RUBBER PRODUCTION IN NEW GUINEA AND PAPUA.

(Continued.)

By R. E. P. Dwyer, B.Sc.Agr.

Department of Agriculture, Rabaul.

Land Acquirement in New Guinea and Papua.

Agricultural and pastoral leases are the main systems of land tenure in both Territories if the freehold expropriated properties in the Mandated Territory and certain Crown lands of limited area in Papua are excluded.

Land acquirement is cheap in both Territories and the rental charges are very similar although the actual means of obtaining the land for alienation are somewhat at variance. The system in Papua, where so much land is bought annually by the Government either for alienation or reservation purposes, has already been mentioned.

(*a*) *Leases for Less Than 30 Years.*[21]—Rental in both Territories is 5 per cent. of the unimproved value of the land, subject to re-appraisement every ten years. The Papuan law provides that the rental shall not exceed 6d. per acre per annum during the first ten years. In Papua, a rental of 3d. per acre per annum is charged as compared with approximately 6d. per acre per annum in New Guinea.

(*b*) *Leases for 30 Years or More.*[21]—Rental of 5 per cent. of the unimproved value of the land is payable in both Territories (generally 3d. per acre in Papua and approximately 6d. per acre in New Guinea), but in the case of a lease of less than 1,000 acres in Papua, no rent is payable during the first ten years.

In New Guinea, the Administrator has the power to remit rent during the first ten years, but in practice, he does not do so. Re-appraisement is effected every twenty years in both Territories.

Survey-fees.—The rates of survey-fees payable in New Guinea are considerably higher than those in force in Papua. The survey-fee for a block of 600 acres in Papua is £47 11s. as compared with a fee in New Guinea of £75, in addition to which there may be charged in New Guinea, travelling expenses to the site of the survey and other charges related to this.

The terms upon which agricultural land can be obtained in Papua are extremely easy to the settler—he can obtain a leasehold of any class of land up to 99 years. This long-term lease is favoured in both Territories.

In Papua, upon making application, the following deposit-fees are required: 100 acres or less, £1; up to 500 acres, £2; up to 1,000 acres, £5; and £5 for every addition of 1,000 acres or portion thereof; and a fee of 30s. for lease.

All agricultural lands that have been alienated by the Crown have been assessed at an unimproved value of 5s. per acre (rent, 3d. per acre).

In the years 1912, 1933 and 1939 the lands of Papua were held as follows:—

	1912. (22)	1933. (23)	1939. (24)
	Acres.	Acres.	Acres.
Area of land held by natives	56,563,582	56,899,003	56,175,985
Area of Crown land	1,032,049	833,618	182,226*
Area of Freehold land	26,547	22,932	23,490*
Area of Leasehold land	332,422	190,047	192,099*
Area of Territory	57,945,600	57,945,600	57,945,600
Area of Territory surveyed	..	..	387,815

* Surveyed.

The total area of land purchased from the natives and land declared for other purposes was 1,019,814 acres in 1933—less than 2 per cent. of the Territory; in 1912 the figure was 1,382,018 acres or 2⅜ per cent. of the Territory. At the 30th June, 1938, it was 1,763,833 acres, and 1,769,705 acres at the 30th June, 1939, 5,872 acres being purchased during the year.

During the German administration of the Territory of New Guinea, land was granted under freehold title after the fulfilment of certain conditions. When the Territory was placed under the Mandate control, this policy was discontinued, and a leasehold system was introduced under the Land Ordinance of 1922. It was then specified that the maximum area that could be held by one person as an agricultural lease must not exceed 2,000 hectares, and the unimproved capital value of the land not more than £5,000. This Ordinance has since been modified and areas up to 4,000 hectares (10,000 acres approximately) have been granted, the limit to be taken up being left to the discretion of the Land Board.

The term of lease may be for any period, not in excess of 99 years. The annual rental is 5 per cent. of the unimproved value, which is appraised every twenty years.

The average general appraisement for the first twenty years is £1 5s. per hectare, equivalent to an annual rent of 1s. 3d. per hectare. The rental paid per individual for agricultural leases ranges from under £6 per annum for leases not exceeding 100 hectares (roughly 250 acres), £6 to £15 per annum for areas up to 250 hectares, £16 to £30 per annum for areas between 250 and 500 hectares. A very few companies and individuals pay rentals ranging from £31 to £62 per annum for areas between 500 and 1,000 hectares and only a couple exceed this payment. The average rental for agricultural leases here probably does not exceed £15 per annum, which is very reasonable rental, although not so liberal as the rates in Papua.

