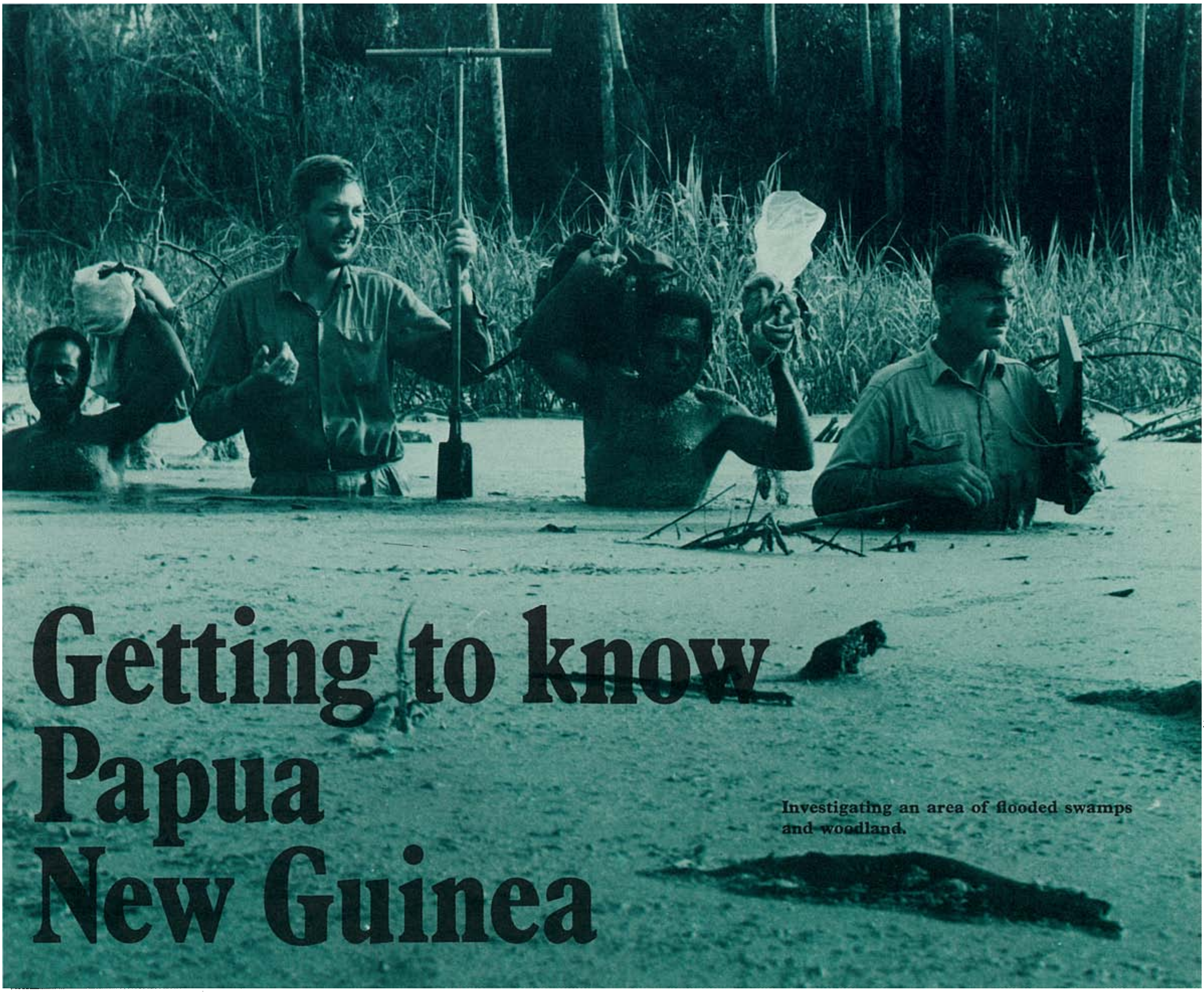
Getting to know Papua New Guinea



Investigating an area of flooded swamps and woodland.

