



PLATE 1.—*Casuarinas and native gardens on steep Chimbu hillside.*

PATROL OF UPPER CHIMBU CENSUS DIVISION EASTERN HIGHLANDS

D. E. MONTGOMERY.

In September-October, 1957, Mr. D. Montgomery made a long patrol of the Upper Chimbu Census Division, in the Chimbu Subdistrict of the Eastern Highlands. The patrol was designed to compile a village agricultural census, but a number of observations as to apparent pressure of population on the land in the area were also made. These observations should be read in conjunction with an earlier Journal article "A Special Report on the Pagaku sub-clan" (Vol. 11 : 4) by J. W. Barrie. Since both these surveys were made, a more intensive investigation of the Chimbu area has begun. Mr. D. Montgomery, an Assistant Agricultural Officer when this paper was written, is at present Agricultural Officer at Bainyik, in the Sepik District.

THE object of the patrol was to collect data to compile an Agricultural Village Census and, from this, together with general observations, to make a reconnaissance of the extent of land population pressure. This pressure was recognized as a future problem in the area shortly after the Chimbu Census Division came under Government control. Later, following Government and mission influence, and the introduction of health services and improved subsistence crops, the ratio of births over deaths began to rise.

On the patrol, the writer accompanied two Native Affairs officers, who were conducting an annual census. Other members of the patrol were two agricultural field workers, four native agricultural trainees, five members of the Royal Papuan and New Guinea Constabulary, one interpreter and one native medical orderly.

As the patrol took place during the annual census check, the villagers in the area gathered to await the patrol. Many treated it as an occasion for celebration.

The agricultural census was made using a question and answer technique, using an interpreter where necessary. Later, the writer, accompanied by agricultural fieldworkers, trainees and village members, inspected crop gardens and held discussions on economic crops and other matters pertaining to agriculture and land use.

GEOGRAPHY AND RELIEF

The Upper Chimbu Census Division has a land area of approximately 190 square miles and forms part of the Chimbu Subdistrict. The Subdistrict Headquarters are centrally located at Kundiawa. The census division comprises a series of high ridges and young river valleys,

which form the watershed of the fast-flowing Chimbu River and is bounded on three sides by steep mountain ranges. In the north is the Bismarck Range, the main feature of which is rugged Mt. Wilhelm, 15,400 ft., the highest mountain in the Territory of Papua and New Guinea. On the western side is the Kerowagi Range, with the Goroka/Asaro divide forming the Eastern boundary.

Most of the populated areas lie between 4,600 ft. and 7,800 ft., which is the limit of subsistence agriculture. Cultivation extends over the steep ridge slopes, which are a feature of the area.

The route followed by the patrol necessitated steep and frequent climbs, sometimes as much as 3,000 ft. a day from one village to the next. The separate village groups are situated in different valleys of the watershed and crossing from one valley to another may often mean climbs and descents of several thousand feet.

However, when walking in a particular valley, it is usual to keep to the native roads, which to some degree follow the contour. But when the main (Chimbu River) valley is crossed this also involves a steep climb. Leaving a village at about 5,500 ft. a decent is made to the river at 4,000 ft. and then a climb on the other side to the next village, or gardens, at about 6,000 ft. Slopes sometimes exceed 50 per cent.

A villager, moving from his house to his more distant gardens in the morning, may have to climb 500 to 1,000 ft. to reach his garden area.

In the upper reaches of the Chimbu Valley, slopes are more gentle from approximately 8,500 ft. to about 10,000 ft., but prevailing temperatures at this altitude are too cold and subsistence crops make little growth.

Soils

The main soil type is a heavy clay or clay-loam of reasonable fertility but little depth which has been developed on limestone. There are no areas of alluvial soil.

Climates

There are two main seasons, the north-west or wet season which extends from November to April and the dry season when rainfall is limited, for the rest of the year. The average annual rainfall over the past four years has been 85.8 inches.

During the north-west season, heavy build-up of clouds in the morning and rain in the early afternoon greatly reduces the hours of sunlight.

Winds in all seasons tend to be light.