In Papua, the rental of agricultural leases for the whole term of 99 years cannot exceed the following amounts, subject to a clause in voluntary forfeiture—"If on any appraisement the rent is raised by more than one-third, the lessee may disclaim the lease and is thereupon entitled to receive compensation for his improvements":—

	Rental per acre.
	d.
First twenty years—	
First ten years (if not exceeding 1,000 acres)	nil
Second ten years	3
Second twenty years	4
Third twenty years	5⅓
Fourth twenty years	$7^{1}/_{9}$
Balance of lease	$9^{13}/_{27}$

It was laid down also that the maximum area of land which shall be included in any agricultural lease granted in respect of any application shall not exceed 5,000 acres. It is likely that this has lately been modified as in New Guinea.

In both Territories it is provided that one-fifth of the land comprised in an agricultural lease must be planted within the first five years; two-fifths within the first ten years; and three-fifths within the first twenty years; while during the remainder of the term, three-fourths of the land so suitable must be kept planted. If such is not done, the lease may be cancelled.

It is also prescribed by land regulation that the lease must be planted with approved tropical crop plants, and, in both Territories, rubber is specified as one of these.

It is the procedure of land acquirement (but not the terms) which is unwieldy in the Territory of New Guinea and it would seem that the Papuan system is better.

The procedure at present adopted entails that intending settlers in this Territory are required to enter into almost direct negotiations with the natives and bargain for their lands, &c., and the methods of determining compensation to natives could be given a more definite basis.

It has been suggested by interested settlers and others that the particular departments which are responsible for native welfare should indicate what districts or areas are, or conversely, are not, over-alienated in relation to the native population requirements. Thus the onus would be on the Administration and officers concerned to allow adequately for present requirements, and for any increase in population in areas where this is expected.

An applicant, having selected an area of land suitable for his purpose in any district in the Territory of New Guinea, ascertains from the native owners that they are willing to sell the land to the Administration and applies to the Lands Department through the District Officer controlling the district in which the land is situated. Obviously an intending applicant, resident in the district and well known to the natives, has the best chance of obtaining land under these conditions. The native owner must be willing to sell the land to the Administration before it can be selected.

The actual procedure of application is similar in Papua and New Guinea though in the latter Territory, the fees are somewhat higher.

In New Guinea, application is made on a printed form and must be accompanied by the necessary fees which vary according to the area and are returned if the application is not granted. Thus, to take up an area of 100 hectares, the cost would be—

	£	s.	d.
Registration-fee	0	10	0
Deposit	2	0	0
Survey-fee	56	5	0
Total	58	15	0

It is necessary to deposit only one-quarter of the money for survey-fees with the application in New Guinea; the balance must be paid on completion of the survey.

The application having been made and lodged, is, in due course, advertised in the *New Guinea Gazette,* and, subsequently, it is heard by the Land Board, when the applicant may attend and state his case.

In Papua, the survey-fees, fixed by regulation, are equal to the actual cost of the field survey, plus 15 per cent. for inspection and office work, and are payable in respect of application for leases of an area exceeding 100 acres.

Land Alienation—New Guinea.

TABLE No. 10.—DETAILS OF LAND ALIENATION IN NEW GUINEA.

	June, 1937.	June, 1938.	June, 1939.	June, 1940.
	Hectares.	Hectares.	Hectares.	Hectares.
1. Total area alienated	294,745	300,775	361,821	(*b*) 365,602
2. Percentage of total area alienated	1.2	1.25	1.5	1.52
3. Freehold land	(*a*) 139,741	(*a*) 154,747	210,869	210,869
4. Agricultural leases	50,113	56,013	53,599	56,079
5. Pastoral leases	3,700	3,700	3,843	3,843
6. Total leasehold lands	55,913	61,813	(*c*) 60,585	(*c*) 63,078
7. Number of agricultural leases	383	..	412	434
8. Total area under European cultivation	101,265	105,940	106,085	110,878
9. Percentage of total area of New Guinea under cultivation	.42	.44	.44	.46
10. Percentage of alienated area under cultivation	34.3	35.2	29.3	30.3

(*a*) Titles issued only.
(*b*) Includes 80,919 hectares of Administration land plus 10,736 hectares vested in the Director of District Services.
(*c*) Includes five other classes of leases.

Table No. 10 gives the particulars of land alienation, to date, in the Mandated Territory of New Guinea. It will be seen that by June, 1940, 365,602 hectares, equivalent to approximately 1½ per cent. of the total area of the Territory, which is estimated at 24,086,440 hectares (or 59,517,593 acres), had been alienated. Only about one-third of the total alienated area is under cultivation, which is less than .5 per cent. of the total area of the Territory. It should also be noted that a little less than 50 per cent. of the land for which freehold titles had been issued is under cultivation.