Twenty-five years ago, very large gaps existed in knowledge of the vegetation, soils, and agricultural potential of Papua New Guinea. The position is quite different now. This year—the country's independence year—the CSIRO Division of Land Use Research is winding up a 23-year survey program that leaves Papua New Guinea as one of the most thoroughly examined and described countries in the developing world.

The work began in 1952, at the request of the Papua New Guinea Administration, which financed the whole project. Scientific parties have trekked through thousands of hectares of rugged country to collect data. The other main source of information has been aerial photos.

Fifteen regional surveys, each taking a year or longer, have resulted in the publication of reports and maps describing the main land characteristics of nearly half the country. About three-fifths of the population live in the areas covered, which include most of the best land for agriculture and take in all the major types of country—high and low, wet and dry.

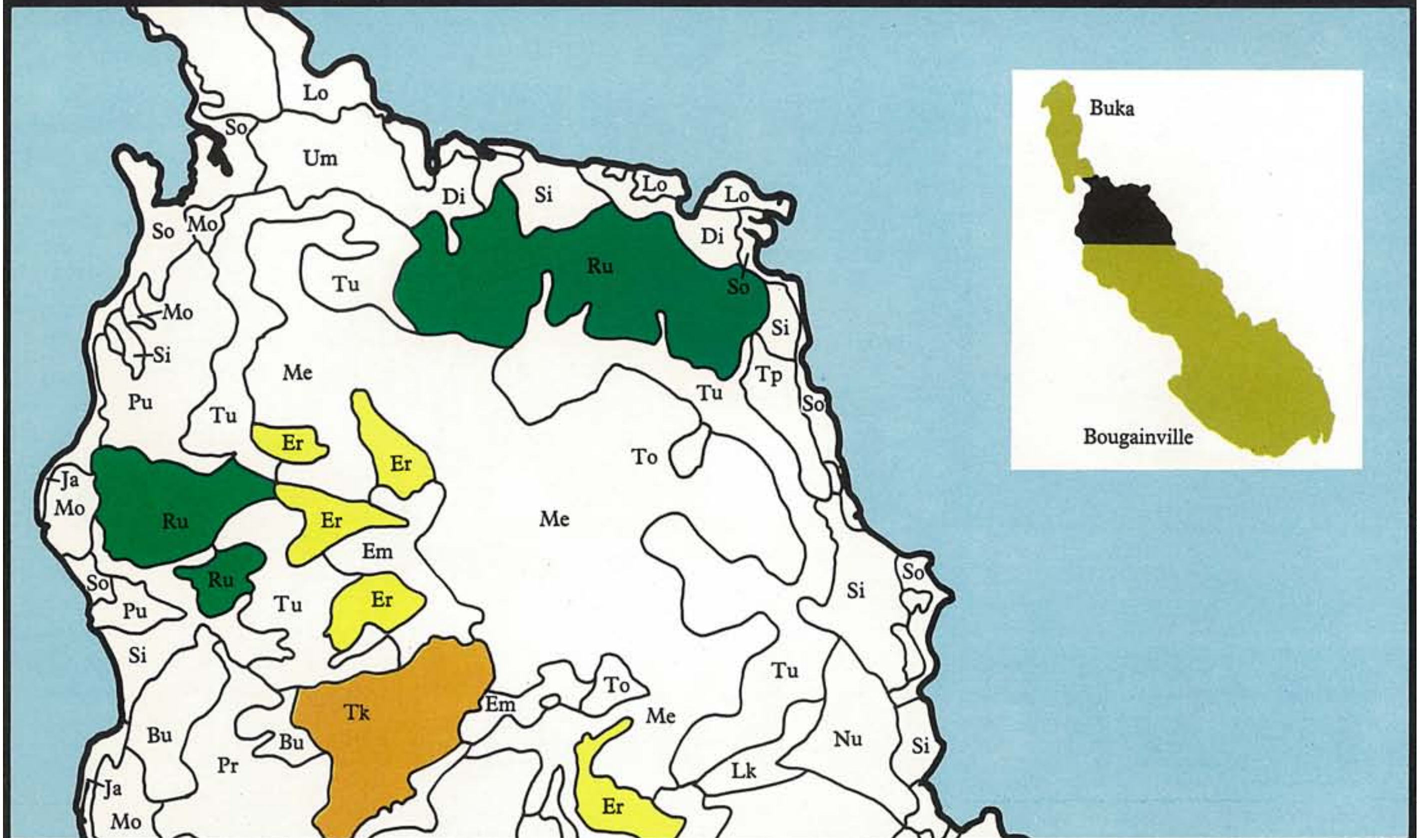
To round out the project, since 1971 the scientists have been drawing on the regional survey findings, aerial photos, and any other available information to produce more general reports and maps covering the whole country. One report and set of maps, soon to be published, will describe in broad terms the agricultural potential of all parts of Papua New Guinea. Others deal with vegetation, land form, climate, and water resources.