Ecology

Little natural timber is found in the areas which are cultivated and the spread of subsistence gardens is, in fact, forcing the timber line slowly to recede. Above 7,500 ft. dense stands of rain forest containing many timber species exist. Above 11,000 feet little growth takes place and tussocky scrub and hardy grasses predominate. Mt. Wilhelm, which was climbed by the writer during the course of the patrol, is completely devoid of any vegetative growth, apart from mosses, above 14,000 feet.

In the cultivated areas, the people make extensive use of Casuarinas as part of the rotational system of subsistence gardening. Some small secondary regrowth timbers are also found among the casuarinas, but these have no specific use. Areas which are gardened and which do not have Casuarinas growing generally support a mixture of two grasses, *Imperata* spp. and *Themeda* spp. The former predominates.

PEOPLE

Before the area came under Administration influence, the Chimbus were apparently a hardy, war-like race, regularly involved in raiding parties on their neighbours. However the people have accepted Government influence and are now peaceful and law-abiding.

The basic social pattern appears to have changed little, but the people are slowly becoming more conscious of Government services available to assist them. The day-to-day existence remains unchanged, with women doing the essential chores of cooking and gardening, while the men carry out the heavier work of pos splitting, fence construction and house building.

Linguistic groups

There is no division by different languages. Chimbu is spoken and understood throughout the area.

State of health

The diet of the adult population appears adequate, providing the available foodstuffs are correctly utilized, but much needs to be done to assist infants. The nutritional disease *kwashiorkor* exists among children because of an inad-

quate diet. This follows social "tambus" which prevent children taking part in feasts and celebrations until they reach maturity, with the result that they get little of the higher protein foods which predominate at these celebrations. The problem of child malnutrition would probably disappear if parents could be persuaded to prepare foods for their children from pigs, fowls, eggs and fresh vegetables, rather than keeping them on a diet of sweet potato or corn.

Malaria does occur, generally among returned labourers who have made contact with the disease during a contract period in coastal employment. Tuberculosis and goitre are also present.

Diet

On the whole, the diet of the adults is excellent with more than 60 different subsistence crops, together with protein supplements in the form of pig and fowl meats, always available, but these are rarely utilized. Periods of food shortage do occur during some dry seasons, but earlier investigations of these food shortages indicated that they usually follow a period of feasting and celebration. In these times, gardens are neglected and a period of hunger results.

Land tenure and customs

Land tenure follows the patrilineal system and very few serious disputes arise over land owner-

ship. The Chimbus are also very jealous of land rights and land plays an important part in their basic human relationships.

Education level and outlook

Very few people of this area have received or are receiving any formal education. There are no Government schools and the Mission schools teach a language which is closer to Pidgin than to English.

On the whole, the way of life is still primitive, the most important advances being made in the field of agriculture, health and general administration.

Living Standards

Living standards can only be described as poor and the writer feels that the improvement of the living standard in this area will come only when population/land pressures are overcome and a cash income is provided.

Houses are small and squat, with low timber walls and a low pitched roof, formed by a framework of young saplings and split casuarinas. Tightly thatched kunai or other grasses are used to roof this structure. The emphasis is on warmth and ventilation is almost non-existent.

The only aperture is a small door which requires one to bend double when entering the house.

PLATE 2.—Chimbu men in ceremonial dress with pigs, fowls and vegetables for patrol.



Pigs still share the same houses as the family, mainly because they provide warmth and as pigs are a treasured item in the social pattern, every care is taken of the animals.

CROPS

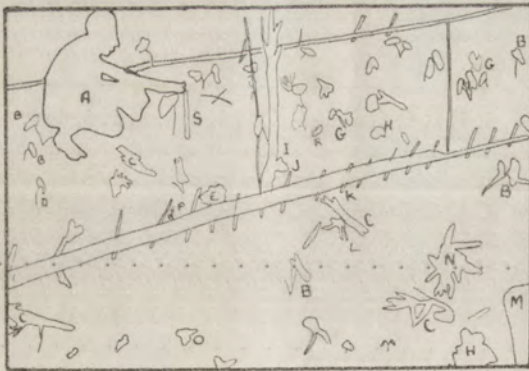
Subsistence

Agriculture is the life of these people and the evolved system of subsistence agriculture suits

the available land area and the steep slopes of the country. Social customs, festivities and in fact all celebrations are centred around food and feasting. Certain gardens are prepared at certain times to ensure an abundance of food for an annual occasion ; marriages are celebrated with the slaughtering of pigs ; special preparation of vegetable foods takes place ; the onset



