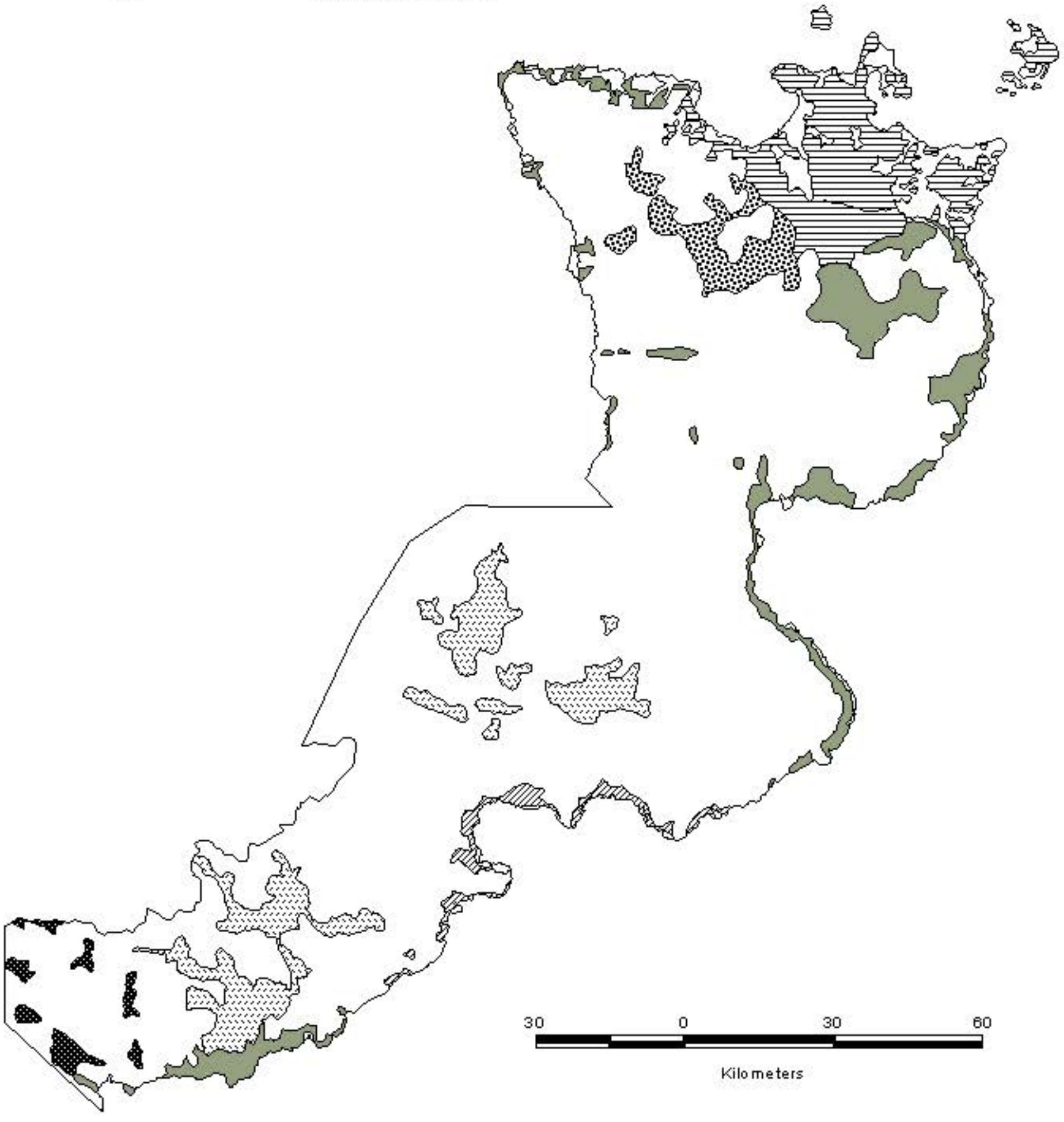


Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE

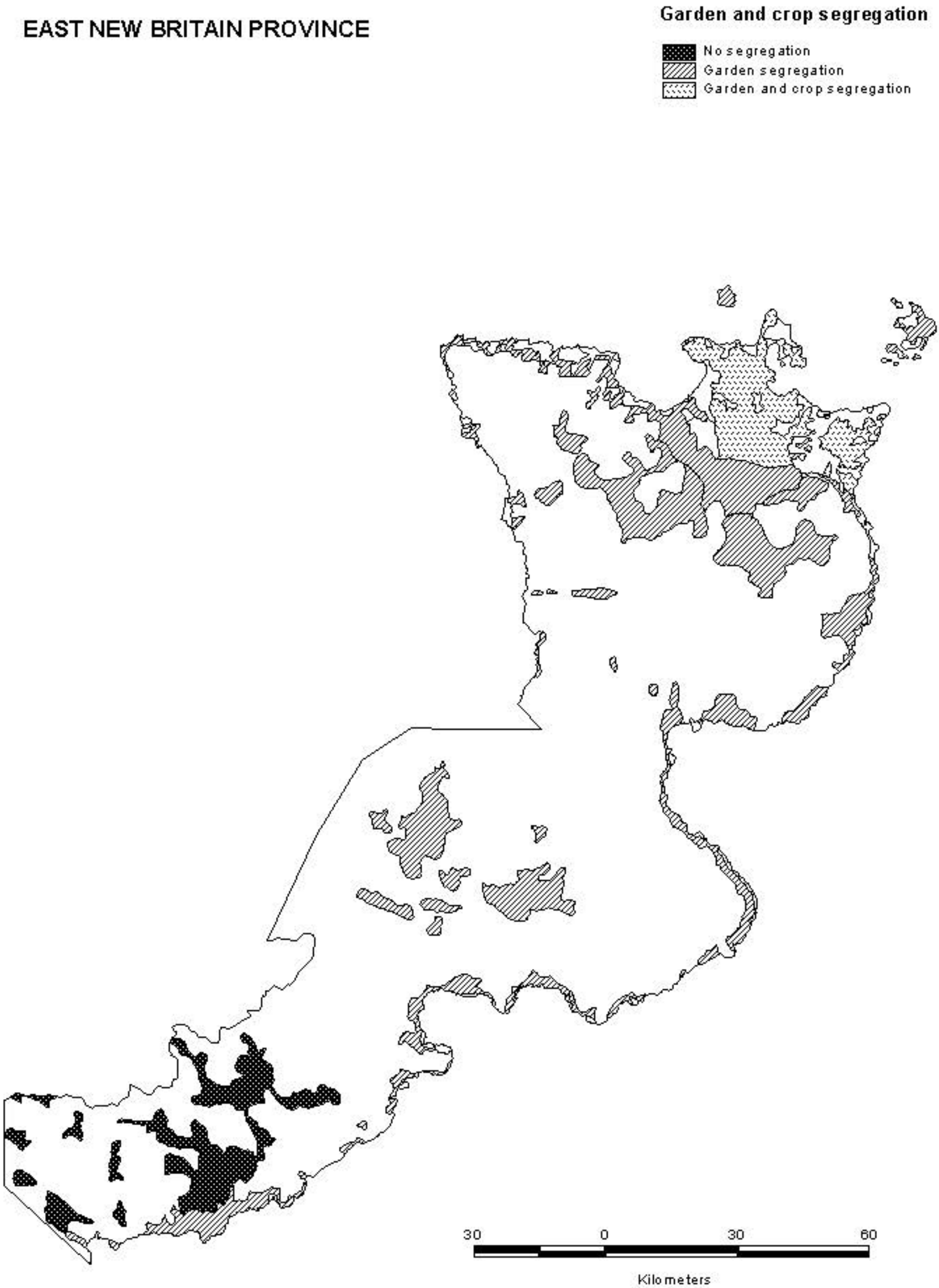
Crop combinations

Most important crops	Important crops
None	Cassava/coconut/sweet potato/taro
None	Cassava/Chinese taro/coconut/sweet potato/taro
Banana	Cassava/Chinese taro/coconut/sweet potato
Banana	Chinese taro/coconut/sweet potato
Banana	Chinese taro/sweet potato
Chinese taro	Taro
Sweet potato	Cassava/coconut
Sweet potato/taro	Cassava
Taro	Cassava/sweet potato



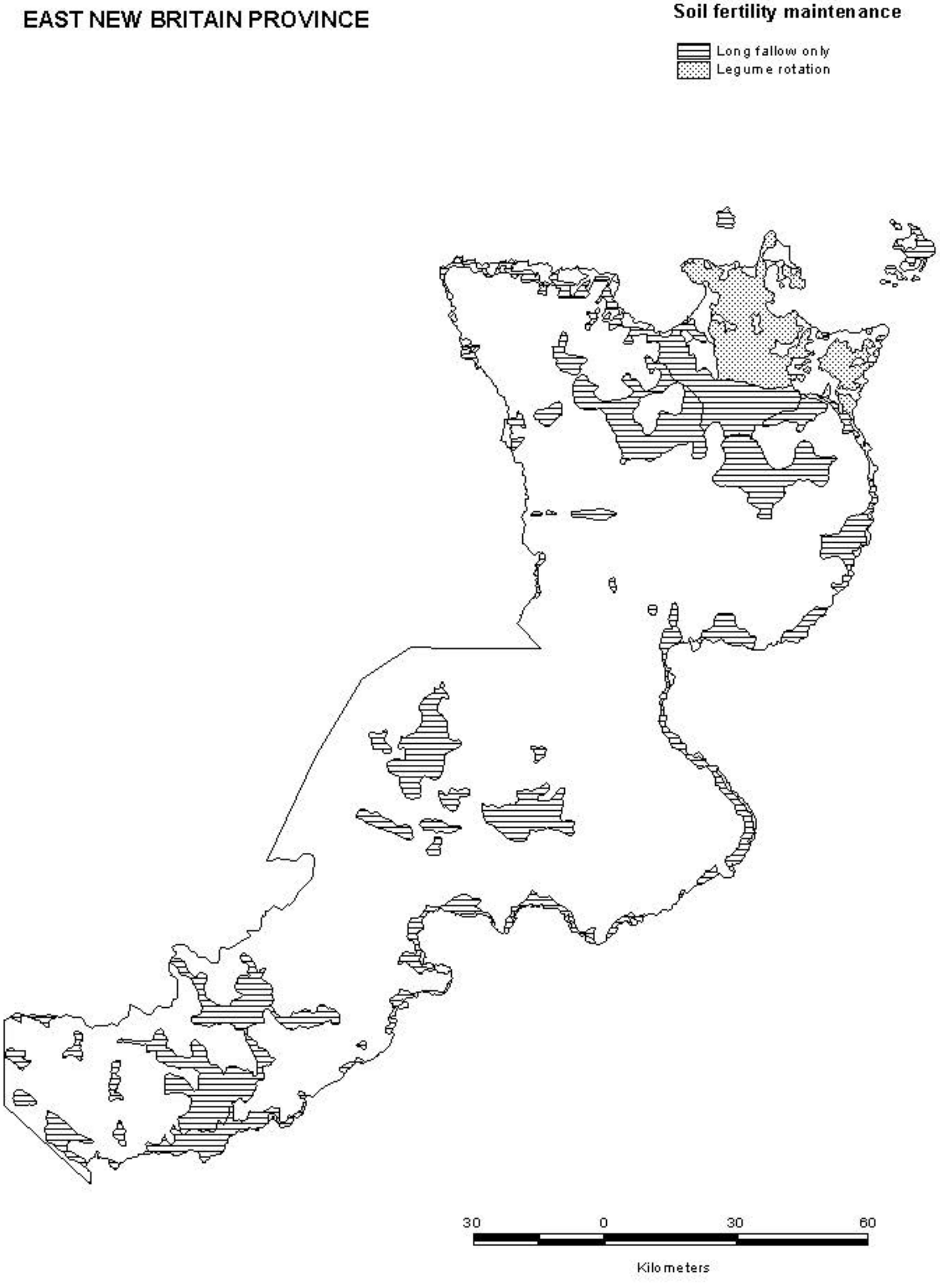
Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE



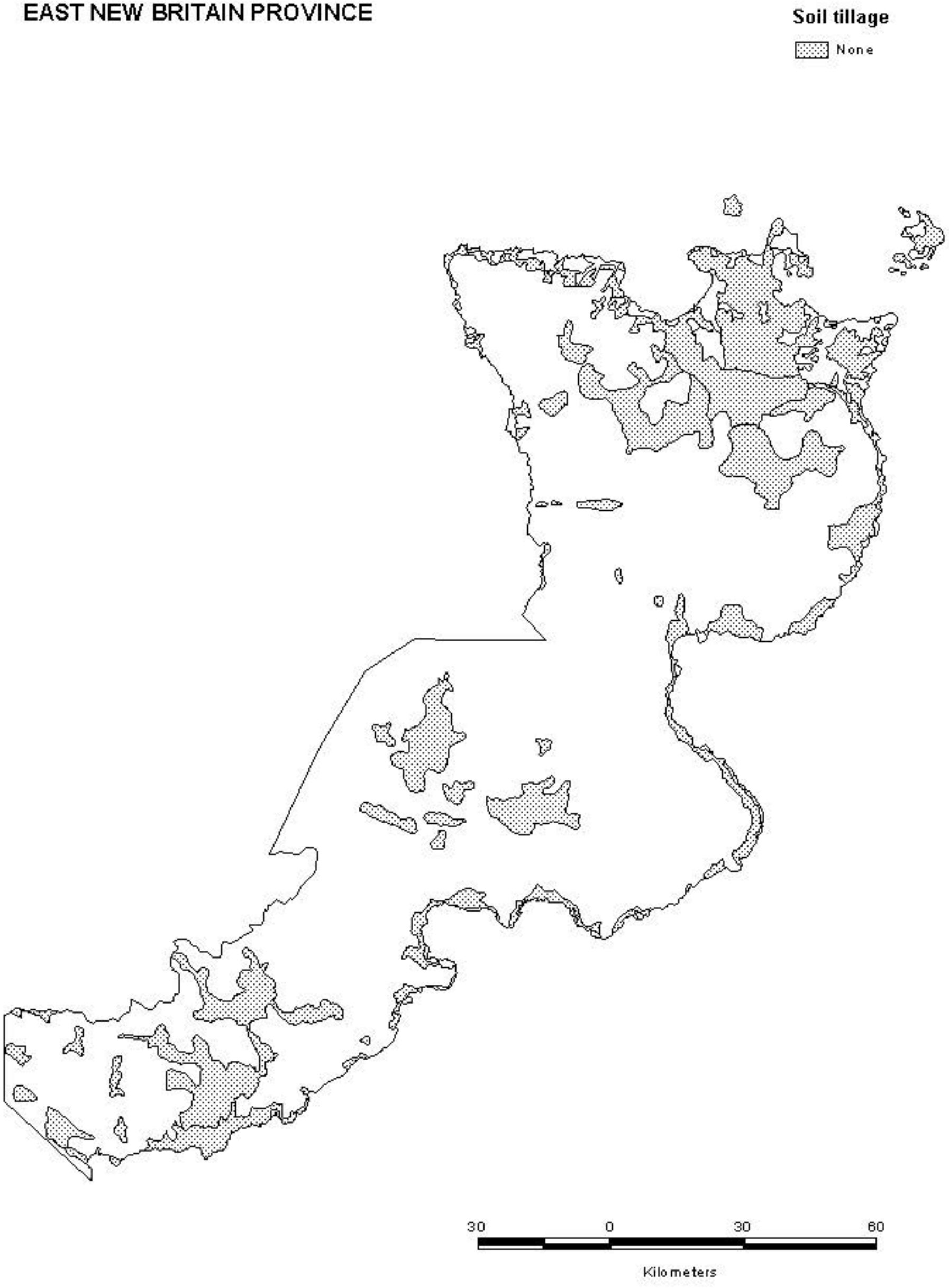
Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE



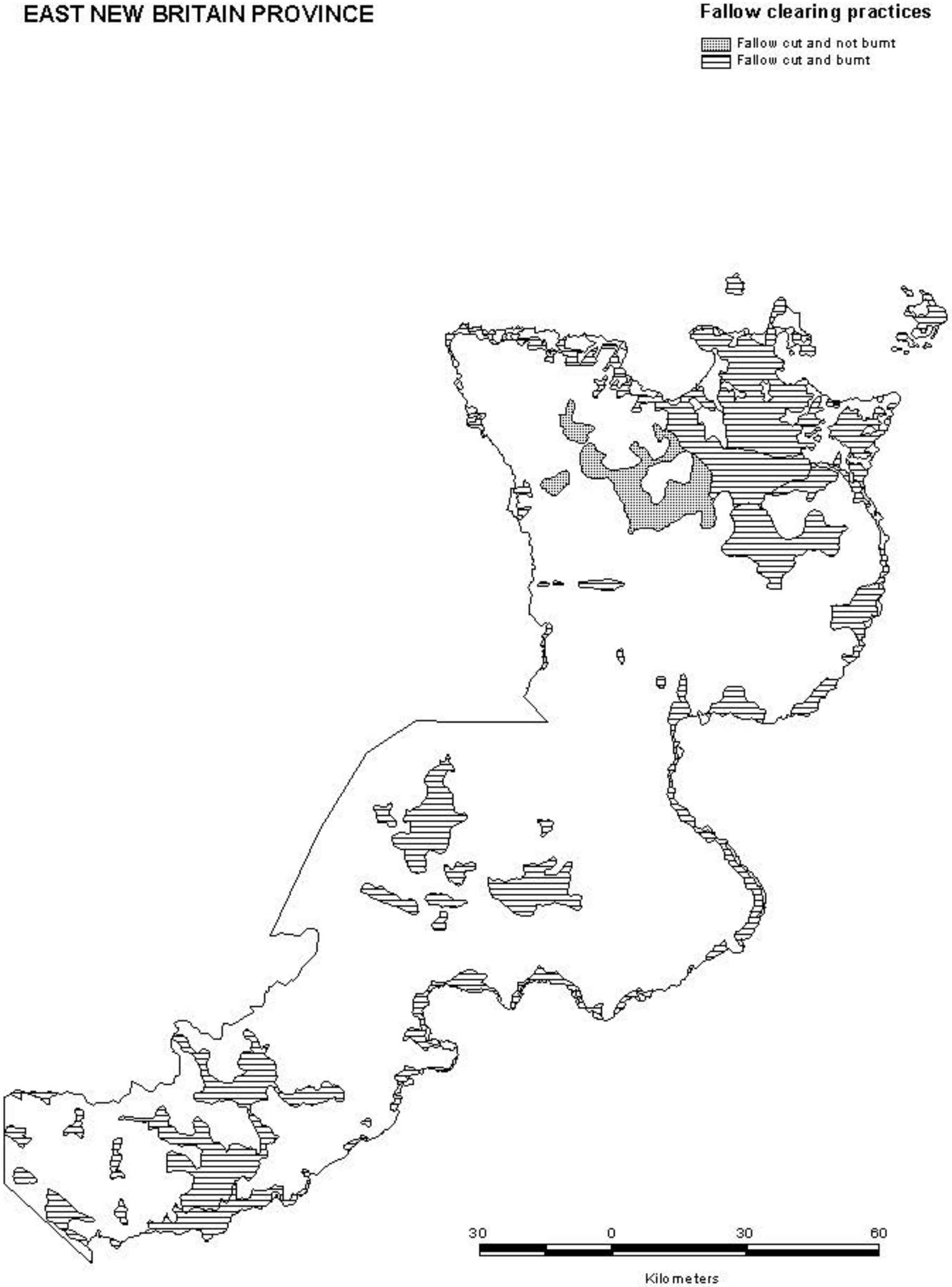
Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE



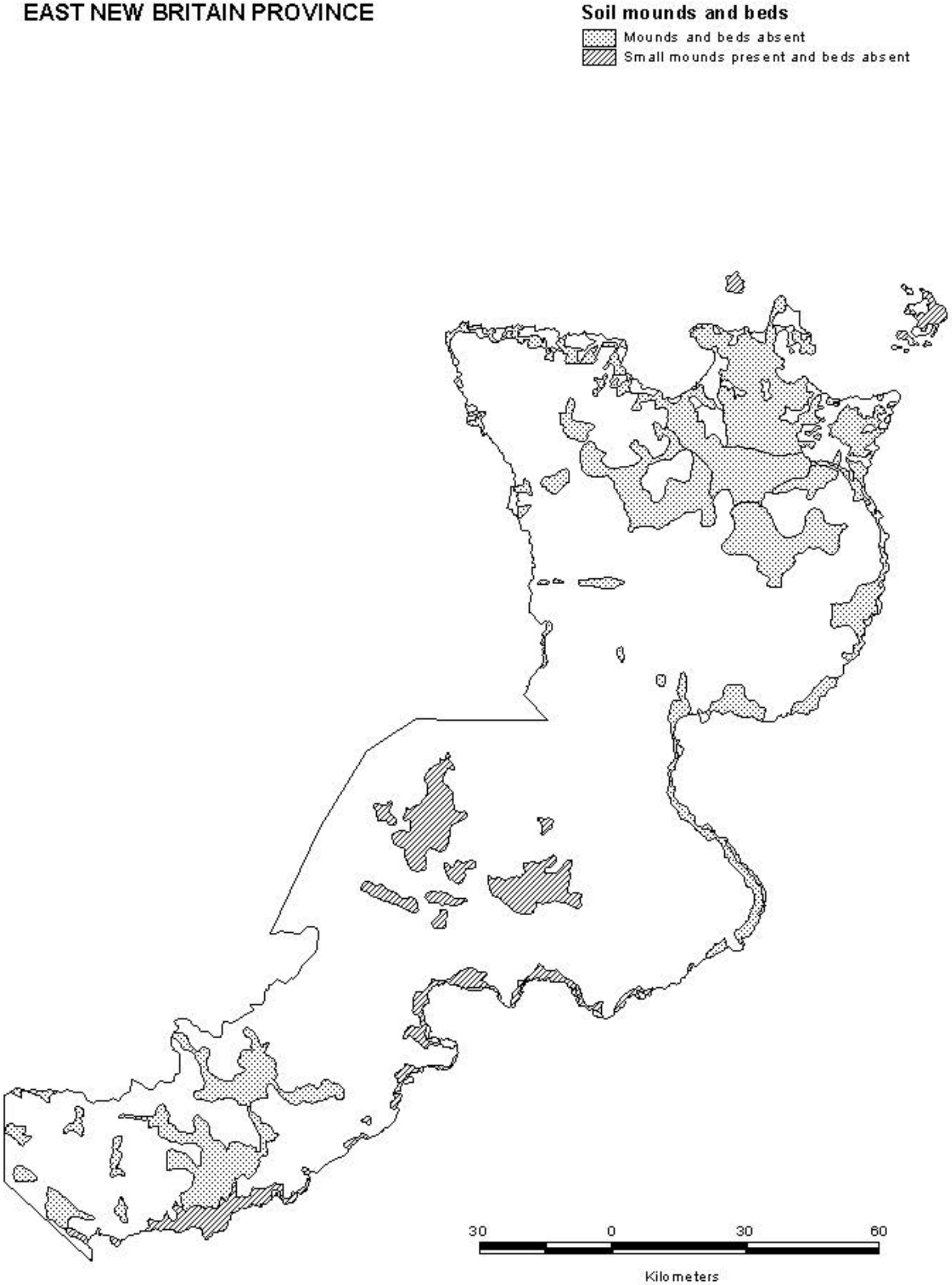
Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE



Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE

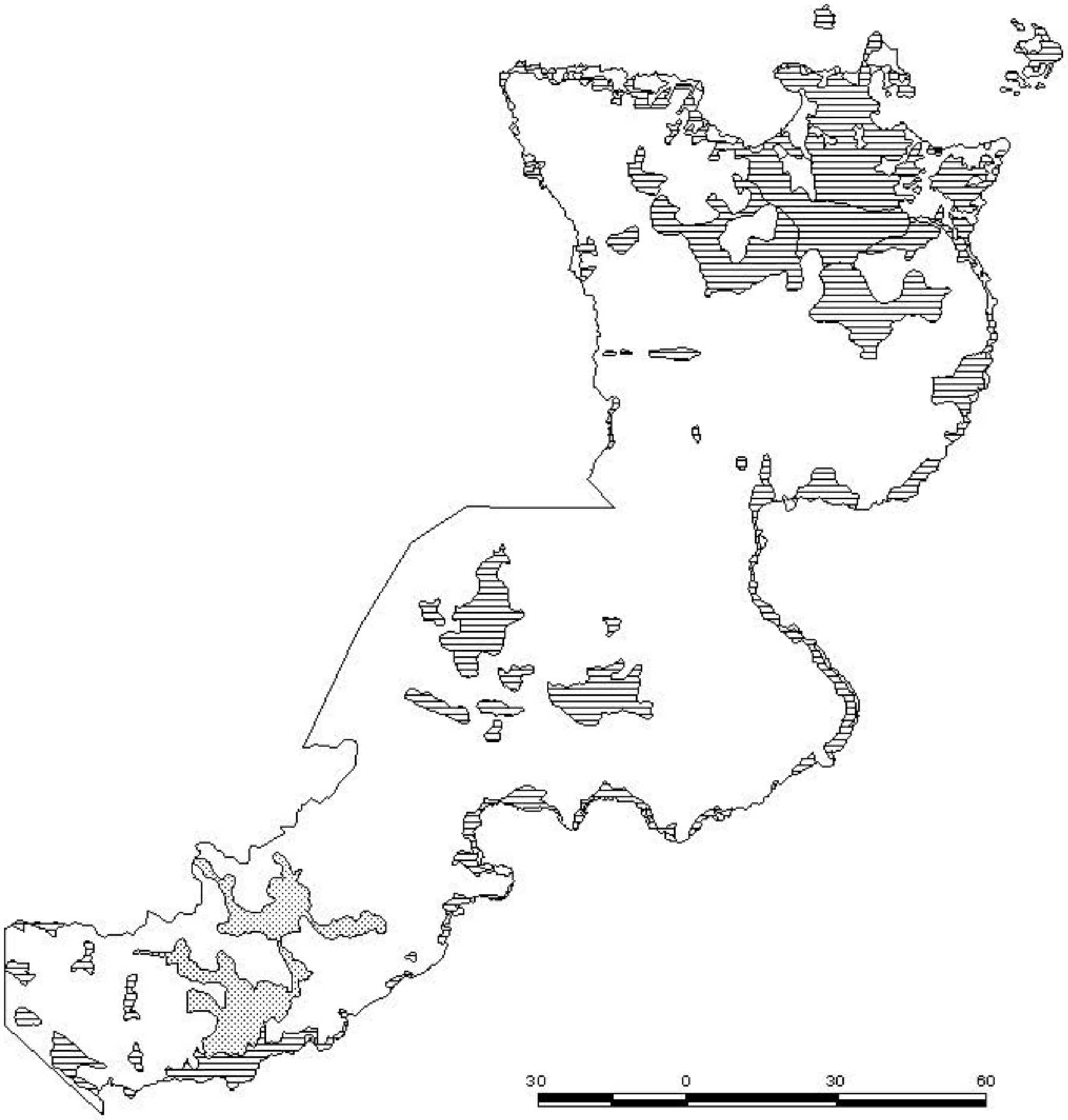


Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE

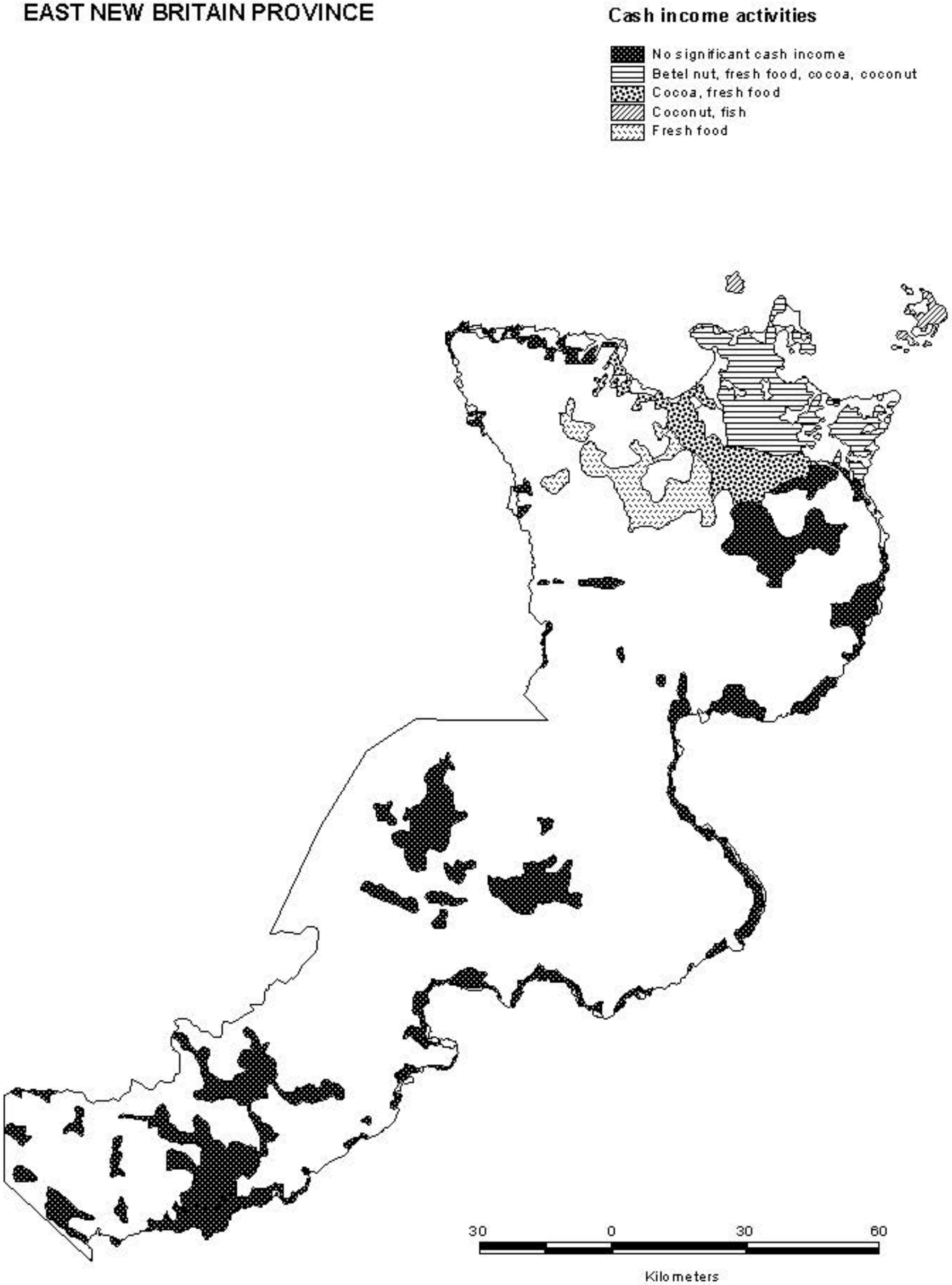
Water management techniques

No water control
Soil retention barriers



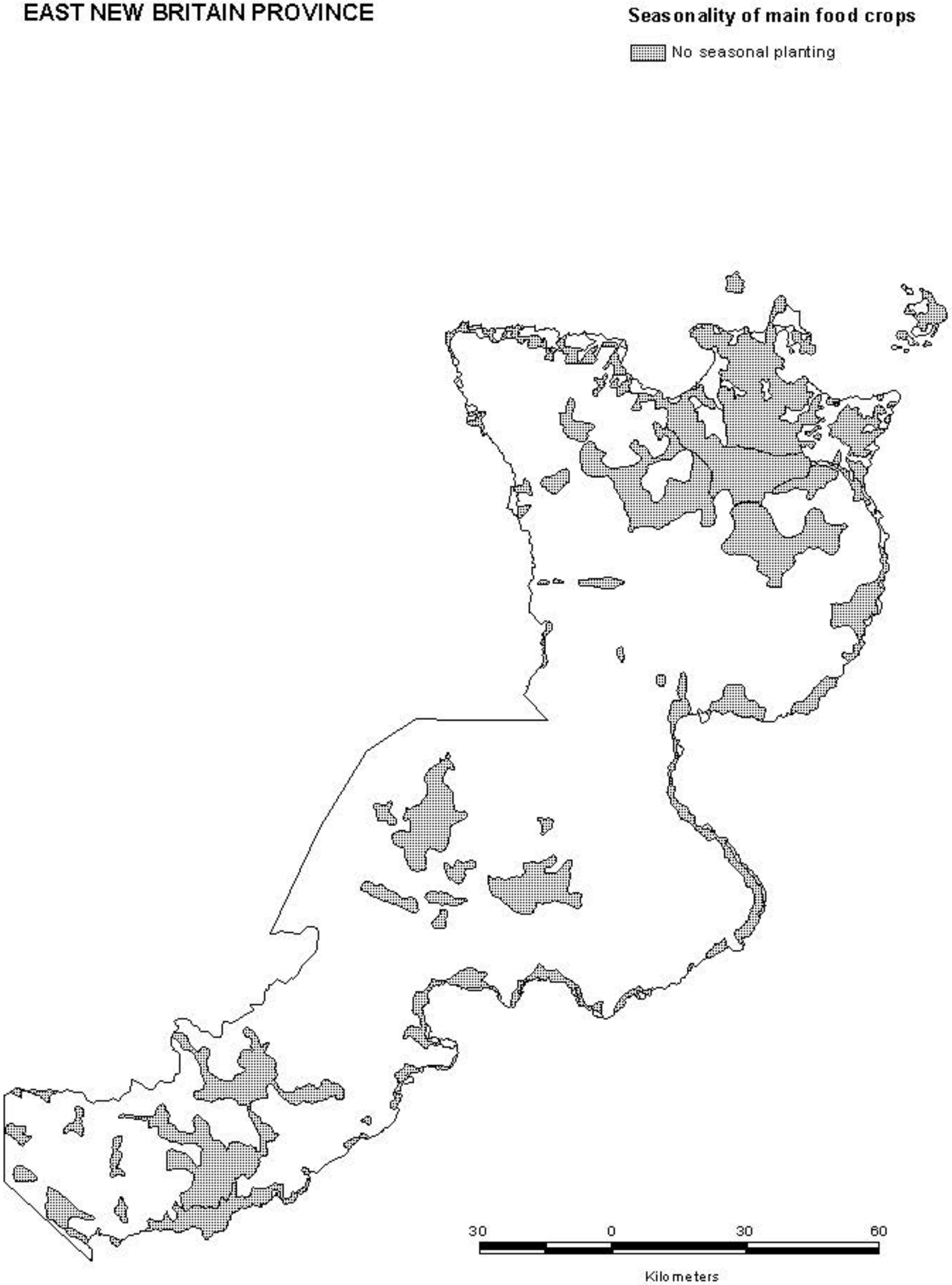
Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE



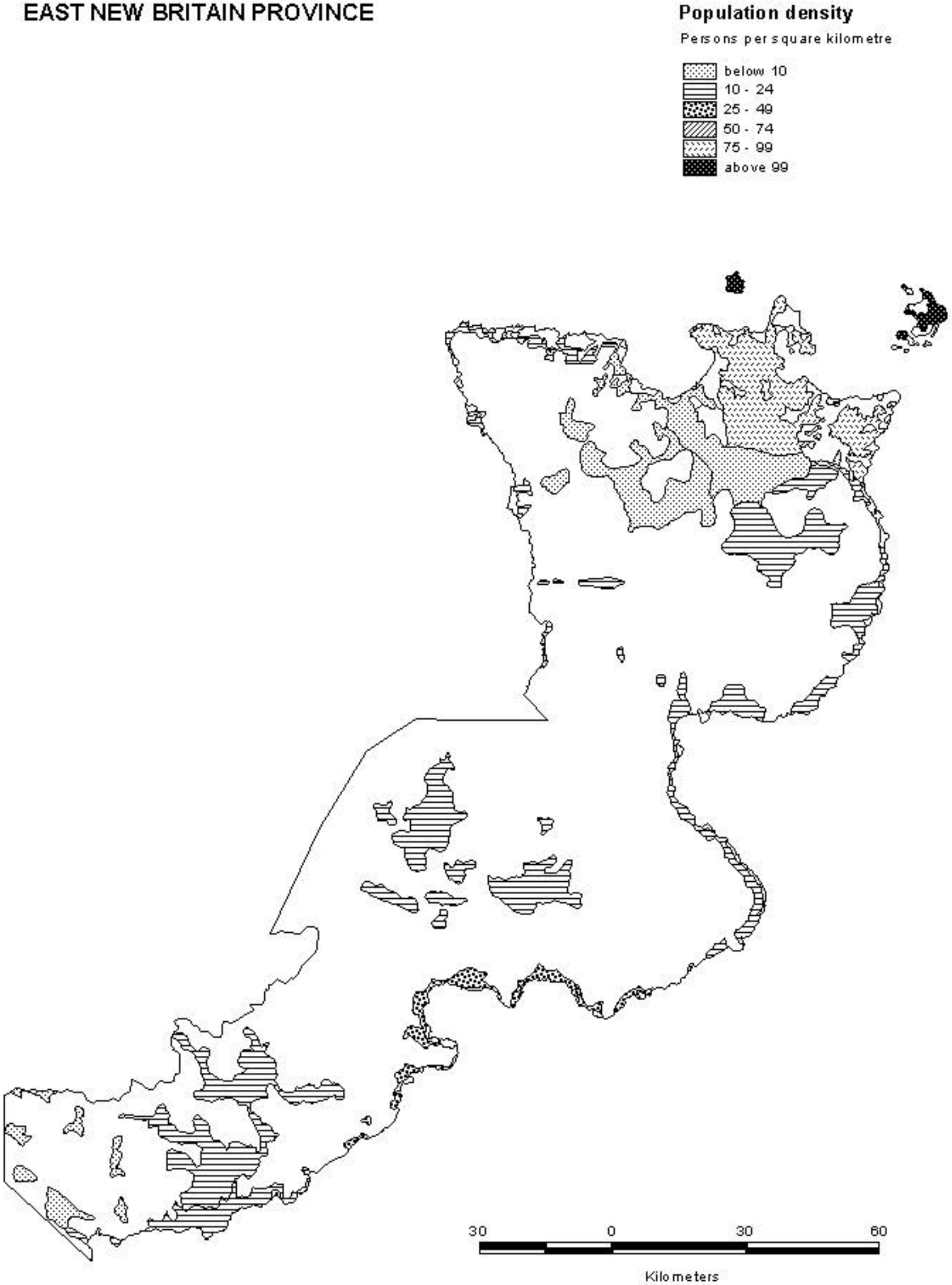
Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE



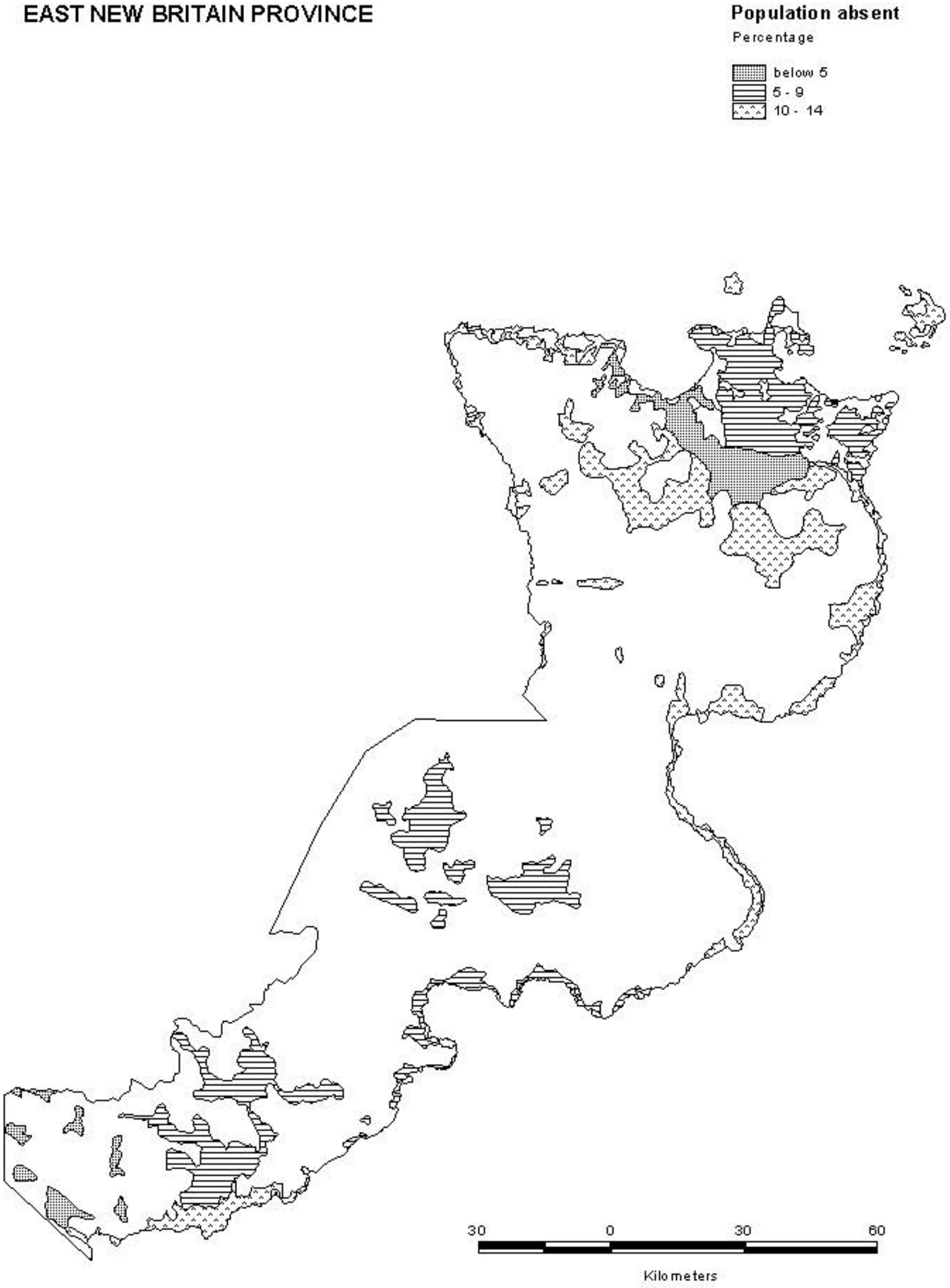
Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE



Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

EAST NEW BRITAIN PROVINCE



Mapping Agricultural Systems Project, Human Geography, ANU; PNG DAL; Geography, UPNG, 1999

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: 18 East New Britain**

System	Sub sys	No. of subsys	Subsys extent	Same sys oth prov	Districts	Census Divisions
1801	1	1	4	1907	2	18
1802	1	1	4	1908	2	18
1803	1	1	4	1915	2	17-18
1804	1	1	4		2	04-17
1805	1	1	4		2	04-07
1806	1	1	4	1914	1-2-3	06-07-09
1807	1	1	4		3	09
1808	1	1	4		3	09-14
1809	1	2	3		1-3	01-02-03-08-10-12-13-14-15
1809	2	2	1		1-3	01-02-03-08-10-12-13-14-15
1810	1	1	4		3	05-16

KEY

Subsys	Subsystem
Same sys oth prov	Same system in other province

AGRICULTURAL SYSTEM DATA LISTING - CODES **Province: 18 East New Britain**

System	Sub sys	Area km^2	Population			Altitude range m		Slope	Fallows		
			Total	Abs	Den	Low	High		Veg	Sht	Per
1801	1	124	558	4	5	50	600	2	5	0	3
1802	1	145	3482	11	24	0	300	2	5	0	2
1803	1	476	5581	10	12	300	1200	3	4	0	2
1804	1	150	5040	10	34	0	500	5	5	0	2
1805	1	436	5535	6	13	300	900	2	5	0	3
1806	1	739	7727	12	10	0	600	3	5	0	2
1807	1	348	3171	14	9	100	1200	3	5	0	2
1808	1	349	1292	3	4	0	400	2	5	0	2
1809	1	571	56040	8	98	0	500	2	5	1	2
1809	2	0	0	0	0	0	500	2	2	2	1
1810	1	52	7500	12	144	0	300	1	4	1	1

KEY

Subsys	Subsystem
Area km^2	Area of System
Population	
Total	Resident population 1980
Abs	Absent population (%)
Den	Population density (persons/km^2)

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

AGRICULTURAL SYSTEM DATA LISTING - CODES Province: 18 East New Britain

System	Sub sys	Staple crops			Narcotic crops
		Most import	Important	Present	
1801	1	13	04-11	02-04-05-11-13-14	2-4-5
1802	1	00	04-06-11-13	02-04-06-11-13-14	2-4-5
1803	1	11-13	04	02-04-05-11-13	1-2-4-5
1804	1	11	04-06	02-04-05-06-11-13	2-4
1805	1	11-13	04	02-04-11-13-14	2-4-5
1806	1	00	04-05-06-11-13	02-04-05-06-11-13	2-4-5
1807	1	05	13	02-04-05-11-13	2-4-5
1808	1	02	05-11	02-04-05-11-13	2-4-5
1809	1	02	05-06-11	02-04-05-06-11-12-13	2-4-5
1809	2	02	05-06-11	02-04-05-06-11	2-4-5
1810	1	02	04-05-06-11	02-04-05-06-11-12-13	2-4

KEY

Subsys Subsystem

AGRICULTURAL SYSTEM DATA LISTING - CODES Province: 18 East New Britain

System	Sub sys	Vegetable crops	Fruit crops	Nut crops
1801	1	01-02-09-10-11-13-15-16-21-30	05-07-12-15-16-26	01-04-06-11
1802	1	01-09-10-11-15-16-23-24-27-30	04-05-07-12-15-17-26	01-06-07-12-15
1803	1	01-02-06-07-09-11-13-16-28-37	07-09-15-16	01
1804	1	01-09-11-13-15-16-21-23-24-27	04-05-07-12-15-16-20-26	01-06-11-12-15
1805	1	01-09-10-11-15-16-21-30	05-07-15-16	01-04-11
1806	1	01-08-09-11-15-16-21-23-27	05-07-12-15-16-26	01-06-12-15
1807	1	01-05-08-09-10-13-16-37	05-07-12-15-16	01-04
1808	1	01-02-09-10-16-19-21-27-37-44	05-07-12-13-15-16-23	04-06-12
1809	1	01-09-10-15-16-19-21-24-27-37	05-07-12-13-15-16-17-23	01-06-07-12-15
1809	2	01-09-10-15-16-19-21-24-27-37	05-07-12-13-15-16-17-23	01-06-07-12-15
1810	1	01-11-15-16-19-21-24-27-36	03-05-07-12-13-15-16-23	01-06-07-12-15

KEY

Subsys Subsystem

AGRICULTURAL SYSTEM DATA LISTING - CODES **Province: 18 East New Britain**

System	Sub	Segregation		Crop	Gard types		Soil fertility maintenance techniques						
	sys	Gar	Crp	Seq	Mix	H'ld	Leg	Tre	Com	Man	Isl	Sil	Fer
1801	1	1	1	0	0	0	0	0	0	0	0	0	0
1802	1	2	1	0	0	0	0	0	0	0	0	0	0
1803	1	1	1	0	0	0	0	0	0	0	0	0	0
1804	1	2	1	0	0	0	0	0	0	0	0	0	0
1805	1	2	1	0	0	0	0	0	0	0	0	0	0
1806	1	2	1	0	0	0	0	0	0	0	0	0	0
1807	1	3	1	0	0	0	0	0	0	0	0	0	0
1808	1	2	1	3	0	0	1	0	0	0	0	0	0
1809	1	2	2	2	0	0	2	0	0	0	0	0	0
1809	2	1	2	3	0	0	3	0	0	0	0	0	0
1810	1	2	1	1	0	1	1	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: 18 East New Britain

System	Sub sys	Management techniques											
		Water		Soil						Fallow		Other	
		Irr	Drn	Pig	Till	Hol	Bar	Mul	Mec	Brn	Cut	Fen	Stk
1801	1	0	0	0	0	0	0	0	0	3	0	2	0
1802	1	0	0	0	0	0	0	0	0	3	0	0	0
1803	1	0	0	0	0	0	2	0	0	3	0	1	0
1804	1	0	0	0	0	0	0	0	0	3	0	3	0
1805	1	0	0	0	0	0	0	0	0	3	0	3	0
1806	1	0	0	0	0	0	0	0	0	3	0	1	0
1807	1	0	0	0	0	0	0	0	0	1	1	2	0
1808	1	0	0	0	1	0	0	0	0	3	0	1	0
1809	1	0	0	0	1	0	0	0	0	3	0	0	1
1809	2	0	0	0	2	0	0	0	0	3	0	0	1
1810	1	0	0	0	1	0	0	0	0	3	0	0	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: 18 East New Britain**

System	Sub sys	Management techniques						Crop planting seasonality		Cropping intensity	R value
		Soil mounds				Garden beds					
		Vsm	Sm	Md	Lge	Sq	Lg	Maj	Min		
1801	1	0	1	0	0	0	0	0	1	1	5
1802	1	0	2	0	0	0	0	0	1	1	9
1803	1	0	0	0	0	0	0	0	0	1	9
1804	1	0	3	0	0	0	0	0	1	1	9
1805	1	0	2	0	0	0	0	0	1	1	5
1806	1	2	1	0	0	0	0	0	1	1	9
1807	1	1	0	0	0	0	0	0	0	1	9
1808	1	1	1	0	0	0	0	0	0	2	17
1809	1	0	1	0	0	0	0	0	0	2	74
1809	2	0	2	0	0	0	0	0	0	3	50
1810	1	0	2	0	0	0	0	0	0	3	83

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: 18 East New Britain

System	Sub	Cash income sources											
	sys	An	Bet	Crd	Cat	Chi	Coc	Cnt	CfA	CfR	Crc	Fwd	Fsh
1801	1	0	0	0	0	0	0	0	0	0	0	0	0
1802	1	0	0	0	0	0	1	0	0	0	0	0	0
1803	1	0	0	0	0	0	0	0	0	0	0	0	0
1804	1	0	0	0	0	0	0	0	0	0	0	0	0
1805	1	0	0	0	0	0	0	0	0	0	0	0	0
1806	1	0	0	0	0	0	1	1	0	0	0	0	0
1807	1	0	0	1	0	0	0	0	0	0	0	0	0
1808	1	0	1	0	0	0	3	0	0	0	0	0	0
1809	1	0	2	0	0	0	3	2	0	0	0	0	0
1809	2	0	2	0	0	0	3	2	0	0	0	0	0
1810	1	0	1	0	0	0	1	3	0	0	0	0	2