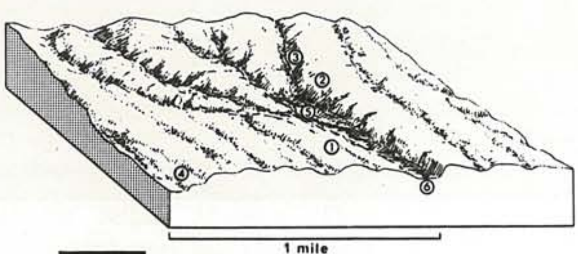
The aim of the CSIRO project has been to provide basic information where none or little existed before—to set out the main features, limitations, and possibilities of the land. The scientists describe their surveying as reconnaissance work. It provides the basis for more detailed investigation and selection of sites when plans are afoot for agricultural developments, road-making, hydro-electric projects, and so on.

The starting point for all the surveys has been black and white aerial photos, taken from about 7000 metres above sea level, of the areas to be investigated. The photos were provided by the Australian government's Division of National Mapping, which also prepared the topographic maps for the CSIRO project.

The scientists began each project by provisionally mapping, from the photos,

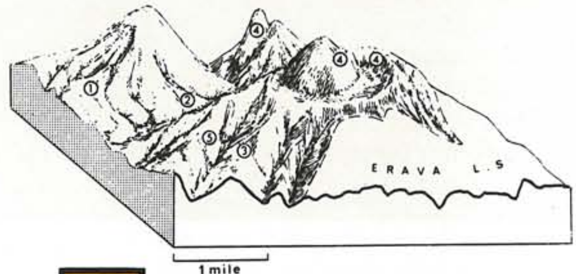
How land systems are shown





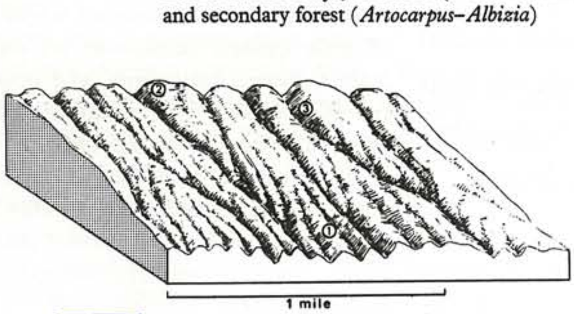
Ru

Rugen (75 sq miles)
Long, low radiating ridges with very short, moderate side slopes; brown loams over reddish friable clays; tall forest (*Vitex–Pometia*) and secondary forest (*Artocarpus–Albizia*)



Tk

Takuan (75 sq miles)
Extinct or dormant partially eroded volcanoes; brown loams; palm and pandan vegetation (*Gulubia–Pandanus*), mid-height forest (*Garcinia–Elaeocarpus*), and tall forest (*Neonauclea–Sloanea*).