PLATE 3 and 3A.—Section of native garden. Key is :



- A—Fieldworker Buasi Kepu.
- B—Taro.
- C—Sugar cane.
- D—"Tankard" (croton).
- E—Cluster of bean plants.
- F—Casuarina trunk.
- G—Yams.
- H—Beans.
- I—Banana sucker.
- J—Potato.
- K—Retaining stick.
- L—Ginger.
- M—Edible pit-pit.
- N—Corn variety.
- O—Edible waxy leaf.
- P—Corn variety.
- R—Cucumber.
- S—Foot ruler.

of the first rains warrants a "Sing-sing", together with the consumption of quantities of food of many kinds; and a feast follows the clearing and preparation of a new garden. Thus the pattern of subsistence agriculture is clearly defined to meet the requirements of these festivities, apart from normal day-to-day food.

The most important and the most intensively cultivated crop is the sweet potato and the people have at least six named varieties for planting at different times, in different locations and for different social and ceremonial functions.

This crop is the basis of their intense rotational system and may be grown on the same area for up to three years with various other subsistence crops, which form part of the defined rotational pattern. The sweet potato plantings are generally confined to the heavier and moister clay soils of the slopes with the other annual crops, sugar cane, pit pit, yams, taros, native and European type vegetables being planted in the more fertile depressions at the base of the slopes.

Where the available land is limited, in the case of smaller landholders or where a small fertile area exists, a mixture of up to 20 annual and bi-annual crops may be planted in an area sometimes no more than 400 square feet, with sweet potato planted on an even smaller area on the garden perimeter. Judging by the intensive system of cultivation adopted by these people, it would appear probable that there is very little ground below the 7,500 ft. contour which has not been cultivated at some stage.

No defined planting season could be determined by the writer. Garden preparation and planting appeared to be a continual cycle and the main activity of the year. As Barrie (1958) states:

"There does, however, appear to be a general slackening off in planting of sweet potato gardens shortly after the commencement of the wet season—usually in November."

The reason for this would appear to be the risk of erosion at the onset of the heavy rains of the north-west season as this would be greatest at this time. The people appear to be conscious of the dangers of erosion on steep slopes because even on the lesser slopes and in the drier months, the gardens which have just

been prepared and cultivated are protected from the elements by a covering of dead branches and the foliage of the *Casuarina*, cut from the dead and dying trees, which formed part of the previous rotational cycle. This covering is burned and the garden "broomed" just before the planting of the subsistence crop.

The *Casuarina* tree plays an important part in the rotational system of the Chimbu gardener. Where an area can support continued cropping of sweet potato and other annuals for periods of up to three years, the *Casuarina* seedlings are planted in the second and third years of the cycle. After the last crop has been harvested, the ground is allowed to revert to the predominating grass species of the area and the *Casuarinas* quickly become established, making rapid growth in the first few years. When a short rotation period is expected, the *Casuarinas* are planted with the subsistence crops in the first year.

The ground may remain under *Casuarina* fallow for as long as 20 years or as little as six

PLATE 4.—*Sugar cane.*





PLATE 5.—*Retaining Terrace.*

years, depending on the amount of ground available to the landholder and the location and fertility of that ground.

Where terracing is used, the system serves a twofold purpose. Its main function is to prevent soil loss by sheet erosion, but the terraces are so constructed that the water run-off during heavy rain is only checked and continues to move more slowly down the slope, increasing water absorption of the soil and leaving a small build-up of topsoil at each terrace. If a solid terrace were constructed and no provision was made to allow for slow dispersal of the water, the consequent damage by large quantities of water building up during a downpour could be disastrous.