TABLE No. 11.—TOTAL AREA ALIENATED, OLD GERMAN PROTECTORATE.(25)

Name of Territory.	1911.	1912.	1913.
	Acres.	Acres.	Acres.
Bismarck Archipelago	240,018	271,825	307,293
Kaiser Wilhelmsland (New Guinea Mainland)	188,168	180,007	192,458
Total area (acres)	428,186	451,832	499,751
Total area (hectares)	173,355	182,928	202,328
Total cultivated area (acres)	64,599	73,317	85,940

Most of the land alienated in the German times was under freehold tenure although the Germans also had a system of leasehold whereby about 2,100 hectares (or about 5,189 acres) could be taken up for small trading sites, &c.

The main purpose for including the table showing land alienated in the German times is to point out the position of freehold land in the Territory at the present time. The 202,000 hectares alienated in 1913 differs little from the amount of freehold land to which titles have been issued up to the present time. In New Guinea, the position of land titles is still most involved as a number of inchoate (uncompleted) titles were recorded in the German Ground-book. It

is known that the legal clarification of the position of freehold land here will take several years to complete. The titles of some large virgin properties may probably be declared valid and others will not—hence the heading, "freehold land under titles issued". Where the German *Fiscus,* controlling the government and other property, was satisfied with the terms of acquisition and that all native claims had been met, a clear title was issued. The cost of such land was usually at about 2s. per acre or 5s. per hectare and payment could be spread over several years. In the years immediately preceding the war, in 1914, the price of such land had risen in many places to as much as £1 per hectare. It is interesting to note that permission to take up about 50,000 hectares of land had been granted by the German Government to the German New Guinea Company when they relinquished their charter rights over the Territory.

Population and Number of Indentured Labourers in Papua and New Guinea.

Various estimates of the native population of the Mandated Territory have been made, as, for example, in 1935 an estimate by the Department of District Services and Native Affairs was 666,000, approximately, and this estimate was increased to 750,000[26] in 1936-37. Since that time, no estimates have been made, the position being too obscure as shown by the fact that the enumerated population in 1939-40, 668,871 natives, was greater than the estimated total population five years previously.

The reason for this can be readily seen by referring to the figures in Table 12, showing the area under government control.[27]

TABLE No. 12.—CONTROLLED AREAS IN NEW GUINEA.

—	Total Area.	Area under Control.	Area under Influence.	Area under Partial Influence.
	Sq. miles.	Sq. miles.	Sq. miles.	Sq. miles.
30th June, 1939	93,000	38,790	9,660	9,125
30th June, 1938	93,000	37,370	10,040	8,695

Thus, it will be seen that by June, 1939, only 41.7 per cent. of the total area was under full control, 10 per cent. under the influence of the Government, and almost another 10 per cent., under partial Government influence. The population of approximately 40 per cent. of the total area has not been enumerated, and, when it is, the total may not fall short of the 800,000 to 1,000,000 range.

If the total population amounted to 750,000 natives, there would be 3½ hectares, or almost 80 acres available to each native man, woman and child in New Guinea. If it were 900,000 natives, 26.5 hectares or 64 acres (approximately) would be available to each native.

The density of population probably ranges somewhere between eight to ten natives a square mile for the whole Territory, which can be considered relatively sparse considering the land and food supply available.

Table No. 13 gives particulars of the distribution of the enumerated population on the mainland and on the various islands of New Guinea. The numbers enumerated for the Bismarck Archipelago, Bougainville and the other islands cannot be expected to change much except by natural increase or decrease. A portion of the rugged interior of New Britain seems to be the only area in this island not accounted for. The native population of the hinterland of New Guinea has not yet been fully accounted for, e.g., the enumerated population in 1939 was almost double that of 1930, *see* Table 13. It will be seen that the greatest population is available in the Sepik, Madang and Morobe Districts of the mainland, where the plantation industry is least developed.

TABLE No. 13.—NEW GUINEA—ENUMERATED POPULATION.

District.	1929–30.			1933–34.			30th June, 1939.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
New Britain ..	42,244	39,343	81,587	55,531	42,833	96,364	46,786	46,433	93,219
New Ireland ..	19,475	18,941	38,416	24,360	18,364	42,724	18,834	18,401	37,235
New Guinea Mainland	102,638	94,410	197,048	139,739	121,901	261,640	194,274	194,703	388,977*
Bougainville (Kieta District)	19,812	19,075	38,887	22,070	19,449	41,519	22,785	23,697	46,482
Admiralty Islands (Manus)	6,894	7,173	14,067	8,033	6,911	14,944	6,681	7,031	13,712
Total in Villages ..	191,062	178,942	370,005	217,057	209,072	426,329	289,360	290,265	579,625
Indentured ..	..	..	30,130	..	..	30,594	..	..	41,675
Constabulary, Patients and Mission Schools	..	..	..	..	..	..	..	..	5,983
	191,062	178,942	400,135	217,057	209,072	456,924	289,360	290,265	627,283