Er

Erava (115 sq miles)
Moderately steep laharic fans largely dissected to ridges with precipitous slopes; brown loams; palm and pandan vegetation (*Gulubia–Pandanus*) and scrub (*Cyathea–Bambusa*).

This is taken from the team's Bougainville and Buka land systems map. The scientists divided the islands into 40 land systems and included brief descriptions of each on the map; the three descriptions given here are typical. The drawings are from the survey report, which also contains detailed descriptions of each system. Other maps show the islands' physical features, geology, major environments, land use and population distribution, land use capability, and forest types.

The aim has been to provide basic information where none or little existed before.

the main features of the area chosen for the survey. The area covered was generally between 5000 and 10 000 square kilometres. They also checked on the location of airfields, roads, tracks, and villages—essential information for planning the on-the-spot investigations.

Gathering information

The scientists then went to Papua New Guinea with the aim of studying examples of all important landscape patterns recognized from the photos. They could cover only a fraction of the survey area in their 3–4 months in the field, so expeditions had to be carefully planned to yield the maximum of information.

Where roads or navigable rivers led where they wanted to go, they used these. But up to 1964, when they first used helicopters, they did most of their travelling on foot. Walking tracks were the only means of access. Sometimes new tracks had to be cut through dense forest if important sites were to be reached.

Planning a trek was a major exercise in logistics. Food was left at points along the planned route before the expedition began, so that less would have to be carried. But up to 100 carriers were hired for each expedition, to bring along the scientific equipment, camping gear, and food.

Generally the plan called for 6 days of travelling and study in a week, with a day at the provisioning points for resting, sorting collected plants, soil, and rocks, and preparing for the next week. The travelling and data-gathering itinerary for a week was often changed as local knowledge accumulated, but the scientists adhered to their basic plan if at all possible. Sometimes a party took a wrong track or was held up by a swollen river; then plans had to change.

The introduction of helicopters reduced the number of base camps needed and gave the scientists a bigger area from which they could choose ground sampling sites. But, because of the higher cost, less time could be spent in the field. Also, dense vegetation often made it impossible to bring helicopters down at places that the scientists wanted to investigate. Sometimes they solved this problem by landing on a sand bar in a river and cutting their way through to the research site. The best areas for helicopter operations were grasslands.

The scientific team for each survey included a geomorphologist to study land forms and geology, a pedologist to describe and classify soils, and a plant ecologist to examine the vegetation. These three travelled together. They made their observations at the same sites so that comprehensive descriptions could be built up of areas chosen as significant.

Also with each party was a botanist who collected and identified plant specimens. He tended to spend more time than the others at fewer sites; the vegetation is so diverse that adequate sampling in an area was a lengthy task. A big collection of plant material has been brought together and studied, and the outcome is that scientists now know much more about Papua New Guinea's vegetation than they did 25 years ago.

A forestry expert also took part in most of the surveys. Like the botanist, he spent more time at fewer sites than the main party.

Members of the team also studied population distribution, existing land use, and potential uses for the land.

