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"Man and the Environment in Papua New Guinea"

CLIMATE AND POSSIBILITY OF GROWING FRUIT TREES IN PAPUA NEW GUINEA

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Introduction

The authors investigated the changes of agricultural production and feature the tree fruit production in Papua New Guinea (PNG). It is clear that agriculture is the main component of the economy in PNG. However, the agricultural production systems are of smallholding, except for some plantation crops such as coconut, cacao, coffee and oil palm. Although production systems of these crops are on large scale which is called estate, culture of other tree fruits is small and mainly for self consumption or for domestic market.

In this program entitled "Man and the environment in Papua New Guinea" of Kagoshima University Research Center for the South Pacific, the authors collected some literature on both the agricultural production and the climate conditions in PNG. The authors carried out a survey around Port Moresby and Lae. The map of PNG is shown in Fig. 1. Agricultural

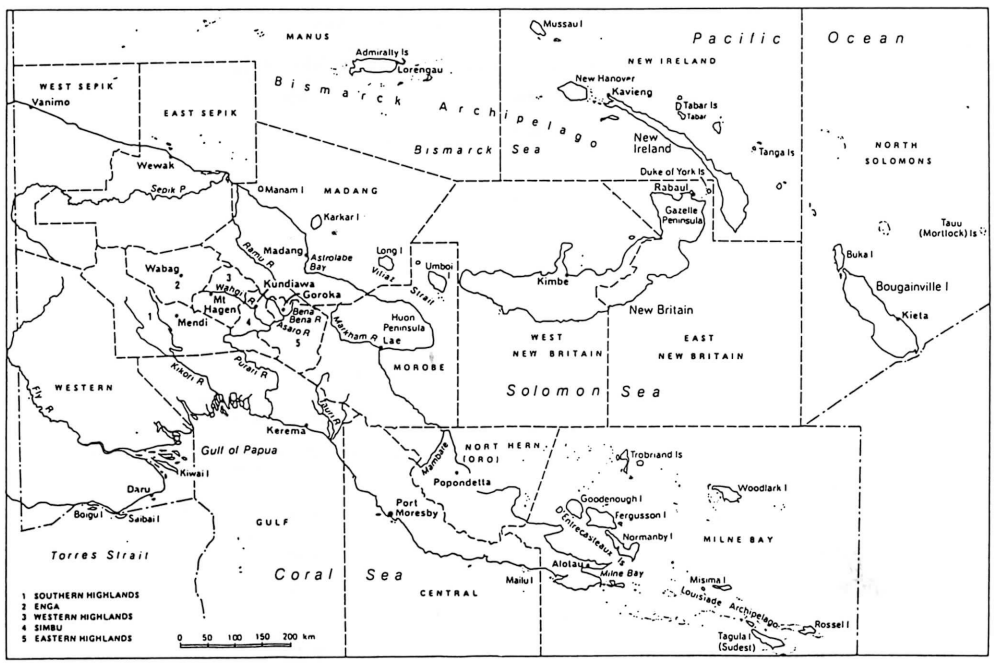

Fig. 1 Maps of Papua New Guinea.
Provinces, provincial headquarters
and general geographical features.
Source: A time to plant and a time to uproot.

data used was published by the Department of Agriculture and Livestock of Papua New Guinea. The climatic data in PNG is shown in the book entitled 'Climate of Papua New Guinea' written by J. R. MCALPINE and Gael KEIG.

As a result of the survey, the authors had some comments on the future of the tree fruit production.

Results and Discussion

1. Tree Fruit Production in PNG

Useful data of agricultural products for export was obtained from the reports entitled 'Agricultural extension improvement study, Volume 1 Main report' published by the Department of Agriculture and Livestock of Papua New Guinea, which was funded by the Australian Government.

Table 1 shows the acreage of large- and small-holding agricultural productions for export in PNG. In 1990, the production area of coconut was predominant, followed by cacao, coffee, oil palm and rubber. The estates, which are large farms, were found to be in rubber, cacao and oil palm growing. On the other hand, small holdings were found to be growing coffee. The reason was that coffee trees were grown mainly on slopes in highlands because they prefer cooler climate. Other cash crops for export could be cultivated under extensive culture condition and in large acreage.