KEY

Subsys Subsystem

Cash Income Sources

An	Animal skins	Chi	Chillie	CfR	Coffee Robusta
Bet	Betel nut	Coc	Cocoa	Crc	Crocodile
Crd	Cardamom	Cnt	Coconut	Fwd	Firewood
Cat	Cattle	CfA	Coffee Arabica	Fsh	Fish

AGRICULTURAL SYSTEM DATA LISTING - CODES
Province: 18 East New Britain

System	Sub	Cash income sources										
	sys	Fod	Op	Pot	Pyr	Ric	Rub	Shp	Tea	Tob	Ot1	Ot2
1801	1	0	0	0	0	0	0	0	0	1	1	0
1802	1	1	0	0	0	0	0	0	0	0	0	0
1803	1	0	0	0	0	0	0	0	0	1	0	0
1804	1	1	0	0	0	0	0	0	0	0	0	0
1805	1	0	0	0	0	0	0	0	0	1	0	0
1806	1	1	0	0	0	0	0	0	0	0	0	0
1807	1	2	0	0	0	0	0	0	0	0	0	0
1808	1	2	0	0	0	0	0	0	0	0	0	0
1809	1	2	0	0	0	0	0	0	0	1	1	0
1809	2	2	0	0	0	0	0	0	0	1	1	0
1810	1	1	0	0	0	0	0	0	0	0	0	0

KEY

Subsys Subsystem

Cash Income Sources

Fod	Fresh food	Ric	Rice	Tob	Tobacco
Op	Oil Palm	Rub	Rubber	Ot1	Other 1
Pot	Potato	Shp	Sheep	Ot2	Other 2
Pyr	Pyrethrum	Tea	Tea		

AGRICULTURAL SYSTEM DATA LISTING - CODES **Province: 18 East New Britain**

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
1801	1	02 90	-	3	RLH	06 95	-	3	RMB	- -	-	-	
1802	1	06 95	-	3	B/H	- -	-	-		- -	-	-	
1803	1	07 95	-	3	RMB	- -	-	-		- -	-	-	
1804	1	04 72	-	2	RMB	06 95	-	3	B/H	- -	-	-	
1805	1	- -	1972-73	4	RMB	11 78	-	3	RMB	06 95	-	3	B/H
1806	1	- -	1971-72	4	RMB	06 95	-	3	RMB	- -	-	-	
1807	1	- -	1970-76	5	RMB	05 81	-	2	RMB	06 95	-	3	BGL
1808	1	- -	1970-76	5	RMB	06 95	-	3	BGL	- -	-	-	
1809	1	- -	1970-76	5	RMB	06 95	-	3	BGL	- -	-	-	
1809	2	- -	1970-76	5	RMB	06 95	-	3	BGL	- -	-	-	
1810	1	09 71	-	2	RMB	06 95	-	3	B/P	- -	-	-	

KEY

Subsys	Subsystem
Sv tp	Survey type
Sv in	Surveyor initials

BGL	R.M. Bourke/T. Geob/G. Ling and others
B/H	R.M. Bourke/S. Heai
B/P	R.M. Bourke/M. Poienou and others
RLH	R.L. Hide
RMB	R.M. Bourke

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: 18 East New Britain

Village		Population	System
DISTRICT 1	Kokopo		
Division 2	Bitapaka		
1	TAUI 1	425	1809
2	TAUI 2	462	1809
3	RATAVUL	183	1809
4	BALADA	101	1809
5	RALUBANG	425	1809
6	VUNABAUR	185	1809
7	WATWAT	242	1809
8	GANAI	331	1809
9	MARAWA	96	1809
10	MARMAR	186	1809
11	MENEBONBON	138	1809
12	BILUR	95	1809
13	KORAI	175	1809
14	KAMAKAMAR	200	1809
15	BIRAR	168	1809
16	KARU	125	1809
17	MAKURAPAU	368	1809
18	KULON	94	1809
19	RAINAU	362	1809
20	MALAKUNA	339	1809
22	TOGORO	254	1809
23	TABUNA	171	1809
24	KATAKATAI	293	1809
Division 6	Sinivit/East Baining		
1	RIET	180	1806
2	ARAMBUM	286	1806
3	DADUL	53	1806
4	MARANIGI	93	1806
5	LEMENGI	136	1806
6	KILIGIA	29	1806
7	SINBUM	120	1806
8	MARAMBU	123	1806
9	LAT	121	1806
10	CAR	159	1806
11	MERAI	343	1806
12	ILI	152	1806
13	KARONG	189	1806
522	WARONGOI STLMNT	747	1808
Division 12	Raluana		
1	RABURUA	245	1809
2	BITATITA	97	1809
3	NGUVALIAN	309	1809
4	BAROVON	296	1809
5	RALUANA	326	1809
6	IALAKUA	313	1809
7	VUNATAGIA	145	1809
8	RANGUNA	222	1809
9	BITABAUR	282	1809
10	VUNAMURMUR	411	1809
11	LIVUAN	331	1809
12	VUNAULUL	384	1809
13	RALALAR	253	1809
14	TURAGUNAN	194	1809
15	KUNAKUNAI	453	1809
16	NGATUR	595	1809
17	TINGANALOM	558	1809
18	NANUK	351	1809
19	BALANATAMAN	295	1809
Division 15	Vunamami		
1	KARAVI	297	1809
2	VUNAMAMI	674	1809
3	BITAREBAREBE	558	1809
4	VUNABALBAL	394	1809
5	GUNANBA	544	1809
6	NGUNGUNA	458	1809
7	TINGENAVUDU	322	1809
8	MALAKUNA	426	1809
9	ULAGUNAN	391	1809
10	TAKUBAR	292	1809
11	LIVUAN	303	1809
12	RAMALE	283	1809
13	BITAGALIP	169	1809
14	KABAKAUL	141	1809
DISTRICT 2	Pomio		
Division 4	Central Pomio		
1	IRENE	325	1804
2	MARA	36	1804
3	PIKAPUNA	49	1804
4	RURAI	114	1804
5	PAROL	154	1804
6	MALAKUR	133	1804
7	NGAVAL	196	1804
8	KERKERENA	91	1804
9	BAIEN	99	1804
10	GAGALOWE	329	1804
11	MARMAR	240	1804
12	POMIO	229	1804
13	OLAIPUN	283	1804
14	SALI	135	1804
15	BOVALPUN	90	1804
16	KALAKRU	56	1804
17	PORA	81	1804
18	PENOI	44	1804
19	KAUWA	97	1804
20	POGOVE	40	1804
21	PONGOLA	103	1804
22	LAMALAMPUN	59	1804
23	TOKAI-RAM	111	1804
24	MATONG	228	1804
25	BUKA	152	1804
26	PAKIA	377	1805
27	MILE	341	1805
28	SANGAMALI	116	1805
29	MUKUL	126	1805
30	MALBONE	220	1805
32	TALIVE	139	1805
33	LELI	89	1805
34	KETANME	140	1805
35	BAGO	162	1805
36	MANU	155	1805
Division 7	East Pomio		
1	MARUNGA	310	1806
2	KAVUDEMKI	112	1806

6.1 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN CENSUS ORDER
Province: 18 East New Britain

Village		Population	System
3	LAMERAIN / PLAGOIP	152	1806
4	LONG	109	1806
5	KALIP	97	1806
6	HOIYA	174	1806
7	KAUKUM	292	1806
8	MU	116	1806
9	KIRKIHAU	63	1806
10	IWAI	296	1806
11	KILALUM	135	1806
12	KOLOM	103	1806
13	KALAMPUN	313	1806
14	SETWI	201	1806
15	TAGUL	96	1806
16	SAMPUN	143	1806
17	TAINTOP	109	1806
18	WAWAS	144	1806
19	BAIN EAST	174	1806
20	RALMAN	106	1806
21	KORPUN	102	1806
22	MASKIKILER	77	1806
23	PULPUL	147	1806
24	BOKONGTATA	175	1806
25	POMAN	32	1806
26	PATURU	89	1805
27	TEITAUL	145	1805
28	SENEL	92	1805
29	PARAKAMAN	55	1805
30	TORAVILEI	137	1805
31	KORA	64	1805
32	PIAVU	104	1805
33	BAKURIA	270	1805
34	BAGATAVI	207	1805
35	KULA	39	1805
36	LALIKA	106	1805
37	KIAGE	74	1805
38	GILIU	146	1805
39	MONGU	52	1805
40	ORA	98	1805
41	LAKIRI	243	1805
42	PENOI	31	1805
43	KAVALI	62	1805
44	PIOVE	123	1805
45	KUPGEN	229	1805
46	BULOI	31	1805
47	TUKE 1	80	1805
48	TUKE 2	185	1805
49	MARIVU	97	1805
50	DAKA	126	1805
51	MANSIPANA	59	1805
52	SITORU	45	1805
53	PONGAREVE	200	1805
54	BAU'OWE	64	1805
55	SIWOIRE	50	1805
56	MASUARI	117	1805
57	KOILAU	116	1805
58	MANINGUGULE	71	1805
59	MOKEIMOKEI	63	1805
60	MILIM	172	1806
61	GUMA	135	1806
Division	17 West Pomio		
1	GUGULEN	186	1804
2	MALMAL	48	1804
3	TALIE	117	1804
4	MANGINUN	138	1804
5	TOTONGPAL	124	1804
6	KAITON	217	1804
7	PUAPAL	147	1804
8	ROWAN	125	1804
9	POME	138	1804
10	BINDAPUNA	13	1804
11	BAIRAMAN	109	1804
12	LAU	94	1804
13	PORLO	32	1804
14	MAU'UNA	78	1804
15	PEPING	156	1803
16	MALMALU	323	1803
17	LEKIMPUNA	126	1803
18	MATAWAN	229	1803
19	ULUTU	79	1803
20	LILA	59	1803
21	LOMELETENA	129	1803
22	PULEPUNA	213	1803
23	MORALONA	106	1803
24	KINSENA	244	1803
25	TALALO	55	1803
26	AU'UNA	299	1803
27	MAPUNA	157	1803
28	PELIN	146	1803
29	KAITOTO	221	1803
30	OKIMPUNA	288	1803
31	YELALONA	140	1803
32	BILI	258	1803
33	PAKA	204	1803
34	POKAPUNA	193	1803
35	SANIPUNA	100	1803
36	VIOSIPUNA	112	1803
37	PALIAVALU	174	1803
38	MAITO	303	1803
39	SERENGUNA	290	1803
951	KAIKOU	149	1803
952	KUKULA	81	1803
953	LAVUGI	91	1803
954	LUGE	123	1803
955	TI	23	1803
956	YAUYAU	76	1803
Division	18 Melkoi		
1	MARMAR	101	1802
2	WOWONGA	58	1802
3	WAIPO	66	1801
4	LOPUN	61	1801
5	AINBUL	59	1801
6	BUROWEI	38	1801
7	SIMI	212	1801
8	TAVALO	183	1802
9	MELETON	172	1802
10	INAHELE	172	1802

6.1 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN CENSUS ORDER
Province: 18 East New Britain

Village		Population	System
11	UWOL	201	1802
12	RUAHUNA	127	1802
13	PULPULO	143	1802
14	MENINGA	208	1802
15	MASO	355	1802
16	SAHALIL	132	1802
17	MAIHUNA	15	1802
18	MEINGI	184	1802
19	ATU	105	1802
20	KANGILONA	87	1802
21	RAULILI	145	1802
22	KORATUL	102	1802
23	HAULO	177	1802
24	PILIMATANA	270	1802
25	POIO	220	1802
26	LAUSIS	231	1802
27	PUNUM	94	1802
28	KANUNU	167	1803
29	KENMENINGA	267	1803
951	BEREME	62	1801
952	MALELE -JUMLA	60	1801
DISTRICT	3 Rabaul		
Division	1 Balanataman		
1	RATUNG	416	1809
2	PILAPILA	546	1809
3	KARAVIA	280	1809
4	RATAVUL	434	1809
5	VOLAVOLO	543	1809
6	NONGA	479	1809
7	TAVUI 1	518	1809
8	TAVUI 2	265	1809
9	TAVUI 3	282	1809
10	KORERE	551	1809
11	MALAGUNA 1	784	1809
12	MALAGUNA 2	454	1809
13	MALAGUNA 3	460	1809
14	IAWAKAKA	533	1809
Division	3 Central		
1	NAPAPAR 5	362	1809
2	NAPAPAR 4	426	1809
3	NAPAPAR 3	355	1809
4	NAPAPAR 2	407	1809
5	NAPAPAR NO1	457	1809
6	TAKEKEL	381	1809
7	VUNAGOGO	316	1809
8	TINGANAGALIP	611	1809
9	RAKANDAKANDA	213	1809
10	RAKUNAI	681	1809
11	LATLAT	265	1809
12	NAVUNARAM	575	1809
13	NAVUILIU	553	1809
14	MALMALUAN	375	1809
15	KARAVIA 2	214	1809
16	TALAKUA	236	1809
17	KARAVIA 1	215	1809
18	TAVANA-VALAUR	332	1809