Putting it together

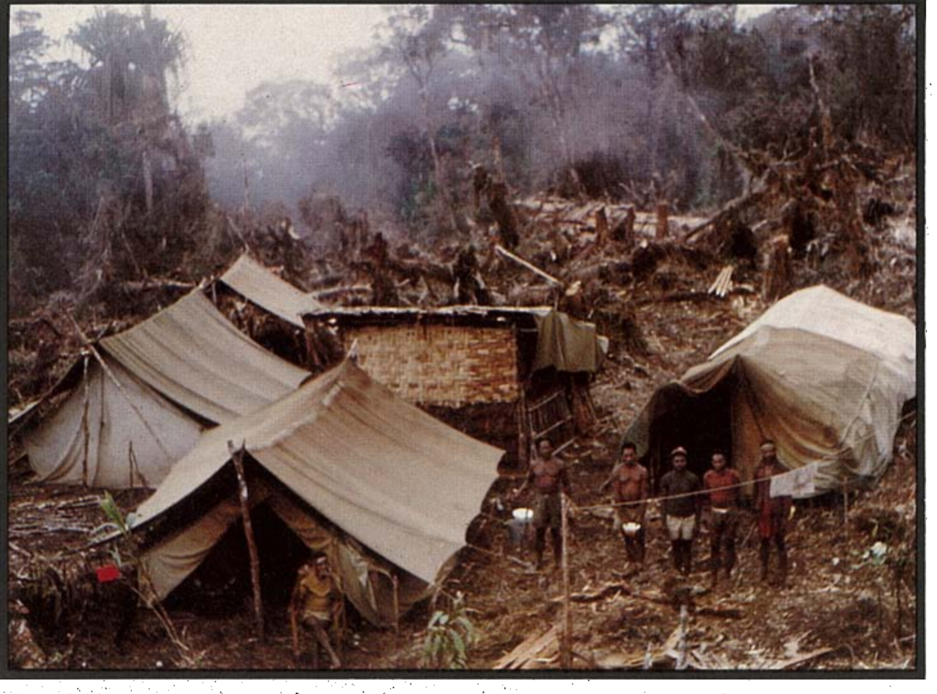
The field work, because of all the travelling and the rough conditions in the bush, was mainly restricted to collecting data. Putting the information together and drawing conclusions had to wait until the party returned to the laboratories in Canberra.

There the scientists divided the survey area into 'land systems', each with a characteristic pattern of rocks, land forms, soils, and vegetation. They mapped these from aerial photos. Smaller areas within the 'land systems', called 'land units', were also identified.

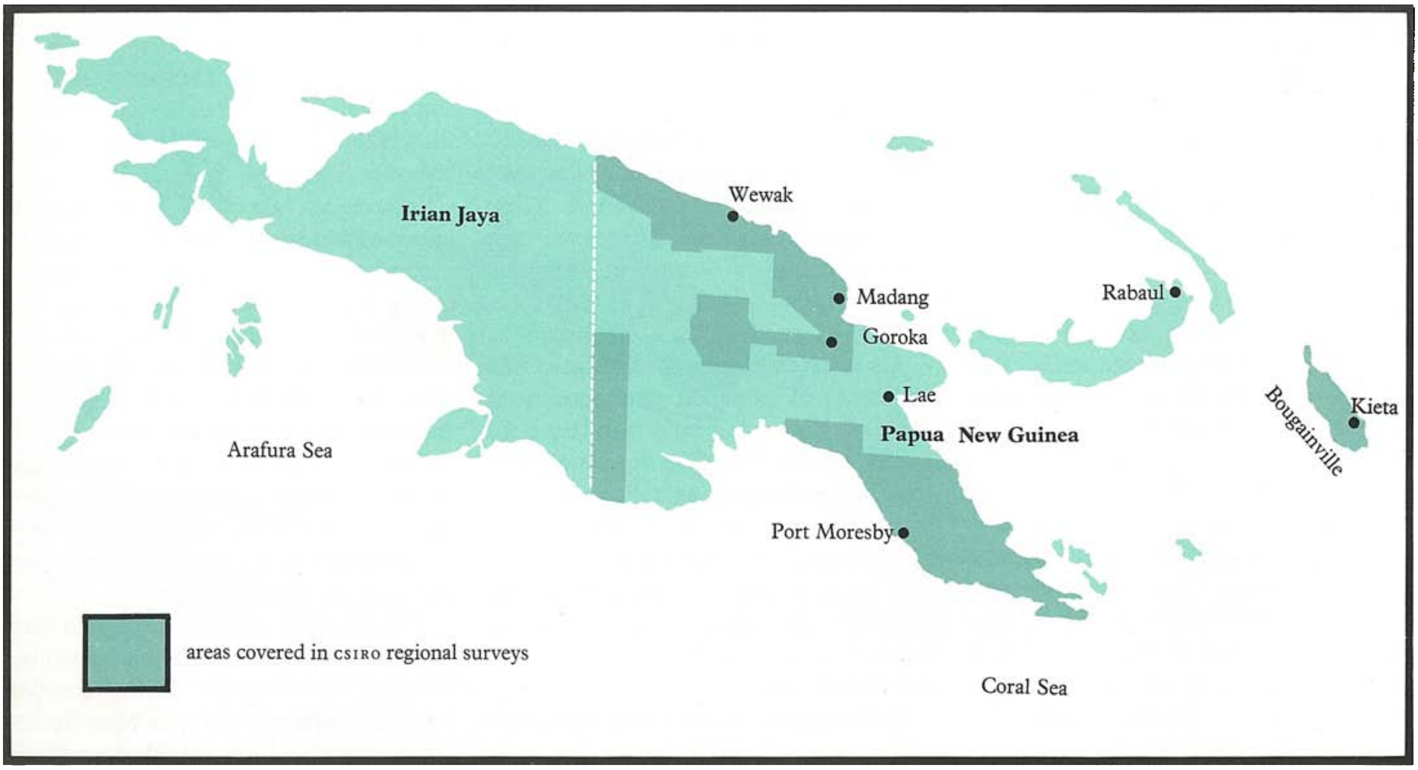
Information about all land systems, either gathered directly in the field or worked out from the photos, was plotted on the maps and set out in reports. The team gathered together as much relevant information as possible for the reports. The one on the Bougainville survey, for example, contains a general description of the area followed by chapters on the land systems, climate, geology, geomorphology, terrain, soils, vegetation and ecology, forest resources, population and land use, and land use capability.