Table 1 Production area and smallholder of crops for export in PNG.

Crop	Total Area (ha)	Smallholder (%)	Estate (%)
Coffee	47,000	86	14
Cocoa	128,000	57	43
Coconut	263,000	64	36
Oil palm	28,000	58	42
Rubber	15,700	52	48
Other minor crops	2,400	81	19

Source: Agricultural extension improvement study, Vol. 1 Main Report(1990).

Table 2 Net return of various crops for export in PNG.

Crop	Net Returns Kina/man·day	NPV* at 12% Kina/ha
Coffee (mature arabica)	1.33	1,200
Coffee (newly established arabica)	0.75	544
Cocoa (sole planted)	4.39	1,440
Cocoa (under coconut)	2.20	770
New Cardamon (Malabar with drier) Mixed Vegetable Production	7.43	26,990
Chillie	2.28	6,546
Pyrethrum	3.17	4,286

Source: Agicultural extension improvement study, Vol. 1 Main Report(1990).

* : 'NPV' = Net present value.

Table 3 Projected production volumes of major crops for export in PNG.

	Estimated <---- Projected ---->					Growth p.a.
	1987	1988	1989	1990	1995	1987-95
Coffee	64,740	46,100	48,000	49,900	60,700	-1%
Cocoa	35,600	37,600	40,100	43,100	58,100	6%
Copra	94,800	95,000	95,000	95,000	95,000	0%
Coconut oil	42,100	41,000	41,000	41,000	41,000	0%
Palm oil	130,000	135,000	161,000	187,000	299,000	10%
Palm kernel	18,700	20,300	24,100	28,100	44,800	11%
Rubber	5,300	5,500	5,700	5,900	6,900	3%
Tea	6,500	7,000	7,000	7,000	7,000	1%

Source: Agricultural extension improvement study, Vol. 1 Main Report(1990).

Table 2 shows the net return of various crops for export. Net return of smallholder was best for new cardamon mixed vegetable production, followed by chillie, pyrethrum, cacao and coffee.

Table 3 shows projected production volumes of major crops for export. The export of oil palm was the largest, followed by copra and coffee until 1988. The forecast of production after 1989 by the Government says that the production of only oil palm will increase and the production of all the other crops will not.

2. Climatic Condition of PNG

The distribution of mean annual rainfall over PNG is shown in Fig. 2. Mean annual

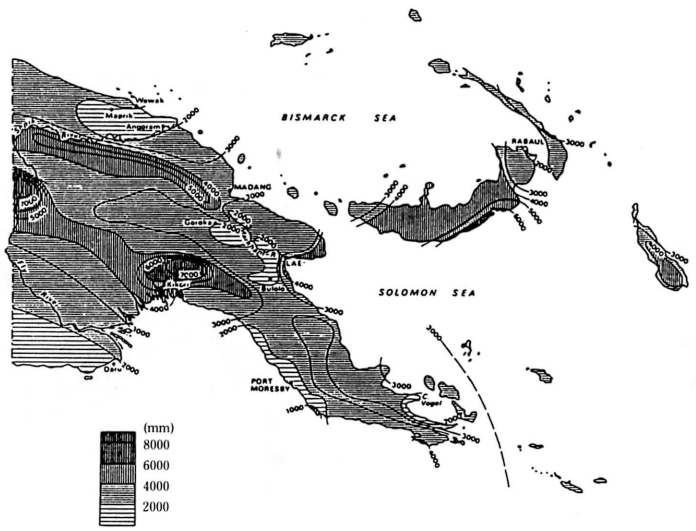

Fig. 2 Mean annual rainfall in PNG.
Source: Climate of Papua New Guinea(1983).

rainfall varies from under 1000mm to over 7000mm dependent on the regions. This variation of rainfall is considered to be caused by the height and the location of each region. The highest annual rainfall was observed in the area around Purari river.