Village		Population	System
Division	5 Duke Of Yorks Islands		
1	NAGALIA	188	1810
2	NAROKOI	90	1810
3	PALPAL	106	1810
4	URUKUK	212	1810
5	MOLOT	265	1810
6	MAREN	303	1810
7	BUTLIVUAN	259	1810
8	PIRTOP	235	1810
9	WAIRA	216	1810
10	WATARA	149	1810
11	NABUAL	282	1810
12	INOLO	197	1810
13	KABATIRAI	168	1810
14	KUMAINA	132	1810
15	NAKUKUR 1	246	1810
16	NAKUKUR 2	318	1810
17	KABILOMO	560	1810
18	URAKUKUR	219	1810
19	KABABIAI	139	1810
20	KUMLOKOR	180	1810
21	INLIMUT	161	1810
22	MUALIM	276	1810
23	VIRIEN	127	1810
24	MIOKO	207	1810
25	PALPAL	276	1810
26	UTUAN 1	150	1810
27	UTUAN 2	121	1810
28	KEREWARA	172	1810
Division	8 Kombiu		
1	RABUANA	388	1809
2	RAKUNUT	303	1809
3	MATALAU	698	1809
4	NODUP	529	1809
5	BAAI	435	1809
6	TALWAT	540	1809
8	MATUPIT 1	771	1809
9	MATUPIT 2	586	1809
10	MATUPIT 3	659	1809
Division	9 Lassul-Baining		
1	MATANAKUNAI	183	1806
2	MANDARAMBIT	131	1806
4	WILIAMBEMKI	493	1807
5	PUNARUPKA / WILMITKI	254	1806
6	TAKIS	192	1806
7	NANGAS	92	1806
9	LAUN	212	1806
10	KARO	244	1806
12	PUKTAS	153	1806
13	KAMANAKAM	290	1809
16	RANOULIT	209	1807
17	MALASAIT	556	1807
18	ALAKASAM	273	1807
19	LAMERAIN	307	1807
21	RAUNSEPNA	483	1807
22	YALOM	612	1807
23	KOMGI	238	1807
24	DRAIWARA	109	1806

6.1 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN CENSUS ORDER
Province: 18 East New Britain

Village		Population	System
25	LASSUL 1 AND 2	88	1806
534	VUNAPALADING SETT	295	1808
535	MANDRESS SETT	110	1808
544	VUNAPALADING L S S	140	1808
Division	10 Livuan		
1	KABAKADA	300	1809
2	VUNAIROTO	535	1809
3	PUTUNAGORORO I	208	1809
4	VUNALIR	243	1809
5	RATONGOR	567	1809
6	RAMBABAT	493	1809
7	VUNADAVAI	556	1809
8	LUNGALUNGA	343	1809
9	MAILIVUAN	174	1809
10	VOLAVOLO	194	1809
11	RASIMEN	159	1809
13	TOBOIN	222	1809
14	RALUAN 3	281	1809
15	RAKUMKUMBUR	251	1809
16	NABATA	165	1809
18	KABAIRA	70	1809
Division	13 Reimber		
1	RAMALMAL	247	1809
2	VUNAKAINALAMA	328	1809
3	TATOKO	156	1809
4	RALIMUT	522	1809
5	VANAULAITING	425	1809
6	TOTOVEL C S	441	1809
7	VUNAPAKA	425	1809
8	KIKITABU	248	1809
9	RAMALE	273	1809
10	RAKOTOP	188	1809
11	RABURBUR	260	1809
12	TARANGA	289	1809
13	VUNAKALKALULU	369	1809
14	KURAIP	529	1809
15	VUNALAKA	292	1809
16	RALUAN 2	279	1809
17	RALUAN 1	204	1809
18	RAPOLO	355	1809
20	VUNAITING	330	1809
Division	14 Toma		
1	RATAVUL	267	1809
2	VUNAKAMBI	220	1809
3	GUNANUR	270	1809
4	RAIM	211	1809
5	TANAKA	304	1809
6	VUNADIDIR	389	1809
7	TAGITAGI 1	438	1809
8	BITAKAPUK	696	1809
9	TAGITAGI 2	343	1809
10	WAIRIKI 3	322	1809
11	WAIRIKI 2	222	1809
12	WAIRIKI 1	491	1809
13	VIVIRAN	528	1809
14	TAKUBAR	399	1809
15	RABATA	151	1809
16	GAULIM	442	1809
18	KAINAGUNAN	302	1809
19	IVERE	171	1809
20	MALABUNGA	322	1809
21	TAULIL	754	1809
22	RAPITOK 3	421	1809
23	RAPITOK 1	325	1809
24	RAPITOK 2	155	1809
25	RAPITOK 4	377	1809
26	RABAGI 1	318	1809
27	RABAGI 2	422	1809
28	TAMANAIRIK	411	1809
Division	16 Watom Island		
1	RAKIVAL	213	1810
2	TARANATA	212	1810
4	VALAUR	328	1810
5	VUNABUK	428	1810
6	VUNAKABAI	365	1810

6.2 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN ALPHABETICAL ORDER
Province: 18 East New Britain

Village	Dist	Div	Unit	System
AINBUL	2	18	5	1801
ALAKASAM	3	9	18	1807
ARAMBUM	1	6	2	1806
ATU	2	18	19	1802
AU'UNA	2	17	26	1803
BAAI	3	8	5	1809
BAGATAVI	2	7	34	1805
BAGO	2	4	35	1805
BAIEN	2	4	9	1804
BAIN EAST	2	7	19	1806
BAIRAMAN	2	17	11	1804
BAKURIA	2	7	33	1805
BALADA	1	2	4	1809
BALANATAMAN	1	12	19	1809
BAROVON	1	12	4	1809
BAU'OWE	2	7	54	1805
BEREME	2	18	951	1801
BILI	2	17	32	1803
BILUR	1	2	12	1809
BINDAPUNA	2	17	10	1804
BIRAR	1	2	15	1809
BITABAUR	1	12	9	1809
BITAGALIP	1	15	13	1809
BITAKAPUK	3	14	8	1809
BITAREBAREBE	1	15	3	1809
BITATITA	1	12	2	1809
BOKONGTATA	2	7	24	1806
BOVALPUN	2	4	15	1804
BUKA	2	4	25	1804
BULOI	2	7	46	1805
BUROWEI	2	18	6	1801
BUTLIVUAN	3	5	7	1810
CAR	1	6	10	1806
DADUL	1	6	3	1806
DAKA	2	7	50	1805
DRAIWARA	3	9	24	1806
GAGALOWE	2	4	10	1804
GANAI	1	2	8	1809
GAULIM	3	14	16	1809
GILIU	2	7	38	1805
GUGULEN	2	17	1	1804
GUMA	2	7	61	1806
GUNANBA	1	15	5	1809
GUNANUR	3	14	3	1809
HAULO	2	18	23	1802
HOIYA	2	7	6	1806
IALAKUA	1	12	6	1809
IAWAKAKA	3	1	14	1809
ILI	1	6	12	1806
INAHELE	2	18	10	1802
INLIMUT	3	5	21	1810
INOLO	3	5	12	1810
IRENE	2	4	1	1804
IVERE	3	14	19	1809
IWAI	2	7	10	1806
KABABIAI	3	5	19	1810
KABAIRA	3	10	18	1809
KABAKADA	3	10	1	1809
KABAKAUL	1	15	14	1809
KABATIRAI	3	5	13	1810
KABILOMO	3	5	17	1810
KAIKOU	2	17	951	1803
KAINAGUNAN	3	14	18	1809
KAITON	2	17	6	1804
KAITOTO	2	17	29	1803
KALAKRU	2	4	16	1804
KALAMPUN	2	7	13	1806
KALIP	2	7	5	1806
KAMAKAMAR	1	2	14	1809
KAMANAKAM	3	9	13	1809
KANGILONA	2	18	20	1802
KANUNU	2	18	28	1803
KARAVI	1	15	1	1809
KARAVIA	3	1	3	1809
KARAVIA 1	3	3	17	1809
KARAVIA 2	3	3	15	1809
KARO	3	9	10	1806
KARONG	1	6	13	1806
KARU	1	2	16	1809
KATAKATAI	1	2	24	1809
KAUKUM	2	7	7	1806
KAUWA	2	4	19	1804
KAVALI	2	7	43	1805
KAVUDEMKI	2	7	2	1806
KENMENINGA	2	18	29	1803
KEREWARA	3	5	28	1810
KERKERENA	2	4	8	1804
KETANME	2	4	34	1805
KIAGE	2	7	37	1805
KIKITABU	3	13	8	1809
KILALUM	2	7	11	1806
KILIGIA	1	6	6	1806
KINSENA	2	17	24	1803
KIRKIHAU	2	7	9	1806
KOILAU	2	7	57	1805
KOLOM	2	7	12	1806
KOMGI	3	9	23	1807
KORA	2	7	31	1805
KORAI	1	2	13	1809
KORATUL	2	18	22	1802
KORERE	3	1	10	1809
KORPUN	2	7	21	1806
KUKULA	2	17	952	1803
KULA	2	7	35	1805
KULON	1	2	18	1809
KUMAINA	3	5	14	1810
KUMLOKOR	3	5	20	1810
KUNAKUNAI	1	12	15	1809
KUPGEN	2	7	45	1805

6.2 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN ALPHABETICAL ORDER
Province: 18 East New Britain

Village	Dist	Div	Unit	System
KURAIP	3	13	14	1809
LAKIRI	2	7	41	1805
LALIKA	2	7	36	1805
LAMALAMPUN	2	4	22	1804
LAMERAIN	3	9	19	1807
LAMERAIN / PLAGOIP	2	7	3	1806
LASSUL 1 AND 2	3	9	25	1806
LAT	1	6	9	1806
LATLAT	3	3	11	1809
LAU	2	17	12	1804
LAUN	3	9	9	1806
LAUSIS	2	18	26	1802
LAVUGI	2	17	953	1803
LEKIMPUNA	2	17	17	1803
LELI	2	4	33	1805
LEMENGI	1	6	5	1806
LILA	2	17	20	1803
LIVUAN	1	12	11	1809
LIVUAN	1	15	11	1809
LOMELETENA	2	17	21	1803
LONG	2	7	4	1806
LOPUN	2	18	4	1801
LUGE	2	17	954	1803
LUNGALUNGA	3	10	8	1809
MAIHUNA	2	18	17	1802
MAILIVUAN	3	10	9	1809
MAITO	2	17	38	1803
MAKURAPAU	1	2	17	1809
MALABUNGA	3	14	20	1809
MALAGUNA 1	3	1	11	1809
MALAGUNA 2	3	1	12	1809
MALAGUNA 3	3	1	13	1809
MALAKUNA	1	2	20	1809
MALAKUNA	1	15	8	1809
MALAKUR	2	4	6	1804
MALASAIT	3	9	17	1807
MALBONE	2	4	30	1805
MALELE -JUMLA	2	18	952	1801
MALMAL	2	17	2	1804
MALMALU	2	17	16	1803
MALMALUAN	3	3	14	1809
MANDARAMBIT	3	9	2	1806
MANDRESS SETT	3	9	535	1808
MANGINUN	2	17	4	1804
MANINGUGULE	2	7	58	1805
MANSIPANA	2	7	51	1805
MANU	2	4	36	1805
MAPUNA	2	17	27	1803
MARA	2	4	2	1804
MARAMBU	1	6	8	1806
MARANIGI	1	6	4	1806
MARAWA	1	2	9	1809
MAREN	3	5	6	1810
MARIVU	2	7	49	1805
MARMAR	1	2	10	1809
MARMAR	2	4	11	1804
MARMAR	2	18	1	1802
MARUNGA	2	7	1	1806
MASKIKILER	2	7	22	1806
MASO	2	18	15	1802
MASUARI	2	7	56	1805
MATALAU	3	8	3	1809
MATANAKUNAI	3	9	1	1806
MATAWAN	2	17	18	1803
MATONG	2	4	24	1804
MATUPIT 1	3	8	8	1809
MATUPIT 2	3	8	9	1809
MATUPIT 3	3	8	10	1809
MAU'UNA	2	17	14	1804
MEINGI	2	18	18	1802
MELETON	2	18	9	1802
MENEBONBON	1	2	11	1809
MENINGA	2	18	14	1802
MERAI	1	6	11	1806
MILE	2	4	27	1805
MILIM	2	7	60	1806
MIOKO	3	5	24	1810
MOKEIMOKEI	2	7	59	1805
MOLOT	3	5	5	1810
MONGU	2	7	39	1805
MORALONA	2	17	23	1803
MU	2	7	8	1806
MUALIM	3	5	22	1810
MUKUL	2	4	29	1805
NABATA	3	10	16	1809
NABUAL	3	5	11	1810
NAGALIA	3	5	1	1810
NAKUKUR 1	3	5	15	1810
NAKUKUR 2	3	5	16	1810
NANGAS	3	9	7	1806
NANUK	1	12	18	1809
NAPAPAR 2	3	3	4	1809
NAPAPAR 3	3	3	3	1809
NAPAPAR 4	3	3	2	1809
NAPAPAR 5	3	3	1	1809
NAPAPAR NO1	3	3	5	1809
NAROKOI	3	5	2	1810
NAVUILIU	3	3	13	1809
NAVUNARAM	3	3	12	1809
NGATUR	1	12	16	1809
NGAVAL	2	4	7	1804
NGUNGUNA	1	15	6	1809
NGUVALIAN	1	12	3	1809
NODUP	3	8	4	1809
NONGA	3	1	6	1809
OKIMPUNA	2	17	30	1803
OLAIPUN	2	4	13	1804
ORA	2	7	40	1805
PAKA	2	17	33	1803
PAKIA	2	4	26	1805
PALIAVALU	2	17	37	1803