The scientists assessed the agricultural potential of land in terms of permanent farming, and this has drawn criticism because agriculture in Papua New Guinea has traditionally been a shifting operation. The people normally clear an area of forest to plant the vegetables they need, crop it for a year or two, and then abandon it for another area of cleared forest. Permanent agriculture is making some inroads, with the planting of coffee, tea, and other crops intended for sale, but shifting subsistence agriculture still dominates.

The leader of the survey team, Mr Herman Haantjens, says one reason why the potential of land was assessed for permanent rather than shifting agriculture is that permanent agriculture will become increasingly necessary with population



An expedition camp 3400 metres up in the Papua New Guinea highlands.



growth and offers more scope for development. Another reason is that no obvious basis exists for judging the value of land for shifting agriculture.

About 80% of Papua New Guinea is hilly or mountainous, and a great deal of subsistence farming is done on slopes judged too steep for permanent farming. On the other hand, large areas of flat, well-drained land have been left virtually unused. Clearly people haven't chosen sites for settlement only on the basis of the potential productivity of the land. Factors that may have led them to less-productive hill sites could include freedom from malaria, ease of defence, cleaner water, and the fact that it is usually more difficult to clear trees from flat land than from slopes.

But some people do engage in shifting agriculture on flat, fertile land. Others obtain their food—mainly sago, fish, and water plants—from swamp areas that score miserably in the land use capability assessments. One conclusion that can be drawn from the surveys is that no clear relation exists between population density and the potential capacity of land to support permanent agriculture.

And using it

The scientists used a rating system to assess land use capability. In the round-up report for the whole country, to be published soon, ratings are given for slope, flood risk, drought risk, drainage, altitude, rockiness of the surface, and the fertility, salinity, and acidity or alkalinity of the soil. The team took all these factors into account in their assessments.

They concluded that about 4·5% of the country has a high or very high capability for growing most tropical crops, but only 3·2% is as well suited to tree crops such as rubber and oil palms. About 6·2% has a high or very high capability for growing improved pastures. For flooded rice production, the estimate is 8·2%. Much larger areas have a moderate potential for cropping or grazing.

Nearly all of Papua New Guinea's extensive grasslands appear to be man-made.

Papua New Guinea's main cash crops now are coffee, cocoa, tea, copra, rubber, palm oil, and pyrethrum (used in insecticides). Some rice is grown, but very little. The survey suggests that a big increase in rice production may be possible.