Fig. 3 shows the seasonal distribution of rainfall. In January, heavy rainfall was observed mainly in the north and west areas of the country. While, in July heavy rainfall areas were around the Purari river and the south and east areas of the island. Thus, the wetter parts of PNG with high rainfall varied seasonally as affected by the direction of wind.

We consider that crop culture would be very hard at the areas with more than 3000mm of rainfall a year. In drier regions, however, many fruit trees which originated in subtropical and tropical regions could be grown.

Distribution of mean maximum and minimum temperatures in January and July are shown in Fig. 4 and Fig. 5, respectively. These figures show only a small seasonal temperature variation over the whole country, and the changes in mean maximum and minimum temperatures are mainly dependent on height above sea level. For example, mean maximum

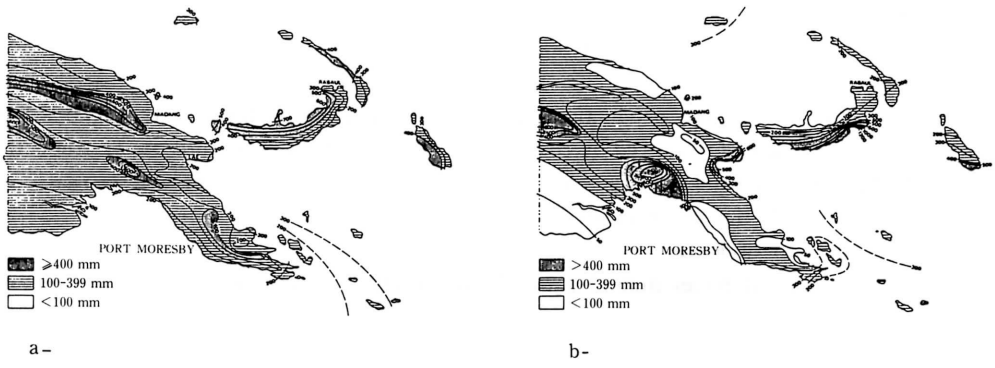

Fig. 3 Seasonal rainfall patterns in PNG.
a-January, b-July
Source: Climate of Papua New Guinea(1983).

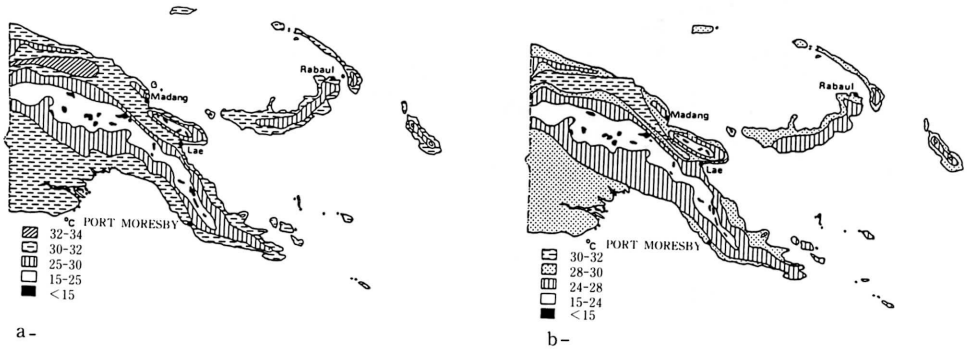

Fig. 4 Mean maximum temperature in PNG.
a-January, b-July
Source: Climate of Papua New Guinea(1983).

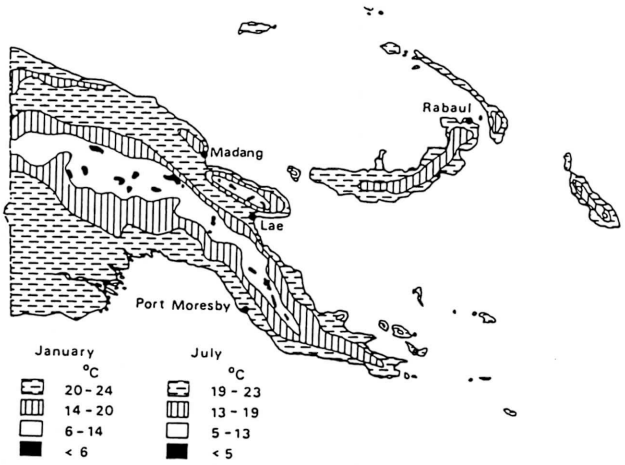

Fig. 5 Mean minimum temperature in PNG.
Source: Climate of Papua New Guinea(1983).