	Males.	Females.	Total.
* Sepik	75,973	72,748	148,721
Madang	56,979	55,016	111,995
Morobe	61,322	66,939	128,261

There are no true counts of the population of Papua, though some estimates have been given. It would appear that the native population is not nearly so dense as that in the Mandated Territory. There are estimates ranging from 200,000[28] to 500,000[29] natives. In 1935, there was a very approximate estimate of 275,000 population, apparently partially enumerated.

This short discussion on the population is designed to indicate that the labour available is not inexhaustible in either Territory and would prove an adequate restriction of plantation production in these countries.

Indentured Labour.

Table No. 14 gives the particulars of indentured labourers in New Guinea and Papua, as far as available in this Department. In the last ten years, the number of native labourers indentured in New Guinea has increased by at least 10,000 natives.

TABLE No. 14.—PARTICULARS OF INDENTURED LABOURERS—NEW GUINEA AND PAPUA.

Year.	Enumerated Population, Territory of New Guinea only.	Total Indentured Labourers.		Indentured Labourers on Plantations, Territory of New Guinea.	
		Territory of New Guinea.	Papua.		Early years for comparison—
1914*	152,075	..	11,383	17,529	In 1890— 869
1922	251,017	..	..	20,155	In 1895— 2,246
1923†	335,258	..	..	20,081	In 1898— 2,348
1930	400,135	30,138	11,000‡	—	In 1908— 8,275
1933	401,129	30,595	..	17,369	In 1909— 8,311
1935	456,924	..	12,588	17,269	In 1910— 9,460
1936	478,686	36,927	..	—	In 1911—10,984
1937	500,040	..	..	19,760	
1938	542,394	40,259	..	20,855	
1939	627,283	41,849	18,478§ (9,648)	20,657	
1940	668,871	39,344	19,733§ (9,759)	20,477	

* To 30th December—Other years to 30th June.
† Counted population only.
‡ Approximation only.
§ Papua—Also includes non-contract labour but not administrative labour. Contract labour included in brackets.

With the expansion in rubber and gold production and the oil search, it would appear that the number of labourers employed in Papua is also on the increase. Furthermore, governmental activities have increased alongside the recognition of Papua's strategic importance to Australia. It would appear that more casual labourers are employed in Papua than in the Mandated Territory. In normal times, more than twice as many natives are employed in the plantation industry in the Mandated Territory as compared with Papua, and the drain on labour in the Territory is correspondingly greater.

TABLE No. 15.—PARTICULARS OF EMPLOYMENT—NATIVE POPULATION—NEW GUINEA.

——	1936–37.	1938–39.	1939–40.
Total Population Estimated	750,000	..	..
Native Population Enumerated	542,394	627,283	668,871
Native Officials	11,027	11,216	11,465
Indentured—			
On Plantations	19,760	20,657	20,477
Mining	7,394	7,162	7,105
Administration	1,577	2,190	1,956
Domestic	4,224	4,498	3,385
Shipping, Commerce, Industry	7,220	7,107	6,238
Miscellaneous	84	61	183
Total Indentured	40,259	41,675	39,344

Table No. 15 gives further particulars concerning the employment of the native population in the Mandated Territory. It will be seen that the number of natives indentured has been on the increase until 1938-39. The war has already had its effect on the number of natives employed (*see* figures for 1939-40).

It may be taken that approximately 40,000 natives are indentured each year, that is equivalent to approximately 6 per cent. of the enumerated population and about 12–13 per cent. of the total male population. It must be remembered that a considerable proportion of the male population is not available for indenture, being either too young or too old; also, allowances have to be made for males necessary to conduct normal village life. It is also pointed out that sick natives and those in uncontrolled areas are not available for recruiting. The natives from high levels in the hinterland are not suitable for work under coastal conditions, as they readily succumb to malaria and other diseases, and are more suited to work on high levels where they are fully acclimatized. It is seen, also, that about 11,500 natives are regularly employed as native officials and about 7,000 natives in the gold-mining industry. A proportion of the natives are also independent producers. It is thus quite probable that nearly 50 per cent. of the enumerated male population is not available for work on plantations. It is obvious that as far as the Mandated Territory is concerned, where any considerable extension of the plantation industry occurs, the labour position would provide a definite limit to such development. There is also the question of how far it is advisable to employ natives in the plantation industry without, to some extent, encouraging their future independence.