Split timber planks and the branches of *Casuarinas* are the usual materials used in the construction of these terraces. However, occasionally large stones or live hedges are employed. The height of the terraces and the parallel distances apart depends on the steepness of the

slope. Pegs are first driven into the ground, these being made from the stouter branches of the *Casuarina* and the split lengths of the tree are laid against these pegs on the uphill side of the slope. The split lengths are then firmly fixed in place by driving a further peg against them. Above the plank or planks, small branches and twigs are placed and pegged with small sticks driven vertically into the ground. From a distance, these terraces, constructed on newly cultivated ground, give an appearance of contour ploughing or drainage ditches and in a sense they serve the same purpose.

On those areas which do not lend themselves to rejuvenation by *Casuarinas*, generally shallow, infertile, steep and exposed limestone slopes and ridges, local grasses predominate and a small area may be "cultivated" at irregular intervals and planted to sweet potatoes. The resultant crop may be used to feed a few pigs.

The difficulties created by the steepness of the country cannot be over-emphasized and the

system of land use adopted by these people has been evolved by them to overcome problems associated with the slopes. It appears that little can be done to improve the existing system. In other areas of Papua and New Guinea, country similar to that which is found in the Upper Chimbu Census Division would in all probability remain unused, except for timber requirements and the occasional bush garden. However, in the Upper Chimbu the pressure of population is forcing gardens up the slopes and driving back the timber line.

Domestic animals

Pigs, apart from a mixture of dogs, are the only domestic animals of importance found in the area, and they play an important part in the lives of the people. All pigs found in the area are wholly or partly domesticated and show strong indications of improved breeding by European strains, particularly Berkshires.

The degree of domestication depends on the part the pigs will play in future pig-killing ceremonies. They still play an important role in bride price and wealth is dictated to a certain extent by the number of pigs an individual owns.

In a litter, one or two of the best suckers are selected and the rest are allowed to roam at will in the village and through the surrounding country. The owners make a careful note of their pigs' distinguishing marks, and in some places a system of ear marks is used when pigs show identical characteristics.

The one or two pigs selected from the litter are carefully nursed and fed, being confined to the village area and the female houses at all times. These pigs are reared for use at particular ceremonial occasions, which may be planned for up to six years in advance. The women show much affection and attention towards these pigs