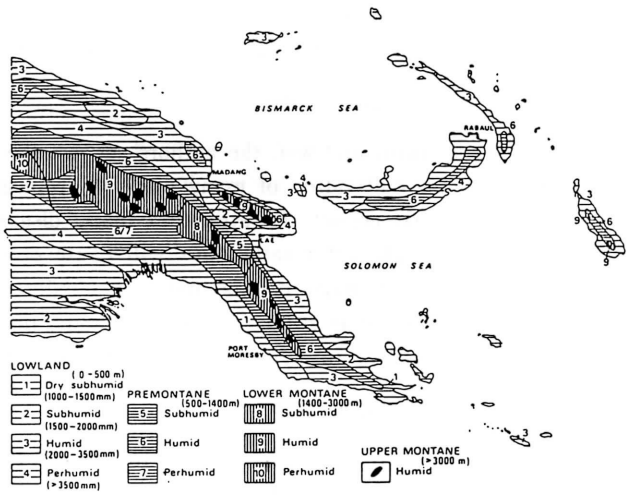

Fig. 6 Climate classification for PNG based on altitude and mean annual rainfall.
Source: Climate of Papua New Guinea(1983).

temperatures in the lowland range around 28-32℃, and mean minimum of 20-24℃ at night with coastal locations having slightly lower mean maximum and higher mean minimum than interior lowland. While, in the highland, mean maximum temperature ranges around 15-24℃ during day time and minimum of 5-14℃ at night.

These large variability in maximum and minimum, as affected by the height above sea level, suggestes that many fruit species could be grown in PNG.

Fig. 6 shows the climate classification for PNG based on altitude and mean annual rainfall. The climatic condition of PNG is divided into 11 categories from dry subhumid to perhumid in each: lowland, premontane, lower montane and upper montane. As described above, many fruit trees prefer the subhumid to humid conditions in premontane and lower montane.

From the above, we consider that many fruit trees, which originated in tropical zone and therefore do not have chilling requirement for breaking dormancy and/or flower initiation, could grow better in the areas of interior lowland and lower montane. On the other hand, some subtropical fruit trees such as oranges could grow in the areas of highland and premontane.

3. Tree Fruits Observed in PNG

As a result of a survey in some locations, we observed several agricultural systems. Besides, we could find many fruit tree species, although almost all of them were planted alone or as a grove of a few trees. Largeholding cultivations, which are called estate and are managed extensively with little hand labor, were found with coconut, oil palm, cacao and rubber. More intensive agriculture systems were found in cultures of coffee plant. In coffee culture, we could see improvements in culture systems such as propagation by grafting, cutback of primary scaffold branch and establishment of drainage canal.

Forthermore, we observed very small scale culture of some fruit trees in home gardens. These were banana, papaya, mango, pineapple and coconut for self consumption. In particular, many banana varieties were present. There were many other subtropical and tropical fruit trees found in some areas in PNG. We saw passion fruit, papaya, cashew, mango, sugar apple, soursop, common custard apple, coffee, cacao, oil palm, Tahiti chestnut, Java almond, avocado and jackfruit etc., although they were all grown as a few trees.

Comments

Because the climate in PNG is warm and wet, the authors suggest the following: warm and wet climate will be suited to the cultivation of many kinds of tropical and subtropical fruit trees. But the climate will also permit the attack of many disease and insects to the trees. The excess moisture on high water table soils will cause erosion and leaching of nutrients. Thus, construction of drainage canals and soil fertilization to soil were recommended for successfull fruit tree production. Also, control of diseases and insects are needed to grow fruit trees introduced to PNG from foreign countries.

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