This entails such considerations as administrative policy, general intelligence of the natives, &c., which it is not possible to discuss in this article. The finding of the Committee on Native Labour Conditions will prove most helpful in assessing such possibilities.

The Amalgamation Committee gave the following comparative statistics for the two Territories at June, 1939. Populations of the Territories are as follows:—

——	Papua.	New Guinea.
European	1,488	4,445
Asiatic	..	1,838
Native (approximately)	200,000 (enumerated)	581,342 (enumerated)

Labour Conditions.

Papua and New Guinea Compared.—This is a most important subject as practically the whole of f.o.b. cost of production for any plantation product is linked with the labour position in the two Territories. The minimum native wages permitted in the two Territories are as follows:—

——	Papua.	New Guinea.
	Per month.	Per month.
	s. d.	*s. d.*
For general labour	10 0	5 0 For first contract
		6 0 For subsequent contracts
For mining labour	12 6	10 0 For heavy labour, including mining

In addition, in New Guinea, a bonus is usually paid to natives on entering into indenture—20s. for a three-year contract, 15s. for a two-year period, and 10s. for one year.

The rates paid in both Territories are in addition to sustenance, clothing, equipment, accommodation and medical attention.

A considerable proportion of both Papua and New Guinea is only under partial or not yet under Government control, though these areas are continually decreasing. It is only from the controlled areas that labour can be recruited. Districts and prescribed areas within particular districts may be closed to recruiting when over-recruiting or other causes necessitate this. The indenture system is in force in both Territories and, under the circumstances, is the only workable system.

The native races in these islands are the product of many migrations and many different races and types are present in both Territories. In many cases the people have risen little above the stone age culture and the villages or small groups usually constitute their main social and economic organizations. Languages and dialects are most abundant, often varying within a few miles.

In Papua, the "Motu" language is being spread as far as possible, as the *lingua franca*, while in New Guinea, pidgin English is widely used. In the Bismarck Archipelago, however, there has been a tendency for the Blanche Bay dialect to spread amongst the natives themselves.

Labour is recruited by private enterprise in both Papua and New Guinea and the natives work under a system of indentures entered into under Government supervision by which the native is bound for a specified period to work for the employer. A breach of these indentures by either employer or native is punishable under the Native Labour Ordinance, though a good deal is left to the discretion of the officers administering this Ordinance. This Ordinance also provides for all the living conditions, conditions of payment, &c., under which the native works and the employer must also fulfil his obligations. Periodical inspections are carried out on all plantations to see that these conditions are observed and the labourer is very well protected as to conditions of employment.

In both Territories, plantation and general labour is legally permitted to engage for a period of three years after which they are usually returned to their villages. The practice in Papua is to engage for only about eighteen months, or two years, as they are apparently averse to signing on further. In the Mandated Territory two and three-year contracts are more common.

TABLE No. 16.—MANDATED TERRITORY—LABOUR RENEWAL OF CONTRACTS.

	Period of Service.			Total Renewals.
	For One Year.	For Two Years.	For Three Years.	
Year—				
1938–39	1,364	5,466	2,822	9,652
1937–38	973	3,240	1,368	5,581
Totals for two years	2,337	8,706	4,190	15,233
Relative percentages for the two years considered	15 per cent.	57 per cent.	28 per cent.	..

The percentage of labourers making three-year contracts when originally signing on has not been tabulated by the District Office. It would be greater than the figures shown for the labour renewing their contracts and making their

second or third papers. In 1938-39, 41,849 natives were indentured, hence the 9,652 renewed contracts represented 23 per cent. of the total indentured labour compared with approximately 14 per cent. the previous year.

A great proportion of the labour recruited is brought in from areas which are far removed from the centres of plantation industry and in such cases the cost of recruitment and transport is high, often amounting to £7 and £8 per head.

In 1916, some of the Papuan planters complained that, although the limit of indenture is three years, the natives limit themselves to one year indenture, because they will not stay away from their villages longer. The "boys" have to be trained to tap the rubber and continued re-training is necessary with every new batch of "boys". In evidence before the Amalgamation Committee, 1939,[30] with very few exceptions, the Papuan employers expressed themselves content with the Papuan practice. Papuan employers stated that the labourer would seldom sign on for more than two years and that, if he did, then he was worked out in the third year. New Guinea employers, on the other hand, said that the native was of very little use in the first six months and, if he were not allowed to serve for three years, the contract would not be of much value to them. It appears that a good deal of such evidence is of little value in assessing the true position and that many other factors are involved in this divergence of policy. Logically, it would seem that the more practice natives had with tapping and factory work, the more proficient they would become. There are other valid arguments for and against making the term of indenture too long, which are not within the province of this article.