An interesting finding from the project is that nearly all of Papua New Guinea's extensive grasslands appear to be man-made. Grass has taken over from vegetable gardens abandoned when new gardens have been cut from the forest. The result has been a slow but steady retreat of forest and extension of grassland.

On the other hand, human activity seems to have had very little effect on the land surface. The scientists found no evidence of widespread man-made erosion. Rain-caused rock slides and earth movement, and volcanic activity, have much more impact. This instability can have big effects on vegetation. Land movements frequently destroy patches of rainforest, so the complex process of forest development then has to start again from scratch (see pages 8–9).

Papua New Guinea has vast areas of forest, ranging from dense and diverse lowland rainforest, through ferny mountain forests, to high mountain forests noted for their gnarled and crooked trees festooned with mosses and liverworts. The country has a major forestry industry, and this seems certain to expand further. The survey team has worked out a way to determine the volume of timber in a forest directly from aerial photos.

A vast amount of information is contained in the survey reports and maps. Although it is difficult to point to direct links between publication of the maps and reports and developments in Papua New Guinea, there is little doubt that the work has had considerable impact. For example, surveys showed that many areas had definite potential for cattle-raising; in recent years there has been an upsurge in grazing. Tea now grows on swampy land that the team suggested had potential for agriculture. The reports have helped greatly in the selection of areas for national parks and other reserves.

More generally, officials in Port Moresby consult the reports when requests come in from districts for development finance. The survey information gives them a rational basis for assessing the comparative merits of proposals—sorting out those that deserve detailed assessment from the rest.

More about the topic

Land Research Series Reports, CSIRO Division of Land Use Research, Canberra:

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No. 12. General report on lands of the Wanigela–Cape Vogel area, Territory of Papua and New Guinea. H. A. Haantjens, E. A. Fitzpatrick, B. W. Taylor, and J. C. Saunders. 1964.

No. 14. Lands of the Port Moresby–Kairuku area, Territory of Papua and New Guinea. J. A. Mabbutt, P. C. Heyligers, R. M. Scott, J. G. Speight, E. A. Fitzpatrick, J. R. McAlpine, and R. Pullen. 1965.

No. 15. General report on lands of the Wabag–Tari area, Territory of Papua and New Guinea, 1960–61. R. A. Perry, M. J. Bik, E. A. Fitzpatrick, H. A. Haantjens, J. R. McAlpine, R. Pullen, R. G. Robbins, G. K. Rutherford, and J. C. Saunders. 1965.

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No. 29. Land resources of the Morehead–Kiunga area, Territory of Papua and New Guinea. K. Paijmans, D. H. Blake, P. Bleeker, and J. R. McAlpine. 1971.

No. 30. Lands of the Aitape–Ambunti area, Papua New Guinea. H. A. Haantjens, P. C. Heyligers, J. R. McAlpine, J. C. Saunders, and R. H. Fagan. 1972.

No. 31. Land resources of the Vanimo area, Papua New Guinea. E. Loffler, H. A. Haantjens, P. C. Heyligers, J. C. Saunders, and K. Short. 1973.

No. 32. Land-form types and vegetation of Eastern Papua. D. H. Blake, K. Paijmans, J. R. McAlpine, and J. C. Saunders. 1973.

No. 33. Explanatory notes to the geomorphological map of Papua New Guinea. E. Loffler. 1974.

No. 35. Explanatory notes to the vegetation map of Papua New Guinea. K. Paijmans. 1975.

No. 36. Explanatory notes to the land limitation on agricultural potential map of Papua New Guinea. P. Bleeker. 1975 (in press).

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Climatic tables for Papua New Guinea. J. R. McAlpine, G. Keig, and K. Short. *CSIRO Division of Land Use Research Technical Paper* No. 37, 1975 (in press).

'Vegetation of Papua New Guinea.' K. Paijmans. (Australian National University Press: Canberra (in press)).

A shaky river crossing.