PLATE 6.—*Influence of imported breeds can be seen in these pigs.*

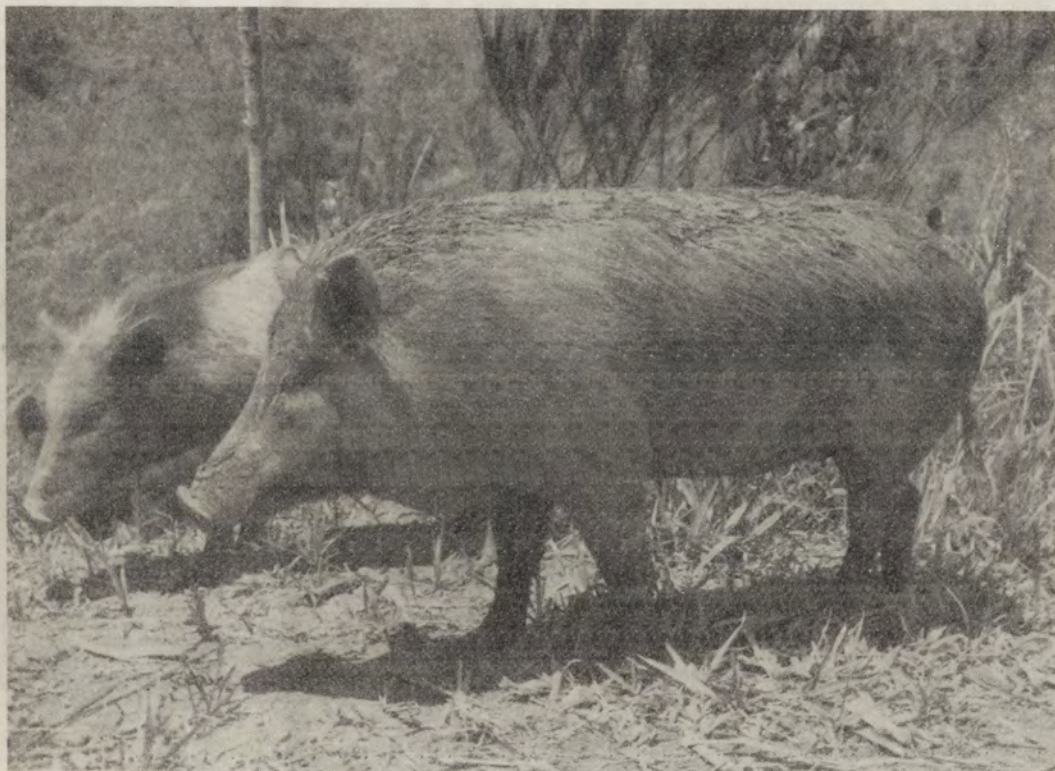




PLATE 7.—*Tobacco leaf.*

and, as has been mentioned, the animals share the warmth of the houses with the women and children.

Male pigs are usually castrated early in life. After weaning the pigs are leg-roped and may accompany the women to the garden sites. As a result their diet is appreciably better than those pigs which receive no special attentions or privileges.

Most pig killings take place at regular intervals and at the time of the patrol a census taken showed a pig population of 24,000 animals of all ages. No major killings had taken place for at least three years and the next big pig-killing ceremony was being planned for 1959. A few pigs are killed regularly, to celebrate marriages, births, sexual maturity, the completion of a new garden, the return of members of a family from a period of indentured labour and on the occasion of a Government patrol.

Cash crops

The people are aware of the advantages of economic crops. Before the introduction of coffee (*C. arabica*) to the Chimbu area, a small cash income was obtained from the sale of fresh foods, mainly sweet potatoes, cabbages, sugar cane and tomatoes to the Government station at Kundiawa and to mission bodies in the area.

Most of the money entering the area comes from the earnings of returned labourers—not only the contract labour which works on the coast, but also the casual labour which is found scattered through the Highlands.

POPULATION RISE AND PRESSURES

The population figures for the Upper Chimbu Census Division (below) show the phenomenal rate of population increase for this area.



PLATE 8.—*Peas are sold as a vegetable where markets can be reached.*

On the basis of these figures, a conservative estimate of population at the end of ten years is a total of 24,000. As the population per square mile of arable land now exceeds 260 (remembering that only about 80 square miles of land appears to be suitable for agriculture) the arable land appears to be inadequate. When the term "arable land" is used, it covers land descriptions much broader than the conventional definition. In the Chimbu, arable land is any which is capable of supporting vegetation. Slopes of more than 60 per cent. are being cultivated in this area.

There appears little which can be done to assist these people with commercial crops. The coffee census figures for the area show a total of only $11\frac{1}{2}$ acres of coffee for 19,000 people, or approximately a third of a tree per individual.

These figures lead to the following conclusions :—

1. The Upper Chimbu Valley will be unlikely to develop a cash crop in the form of coffee, which utilises existing land areas.
2. Subsistence agriculture should not, under any circumstances be allowed to make way for a cash crop, because this would interfere with food needs of the people.

3. Accordingly, the economic potential of the Upper Chimbu Valley is poor.

The people in the area do realize the advantages of growing cash crops, but it is the duty of the Administration to see that agricultural development, which may result in detriment to the welfare of these people, is not allowed to take place.

A possible answer to the problem of over population lies in resettlement, but this again presents problems which would appear insurmountable at the present stage of educational advancement of these people. In discussions, the local people have indicated that they do not want to leave their land. This is understandable when the problems of social adjustment involved are considered. If any resettlement programme took place, it would involve a complete social and technological change, assuming that the people would be resettled on an area sufficient to provide for the food requirements of a family unit, together with the opportunity of taking part in a scheme for economic development.

The alternative to resettlement is that of outside employment. Chimbus provide an appreciable proportion of the Territory's labour force. The question of technical education is raised as a means of improving the standard of labour they have to offer.