Natives from certain localities are regarded as more intelligent for certain work (such as tapping) than others. This fact is true for both Territories. It is believed that certain groups of natives in Papua with rather pronounced Polynesian strain are more advanced than the better tribes here. This contention may be true but, in any case, whether any superiority is due to better natural intelligence than to longer association with the type of work they are engaged on, would be difficult to prove.

It was formerly a common idea that even the best natives from the Mandated Territory would not make good rubber tappers. An old planter, who has had many years of association with rubber planting in Java and Malaya, said that some old tapping done at Aropa, Bougainville Island, was excellent. To further test this contention, a former Papuan planter now working rubber in this Territory, sent five New Ireland "boys" to Samarai in Papua and in no time they were tapping rubber as well as the Papuans and carrying on the same task. Later experience has shown that a proportion of the labour employed is not good at tapping as compared with the labour in Papua, and probably in other parts of the world, but they are readily absorbed in other tasks.

At the commencement, it was found that the natives tended to carve the trees and in Papua are often referred to as "butchers". Before three weeks, the better tappers come to the fore and, with close supervision, become quite proficient. This exactly tallies with experiences on recently opened-up tapping areas in the Territory of New Guinea.

The greater proportion of the natives can be taught to tap rubber very well and also to carry out all factory procedure. Some of the tapping work one has seen on plantations near Rabaul and at Magaria, Madang, is very good, although

there is a tendency for some of the natives to become heavy-handed, and tap too deeply, unless constant supervision is employed. It does seem that Chinese and Eurasians could be employed very usefully in such supervision, particularly if they were experienced tappers themselves.

The labour problem is, however, of paramount importance when considering the development of any new planting industry in New Guinea or, in fact, any of the South Sea Islands. In a special commission's report[31] on trade in the South Pacific in 1916, practically all of the numerous witnesses called attention to this fact.

It is only recently that a representative commission with wide powers[32] examined witnesses from all parts of the Mandated Territory and closely studied the wide aspects of this important subject, and a comprehensive report is to be furnished.

The area suitable for cultivation in this Territory, as in Papua, has never been accurately determined. It is certain, however, that much more suitable land than labour is available.

It is not intended to discuss the pros and cons of introducing labour under indenture or contract from other countries to develop plantation industries here, such as was done in Malaya, Sumatra, Fiji and Samoa. So far the need for such action has not arisen here and the future holds so many indeterminate factors that it is not intended to deal with this subject now.

It is pointed out, however, that a few special artisans have been brought in under contract and the author believes that the possibility of the introduction of key workers for certain advanced works should not be overlooked. As a rule, the local Asiatic population belongs to the trading more than to the genuine agricultural class. What are particularly lacking in New Guinea are intelligent Chinese, Malays or Javanese trained in bud-grafting, both for cacao and rubber propagation. Some of our most intelligent "boys" are capable of doing this work but do not work with sustained interest, tending to become careless. Further trained workers who have been used to plantation and factory routine in the more advanced tropical countries would be of great use. In the long run, they would help to develop the industry and cause our own natives to take a more intelligent interest in such work.

Labour Costs in New Guinea.

It would be practically impossible to arrive at the labour costs involved for rubber production in this Territory, as, at the present time, only old-established rubber is being tapped. It is likely that labour costs for rubber production would be somewhat higher than for copra production. Some general particulars of the labour costs on coco-nut plantations are given as a guide. It is known that the cost of labour varies greatly with the size of the plantation, efficiency of management, distance from recruiting centres, costs of tools, rice, issues, &c. Forsayth,[33] in evidence, stated that, previous to 1911, the costs varied between 60 to 70 pfennigs a day (7d. to 8d. a day). This sum covered everything, as follows:—Recruiting-fee (£1 to £5) for three years; wages (£4 to £7 a year); government depot fee (5s.); medical attention; food and other etceteras. This planter was well known locally and many natives came into his employ without any recruiting-fee. Also a large amount of native food was grown on the estate to reduce the cost of labour.

The actual wages paid at the present time have shown very little increase on those figures, e.g., 6s. a month is equivalent to £3 12s. a year; 8s. a month equals £4 16s.; and 10s. a month (which is only paid to the better type of "boys") equals £6 per annum.

At the present time, according to most planters, wages and issue costs are said to range from 6d. to 8d. a "boy" a day, but when costs of recruiting, supervision, transport and medical attention are taken into account, the labour costs have been variously estimated to range from 9d. to 1s. 3d. a unit a day. Commonly, the labour costs are given as somewhere between 10d. and 1s. a day. There is undoubtedly a wide range of labour costs on plantations here, probably ranging from £12 to £20 a year, depending on several factors, as indicated. It would appear that the average "all in" cost per annum a labourer, in New Guinea, is somewhere between £16 and £18 a year on most plantations, or about 6s. 6d. to 7s. a week.