6.2 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN ALPHABETICAL ORDER
Province: 18 East New Britain

Village	Dist	Div	Unit	System
PALPAL	3	5	3	1810
PALPAL	3	5	25	1810
PARAKAMAN	2	7	29	1805
PAROL	2	4	5	1804
PATURU	2	7	26	1805
PELIN	2	17	28	1803
PENOI	2	4	18	1804
PENOI	2	7	42	1805
PEPING	2	17	15	1803
PIAVU	2	7	32	1805
PIKAPUNA	2	4	3	1804
PILAPILA	3	1	2	1809
PILIMATANA	2	18	24	1802
PIOVE	2	7	44	1805
PIRTOP	3	5	8	1810
POGOVE	2	4	20	1804
POIO	2	18	25	1802
POKAPUNA	2	17	34	1803
POMAN	2	7	25	1806
POME	2	17	9	1804
POMIO	2	4	12	1804
PONGAREVE	2	7	53	1805
PONGOLA	2	4	21	1804
PORA	2	4	17	1804
PORLO	2	17	13	1804
PUAPAL	2	17	7	1804
PUKTAS	3	9	12	1806
PULEPUNA	2	17	22	1803
PULPUL	2	7	23	1806
PULPULO	2	18	13	1802
PUNARUPKA / WILMITKI	1806	3	9	5
PUNUM	2	18	27	1802
PUTUNAGORO ROI	3	10	3	1809
RABAGI 1	3	14	26	1809
RABAGI 2	3	14	27	1809
RABATA	3	14	15	1809
RABUANA	3	8	1	1809
RABURBUR	3	13	11	1809
RABURUA	1	12	1	1809
RAIM	3	14	4	1809
RAINAU	1	2	19	1809
RAKANDAKANDA	3	3	9	1809
RAKIVAL	3	16	1	1810
RAKOTOP	3	13	10	1809
RAKUMKUMBUR	3	10	15	1809
RAKUNAI	3	3	10	1809
RAKUNUT	3	8	2	1809
RALALAR	1	12	13	1809
RALIMUT	3	13	4	1809
RALMAN	2	7	20	1806
RALUAN 1	3	13	17	1809
RALUAN 2	3	13	16	1809
RALUAN 3	3	10	14	1809
RALUANA	1	12	5	1809
RALUBANG	1	2	5	1809
RAMALE	1	15	12	1809
RAMALE	3	13	9	1809
RAMALMAL	3	13	1	1809
RAMBABAT	3	10	6	1809
RANGUNA	1	12	8	1809
RANOULIT	3	9	16	1807
RAPITOK 1	3	14	23	1809
RAPITOK 2	3	14	24	1809
RAPITOK 3	3	14	22	1809
RAPITOK 4	3	14	25	1809
RAPOLO	3	13	18	1809
RASIMEN	3	10	11	1809
RATAVUL	1	2	3	1809
RATAVUL	3	1	4	1809
RATAVUL	3	14	1	1809
RATONGOR	3	10	5	1809
RATUNG	3	1	1	1809
RAULILI	2	18	21	1802
RAUNSEPNA	3	9	21	1807
RIET	1	6	1	1806
ROWAN	2	17	8	1804
RUAHUNA	2	18	12	1802
RURAI	2	4	4	1804
SAHALIL	2	18	16	1802
SALI	2	4	14	1804
SAMPUN	2	7	16	1806
SANGAMALI	2	4	28	1805
SANIPUNA	2	17	35	1803
SENEL	2	7	28	1805
SERENGUNA	2	17	39	1803
SETWI	2	7	14	1806
SIMI	2	18	7	1801
SINBUM	1	6	7	1806
SITORU	2	7	52	1805
SIWOIRE	2	7	55	1805
TABUNA	1	2	23	1809
TAGITAGI 1	3	14	7	1809
TAGITAGI 2	3	14	9	1809
TAGUL	2	7	15	1806
TAINTOP	2	7	17	1806
TAKEKEL	3	3	6	1809
TAKIS	3	9	6	1806
TAKUBAR	1	15	10	1809
TAKUBAR	3	14	14	1809
TALAKUA	3	3	16	1809
TALALO	2	17	25	1803
TALIE	2	17	3	1804
TALIVE	2	4	32	1805
TALWAT	3	8	6	1809
TAMANAIRIK	3	14	28	1809
TANAKA	3	14	5	1809
TARANATA	3	16	2	1810
TARANGA	3	13	12	1809
TATOKO	3	13	3	1809
TAUI 1	1	2	1	1809
TAUI 2	1	2	2	1809
TAULIL	3	14	21	1809

6.2 RURAL VILLAGES WITH AGRICULTURAL SYSTEM NUMBERS IN ALPHABETICAL ORDER
Province: 18 East New Britain

Village	Dist	Div	Unit	System
TAVALO	2	18	8	1802
TAVANA-VALAUR	3	3	18	1809
TAVUI 1	3	1	7	1809
TAVUI 2	3	1	8	1809
TAVUI 3	3	1	9	1809
TEITAUL	2	7	27	1805
TI	2	17	955	1803
TINGANAGALIP	3	3	8	1809
TINGANALOM	1	12	17	1809
TINGENAVUDU	1	15	7	1809
TOBOIN	3	10	13	1809
TOGORO	1	2	22	1809
TOKAI-RAM	2	4	23	1804
TORAVILEI	2	7	30	1805
TOTONGPAL	2	17	5	1804
TOTOVEL C S	3	13	6	1809
TUKE 1	2	7	47	1805
TUKE 2	2	7	48	1805
TURAGUNAN	1	12	14	1809
ULAGUNAN	1	15	9	1809
ULUTU	2	17	19	1803
URAKUKUR	3	5	18	1810
URUKUK	3	5	4	1810
UTUAN 1	3	5	26	1810
UTUAN 2	3	5	27	1810
UWOL	2	18	11	1802
VALAUR	3	16	4	1810
VANAULAITING	3	13	5	1809
VIOSIPUNA	2	17	36	1803
VIRIEN	3	5	23	1810
VIVIRAN	3	14	13	1809
VOLAVOLO	3	1	5	1809
VOLAVOLO	3	10	10	1809
VUNABALBAL	1	15	4	1809
VUNABAUR	1	2	6	1809
VUNABUK	3	16	5	1810
VUNADAVAI	3	10	7	1809
VUNADIDIR	3	14	6	1809
VUNAGOGO	3	3	7	1809
VUNAIROTO	3	10	2	1809
VUNAITING	3	13	20	1809
VUNAKABAI	3	16	6	1810
VUNAKAINALAMA	3	13	2	1809
VUNAKALKALULU	3	13	13	1809
VUNAKAMBI	3	14	2	1809
VUNALAKA	3	13	15	1809
VUNALIR	3	10	4	1809
VUNAMAMI	1	15	2	1809
VUNAMURMUR	1	12	10	1809
VUNAPAKA	3	13	7	1809
VUNAPALADING L S S	3	9	544	1808
VUNAPALADING SETT	3	9	534	1808
VUNATAGIA	1	12	7	1809
VUNAULUL	1	12	12	1809
WAIPO	2	18	3	1801
WAIRA	3	5	9	1810
WAIRIKI 1	3	14	12	1809
WAIRIKI 2	3	14	11	1809
WAIRIKI 3	3	14	10	1809
WARONGOI STLMNT	1	6	522	1808
WATARA	3	5	10	1810
WATWAT	1	2	7	1809
WAWAS	2	7	18	1806
WILIAMBEMKI	3	9	4	1807
WOWONGA	2	18	2	1802
YALOM	3	9	22	1807
YAUYAU	2	17	956	1803
YELALONA	2	17	31	1803

6.3 RURAL VILLAGES LISTED BY AGRICULTURAL SYSTEM **Province: 18 East New Britain**

Village	Dist	Div	Unit	RMU
SYSTEM 1801				
AINBUL	2	18	5	125
BEREME	2	18	951	126
BUROWEI	2	18	6	120
LOPUN	2	18	4	126
MALELE -JUMLA	2	18	952	126
SIMI	2	18	7	127
WAIPO	2	18	3	123
SYSTEM 1802				
ATU	2	18	19	114
HAULO	2	18	23	117
INAHELE	2	18	10	117
KANGILONA	2	18	20	114
KORATUL	2	18	22	117
LAUSIS	2	18	26	105
MAIHUNA	2	18	17	116
MARMAR	2	18	1	120
MASO	2	18	15	117
MEINGI	2	18	18	115
MELETON	2	18	9	117
MENINGA	2	18	14	117
PILIMATANA	2	18	24	117
POIO	2	18	25	117
PULPULO	2	18	13	117
PUNUM	2	18	27	117
RAULILI	2	18	21	117
RUAHUNA	2	18	12	117
SAHALIL	2	18	16	117
TAVALO	2	18	8	118
UWOL	2	18	11	117
WOWONGA	2	18	2	120
SYSTEM 1803				
AU'UNA	2	17	26	137
BILI	2	17	32	87
KAIKOU	2	17	951	136
KAITOTO	2	17	29	105
KANUNU	2	18	28	105
KENMENINGA	2	18	29	105
KINSENA	2	17	24	137
KUKULA	2	17	952	134
LAVUGI	2	17	953	136
LEKIMPUNA	2	17	17	105
LILA	2	17	20	105
LOMELETENA	2	17	21	105
LUGE	2	17	954	136
MAITO	2	17	38	105
MALMALU	2	17	16	105
MAPUNA	2	17	27	137
MATAWAN	2	17	18	128
MORALONA	2	17	23	137
OKIMPUNA	2	17	30	133
PAKA	2	17	33	87
PALIAVALU	2	17	37	105
PELIN	2	17	28	137
PEPING	2	17	15	105
POKAPUNA	2	17	34	133
PULEPUNA	2	17	22	137
SANIPUNA	2	17	35	133
SERENGUNA	2	17	39	105
TALALO	2	17	25	133
TI	2	17	955	136
ULUTU	2	17	19	129
VIOSIPUNA	2	17	36	87
YAUYAU	2	17	956	136
YELALONA	2	17	31	133
SYSTEM 1804				
BAIEN	2	4	9	112
BAIRAMAN	2	17	11	112
BINDAPUNA	2	17	10	112
BOVALPUN	2	4	15	111
BUKA	2	4	25	80
GAGALOWE	2	4	10	105
GUGULEN	2	17	1	112
IRENE	2	4	1	112
KAITON	2	17	6	112
KALAKRU	2	4	16	111
KAUWA	2	4	19	110
KERKERENA	2	4	8	112
LAMALAMPUN	2	4	22	110
LAU	2	17	12	112
MALAKUR	2	4	6	112
MALMAL	2	17	2	112
MANGINUN	2	17	4	112
MARA	2	4	2	112
MARMAR	2	4	11	111
MATONG	2	4	24	80
MAU'UNA	2	17	14	113
NGAVAL	2	4	7	112
OLAIPUN	2	4	13	105
PAROL	2	4	5	112
PENOI	2	4	18	110
PIKAPUNA	2	4	3	105
POGOVE	2	4	20	110
POME	2	17	9	112
POMIO	2	4	12	111
PONGOLA	2	4	21	110
PORA	2	4	17	110
PORLO	2	17	13	105
PUAPAL	2	17	7	112
ROWAN	2	17	8	112
RURAI	2	4	4	112
SALI	2	4	14	111
TALIE	2	17	3	112
TOKAI-RAM	2	4	23	80
TOTONGPAL	2	17	5	112
SYSTEM 1805				
BAGATAVI	2	7	34	106
BAGO	2	4	35	101
BAKURIA	2	7	33	106
BAU'OWE	2	7	54	101
BULOI	2	7	46	92
DAKA	2	7	50	87
GILIU	2	7	38	106
KAVALI	2	7	43	106