Labour Costs in Papua.

There are no recent particulars concerning the cost of labour in Papua. It is known that the monthly wages have not altered for many years, hence, the estimates given by Staniforth Smith[34] for cost of labour should not be far wide of the mark and they are as follows:—

> The cost of native labour depends largely upon whether native food is grown on the plantation or in the vicinity of the industry that is being carried on. If a large proportion of the diet of the employees consists of bananas, sweet potatoes, yams, taro, tapioca and maize, the regimen will ensure better health and decreased expense. On a well-managed plantation, the cost (including everything) a working day for each labourer should be well under 1s. Assuming, however, that the native labourers are fed entirely on imported foodstuffs (which is quite usual) at local store prices, the cost is only about 1s. 2d. a day.

COST OF AGRICULTURAL LABOUR FOR ONE YEAR.

Smith's 1912 figures.	£	s.	d.	Adjusted 1940 figures on same basis.	£	s.	d.
Rations—							
Meat—1 lb. per week at 9d. per lb.	1	19	0		1	19	0
Tobacco—1 stick per week—52 sticks at 3s. 6d. a lb. of 26 sticks	0	7	0	1 stick at 5s. 6d. per lb. (If 3 sticks supplied—£1 13s.)	0	11	0
Soap—2 oz. per week, 6½ lb. for 52 weeks at 1s. per bar of 2½ lb.	0	6	0		0	6	0
Sugar—1 lb. per week at 3½d. per lb.	0	15	2	Sugar—1 lb. per week at 4d. per lb.	0	18	0
Rice—1½ lb. per day, 547½ lb. for 52 weeks at 8s. 6d. per bag of 56 lb.	4	3	1		4	3	1
Salt—1 oz. per week, 3¼ lb. for 52 weeks at 2d. per lb.	0	0	6½		0	0	6½
Cost of Food Supply	7	7	4½		7	17	7½
Other Expenses—							
Wages at 10s. per month	6	0	0		6	0	0
Fees for signing on and off	0	6	0		0	6	0
Recruiting fees and fares	3	10	0		5	0	0
Return passage	0	10	0		0	10	0
Blanket	0	5	0		0	5	0
Sulus (Lap Laps) 4 at 1s. each	0	4	0		0	4	0
Total	18	2	4½		20	2	7½

After deducting 52 Sundays, a total of £18 2s. 4½d. would amount to 1s. 2d. a working day. It is commented that 4 ounces of coco-nut a day may be substituted for sugar. Native vegetable food may take the place of rice to a large extent. When fish are plentiful, even the purchase of meat may be greatly reduced. The recruiting-fees are often saved by planters recruiting their own labour.

It would seem that supervision, medical expenses, housing, percentage of labour lost through illness, tools supplied, some forms of licences and extra issues (box, bowl, spoon, fish-liver oil, &c.), are not taken into account in the above estimate. It is also pointed out that the prices of certain commodities, particularly tobacco, have changed from the old basis given. It is estimated that the £18 2s. 4½d. adjusted to present prices would bring the figure to £20 2s. 7d. per annum.

	£	s.	d.
Additional—	20	2	7
Medical expenses	0	10	0
Tools	1	5	0
Extra issues	0	5	0
Average four days' labour lost a year	0	4	0
Total	22	6	7

Allowing for Sundays, this cost would amount to 1s. 5d. a working day. It would seem that even if the issues were similar to those in New Guinea, the "all in" costs would be £18 + £3 (extra wages) = £21 per annum or 1s. 4d. a day. The extras allowed for and the generally shorter contracts would make the labour costs higher unless cheap native foods and recruits are available. If the labour in New Guinea can be taught to tap rubber as efficiently as the Papuan labour, then the cost of production in the Mandated Territory should be cheaper than in Papua.

Labour Conditions—Papua.

One plantation manager in Papua made the following remarks on the labour conditions and cost of production in Papua:—

Costs of production in Papua are necessarily much higher than in Ceylon and the Federated Malay States.

In Malaya, apparently, during the reign of low prices, estates have been in a position to give contracts for tapping and upkeep to Chinese at a very low figure; the Chinese, not owning the land in Malaya, has had to exist or be repatriated, and, therefore, has been forced to accept a wage which gives him a bare existence. Any increase in the price of rubber will bring into tapping a large area now not in production, with a consequent demand for labour which will carry with it restoration, to a certain extent, of former wages, and thus an increase in cost of production.