Village	Dist	Div	Unit	RMU
KETANME	2	4	34	101
KIAGE	2	7	37	106
KOILAU	2	7	57	101
KORA	2	7	31	106
KULA	2	7	35	106
KUPGEN	2	7	45	92
LAKIRI	2	7	41	106
LALIKA	2	7	36	106
LELI	2	4	33	101
MALBONE	2	4	30	87
MANINGUGULE	2	7	58	91
MANSIPANA	2	7	51	101
MANU	2	4	36	101
MARIVU	2	7	49	87
MASUARI	2	7	56	101
MILE	2	4	27	87
MOKEIMOKEI	2	7	59	91
MONGU	2	7	39	106
MUKUL	2	4	29	87
ORA	2	7	40	87
PAKIA	2	4	26	87
PARAKAMAN	2	7	29	106
PATURU	2	7	26	106
PENOI	2	7	42	106
PIAVU	2	7	32	106
PIOVE	2	7	44	87
PONGAREVE	2	7	53	92
SANGAMALI	2	4	28	87
SENEL	2	7	28	106
SITORU	2	7	52	101
SIWOIRE	2	7	55	91
TALIVE	2	4	32	101
TEITAUL	2	7	27	106
TORAVILEI	2	7	30	106
TUKE 1	2	7	47	101
TUKE 2	2	7	48	101
SYSTEM 1806				
ARAMBUM	1	6	2	37
BAIN EAST	2	7	19	80
BOKONGTATA	2	7	24	80
CAR	1	6	10	44
DADUL	1	6	3	37
DRAIWARA	3	9	24	14
GUMA	2	7	61	75
HOIYA	2	7	6	76
ILI	1	6	12	46
IWAI	2	7	10	75
KALAMPUN	2	7	13	75
KALIP	2	7	5	76
KARO	3	9	10	14
KARONG	1	6	13	54
KAUKUM	2	7	7	76
KAVUDEMKI	2	7	2	59
KILALUM	2	7	11	75
KILIGIA	1	6	6	47
KIRKIHAU	2	7	9	75
KOLOM	2	7	12	75
KORPUN	2	7	21	81
LAMERAIN / PLAGOIP	2	7	3	59
LASSUL 1 AND 2	3	9	25	19
LAT	1	6	9	40
LAUN	3	9	9	19
LEMENGI	1	6	5	47
LONG	2	7	4	76
MANDARAMBIT	3	9	2	33
MARAMBU	1	6	8	47
MARANIGI	1	6	4	47
MARUNGA	2	7	1	54
MASKIKILER	2	7	22	81
MATANAKUNAI	3	9	1	62
MERAI	1	6	11	46
MILIM	2	7	60	76
MU	2	7	8	75
NANGAS	3	9	7	18
POMAN	2	7	25	80
PUKTAS	3	9	12	14
PULPUL	2	7	23	80
PUNARUPKA / WILMITKI	3	9	5	21
RALMAN	2	7	20	81
RIET	1	6	1	37
SAMPUN	2	7	16	80
SETWI	2	7	14	80
SINBUM	1	6	7	41
TAGUL	2	7	15	80
TAINTOP	2	7	17	80
TAKIS	3	9	6	141
WAWAS	2	7	18	80
SYSTEM 1807				
ALAKASAM	3	9	18	25
KOMGI	3	9	23	26
LAMERAIN	3	9	19	26
MALASAIT	3	9	17	142
RANOULIT	3	9	16	24
RAUNSEPNA	3	9	21	26
WILIAMBEMKI	3	9	4	25
YALOM	3	9	22	26
SYSTEM 1808				
MANDRESS SETT	3	9	535	13
VUNAPALADING L S S	3	9	544	13
VUNAPALADING SETT	3	9	534	13
WARONGOI STLMNT	1	6	522	40
SYSTEM 1809				
BAAI	3	8	5	7
BALADA	1	2	4	10
BALANATAMAN	1	12	19	139
BAROVON	1	12	4	10
BILUR	1	2	12	39
BIRAR	1	2	15	39
BITABAUR	1	12	9	139
BITAGALIP	1	15	13	10
BITAKAPUK	3	14	8	10
BITAREBAREBE	1	15	3	10
BITATITA	1	12	2	7
GANAI	1	2	8	39

6.3 RURAL VILLAGES LISTED BY AGRICULTURAL SYSTEM **Province: 18 East New Britain**

Village	Dist	Div	Unit	RMU
GAULIM	3	14	16	12
GUNANBA	1	15	5	10
GUNANUR	3	14	3	10
IALAKUA	1	12	6	7
IAWAKAKA	3	1	14	6
IVERE	3	14	19	12
KABAIRA	3	10	18	13
KABAKADA	3	10	1	10
KABAKAUL	1	15	14	139
KAINAGUNAN	3	14	18	37
KAMAKAMAR	1	2	14	39
KAMANAKAM	3	9	13	19
KARAVI	1	15	1	139
KARAVIA	3	1	3	6
KARAVIA 1	3	3	17	7
KARAVIA 2	3	3	15	10
KARU	1	2	16	39
KATAKATAI	1	2	24	10
KIKITABU	3	13	8	10
KORAI	1	2	13	10
KORERE	3	1	10	7
KULON	1	2	18	39
KUNAKUNAI	1	12	15	10
KURAIP	3	13	14	10
LATLAT	3	3	11	10
LIVUAN	1	12	11	7
LIVUAN	1	15	11	10
LUNGALUNGA	3	10	8	9
MAILIVUAN	3	10	9	13
MAKURAPAU	1	2	17	39
MALABUNGA	3	14	20	12
MALAGUNA 1	3	1	11	7
MALAGUNA 2	3	1	12	8
MALAGUNA 3	3	1	13	7
MALAKUNA	1	2	20	39
MALAKUNA	1	15	8	10
MALMALUAN	3	3	14	10
MARAWA	1	2	9	39
MARMAR	1	2	10	39
MATALAU	3	8	3	7
MATUPIT 1	3	8	8	8
MATUPIT 2	3	8	9	8
MATUPIT 3	3	8	10	8
MENEBONBON	1	2	11	39
NABATA	3	10	16	10
NANUK	1	12	18	139
NAPAPAR 2	3	3	4	10
NAPAPAR 3	3	3	3	10
NAPAPAR 4	3	3	2	10
NAPAPAR 5	3	3	1	10
NAPAPAR NO1	3	3	5	10
NAVUILIU	3	3	13	10
NAVUNARAM	3	3	12	10
NGATUR	1	12	16	10
NGUNGUNA	1	15	6	10
NGUVALIAN	1	12	3	7
NODUP	3	8	4	7
NONGA	3	1	6	6
PILAPILA	3	1	2	6
PUTUNAGORORO I	3	10	3	10
RABAGI 1	3	14	26	10
RABAGI 2	3	14	27	10
RABATA	3	14	15	12
RABUANA	3	8	1	7
RABURBUR	3	13	11	10
RABURUA	1	12	1	7
RAIM	3	14	4	10
RAINAU	1	2	19	10
RAKANDAKANDA	3	3	9	10
RAKOTOP	3	13	10	10
RAKUMKUMBUR	3	10	15	10
RAKUNAI	3	3	10	10
RAKUNUT	3	8	2	7
RALALAR	1	12	13	7
RALIMUT	3	13	4	10
RALUAN 1	3	13	17	10
RALUAN 2	3	13	16	10
RALUAN 3	3	10	14	10
RALUANA	1	12	5	139
RALUBANG	1	2	5	12
RAMALE	1	15	12	10
RAMALE	3	13	9	10
RAMALMAL	3	13	1	10
RAMBABAT	3	10	6	9
RANGUNA	1	12	8	139
RAPITOK 1	3	14	23	10
RAPITOK 2	3	14	24	12
RAPITOK 3	3	14	22	12
RAPITOK 4	3	14	25	11
RAPOLO	3	13	18	7
RASIMEN	3	10	11	13
RATAVUL	1	2	3	10
RATAVUL	3	1	4	7
RATAVUL	3	14	1	10
RATONGOR	3	10	5	10
RATUNG	3	1	1	6
TABUNA	1	2	23	10
TAGITAGI 1	3	14	7	11
TAGITAGI 2	3	14	9	11
TAKEKEL	3	3	6	10
TAKUBAR	1	15	10	139
TAKUBAR	3	14	14	11
TALAKUA	3	3	16	10
TALWAT	3	8	6	7
TAMANAIRIK	3	14	28	11
TANAKA	3	14	5	10
TARANGA	3	13	12	10
TATOKO	3	13	3	10
TAUI 1	1	2	1	10
TAUI 2	1	2	2	10
TAULIL	3	14	21	12
TAVANA-VALAUR	3	3	18	7
TAVUI 1	3	1	7	6
TAVUI 2	3	1	8	6
TAVUI 3	3	1	9	6
TINGANAGALIP	3	3	8	10
TINGANALOM	1	12	17	10
TINGENAVUDU	1	15	7	10

6.3 RURAL VILLAGES LISTED BY AGRICULTURAL SYSTEM **Province: 18 East New Britain**

Village	Dist	Div	Unit	RMU
TOBOIN	3	10	13	10
TOGORO	1	2	22	10
TOTOVEL C S	3	13	6	10
TURAGUNAN	1	12	14	10
ULAGUNAN	1	15	9	10
VANAULAITING	3	13	5	10
VIVIRAN	3	14	13	12
VOLAVOLO	3	1	5	6
VOLAVOLO	3	10	10	13
VUNABALBAL	1	15	4	10
VUNABAUR	1	2	6	39
VUNADAVAI	3	10	7	9
VUNADIDIR	3	14	6	10
VUNAGOGO	3	3	7	10
VUNAIROTO	3	10	2	10
VUNAITING	3	13	20	10
VUNAKAINALAMA	3	13	2	10
VUNAKALKALULU	3	13	13	10
VUNAKAMBI	3	14	2	10
VUNALAKA	3	13	15	10
VUNALIR	3	10	4	10
VUNAMAMI	1	15	2	10
VUNAMURMUR	1	12	10	7
VUNAPAKA	3	13	7	10
VUNATAGIA	1	12	7	139
VUNAULUL	1	12	12	10
WAIRIKI 1	3	14	12	12
WAIRIKI 2	3	14	11	12
WAIRIKI 3	3	14	10	12
WATWAT	1	2	7	39
SYSTEM 1810				
BUTLIVUAN	3	5	7	2
INLIMUT	3	5	21	2
INOLO	3	5	12	2
KABABIAI	3	5	19	2
KABATIRAI	3	5	13	2
KABILOMO	3	5	17	2
KEREWARA	3	5	28	4
KUMAINA	3	5	14	2
KUMLOKOR	3	5	20	2
MAREN	3	5	6	2
MIOKO	3	5	24	4
MOLOT	3	5	5	2
MUALIM	3	5	22	4
NABUAL	3	5	11	2
NAGALIA	3	5	1	1
NAKUKUR 1	3	5	15	2
NAKUKUR 2	3	5	16	2
NAROKOI	3	5	2	1
PALPAL	3	5	3	1
PALPAL	3	5	25	4
PIRTOP	3	5	8	2
RAKIVAL	3	16	1	5
TARANATA	3	16	2	5
URAKUKUR	3	5	18	2
URUKUK	3	5	4	2
UTUAN 1	3	5	26	4
UTUAN 2	3	5	27	4
VALAUR	3	16	4	5
VIRIEN	3	5	23	4
VUNABUK	3	16	5	5
VUNAKABAI	3	16	6	5
WAIRA	3	5	9	2
WATARA	3	5	10	2

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, EAST NEW BRITAIN PROVINCE[1]

Code	Division
01	**KOKOPO**
02	BITAPAKA
06	SINIVIT/EAST BAININGS
12	RALUANA
15	VUNAMAMI
02	**POMIO**
04	CENTRAL POMIO
07	EAST POMIO
17	WEST POMIO
18	MELKOI
03	**RABAUL**
01	BALANATAMAN
03	CENTRAL
05	DUKE OF YORK ISLES
08	KOMBIU
09	LASSUL/BAININGS
10	LIVUAN
13	REIMBER
14	TOMA
16	WATOM ISLAND

[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.