In Papua, the native is always a landowner, and to exist it is not necessary for him to hire out his services, and, therefore, he is not forced to accept a lower wage, and expects the same wage now as when the price of all commodities was higher.

Also, at this stage of his existence, it is impossible to work on a system of private contracts and it is only by indenture that he can successfully be employed.

An appeal to the Papuan Government to allow natives to be indentured at a lower wage was emphatically discouraged.

It is very difficult to compare labour costs in Papua and New Guinea with those prevailing in Java and Malaya. Most of the work in the two latter countries is done by contract and the labour available is compelled to work by economic pressure. This is especially the case in Java where there is such a large population. Often the Javanese family almost works as a unit in such operations as coffee-picking and rubber-tapping.

The question of relative efficiency for such operations is also involved, and, taking this into account, New Guinea labour is not so cheap as it would appear from the wages actually paid.

The Malayan rubber industry is almost dependent upon immigrant labour. The rubber plantations are organized on the lines of a predominantly south Indian force (Tamils). Out of a total labour force of 281,978, of all nationalities employed on the European-owned estates, 224,628 or 80 per cent. are Indians.

The normal wage rates were 50 cents (= 1s. 2d. sterling at par) for men, and 40 cents (= 11.2d. sterling at par) a day for women, later reduced owing to recession in the industry to 45 cents and 35 cents a day, respectively.

It costs about 50 Straits dollars (about £5 16s. sterling) to send a labourer back to India and bring him back again to Malaya, which is not much different to the cost of recruitment in New Guinea and Papua.

In Samoa and Fiji, the wages rates for Chinese contract or indentured labour for tapping rubber were previously given as 3s. a day, but for many years this type of labour has been little used and their labour industry has assumed only very small proportions.

The labour costs for coolies in Java have varied from about 15 to 20 Dutch cents per day and double that for mandoers (head boys). In contract work the coolie labourer earns more—somewhere in the vicinity of 30-35 Dutch cents. At par rates, there are 12 Dutch guilders or florins to the £1 sterling (although of recent years the exchange has been only somewhere around 7 guilders to the £1 sterling), and there are 100 cents to a guilder. Fifteen Dutch cents at par equals about 3d. sterling at par and 20 Dutch cents at par equals about 4d. sterling, 30 cents (Dutch) equals 6d. and 40 Dutch cents equals 8d., which is about the maximum wage paid.

In Java, the labourer keeps and houses himself in the neighbouring kampong or village, except where a small proportion of key workers is sometimes housed on the plantation.

The extra costs would be medical expenses which are relatively small as each plantation is compelled to contribute to a central hospital on the basis of size of the plantation. Tools are also supplied by the plantation. If it is assumed that the average wage for Java coolies is 20 cents, then these costs would not increase the wage beyond 25 cents and more likely around 22-23 Dutch cents.

It will be seen that the cost for Java labour is actually much cheaper than that paid in New Guinea. This margin is not as great in Sumatra, where the labour is often introduced from Java at a considerable cost, and housing, &c., has to be provided.

Java labour is also considerably cheaper than Malayan labour. As far as one can judge, the labour costs in New Guinea are actually cheaper than the Malayan costs, but there the question of relative efficiency in proportion to the money paid is involved. There is little doubt that clearing operations in New Guinea would be just as cheap as in Malaya and would probably compare favorably with Java. In rubber tapping, factory work and skilled work, a proportion of the labour would not be so efficient as those employed in Java and Malaya, where they are generally more advanced and have had long continued association with this class of work.

The Early History of Rubber Exploitation in the Territory of New Guinea.

One important reason for the increased interest displayed in rubber planting in New Guinea is that, on several properties here, where ordinary Para rubber, *Hevea brasiliensis*, and Assam rubber, *Ficus elastica,* were established during the German régime, the produce is now being successfully and profitably exploited and a small but valuable export carried on.

The fact that the rubber tree grows in New Guinea just as successfully as in any other tropical country has been known for many years. It is, therefore, obvious that there must be certain reasons why rubber culture has not received more attention in the Mandated Territory of New Guinea since the earliest plantations were established and these will be dealt with under separate headings.

The German Government and the various companies operating prior to Australia acquiring this country, paid considerable attention to rubber culture, but rubber planting had already come to standstill in 1911. Some large expeditions, known as the Gutta-percha and Caoutchouc (rubber) Expeditions, were financed and organized by the Caoutchouc Commission[35] of the German Colonial Economic Committee, in an attempt to locate any local plants which may be profitable rubber or gutta-percha producers. The local types of *Ficus* spp. including one creeper, *Alstonias* spp., *Palaquium* spp. (Gutta-percha), and other rubber-yielding bush trees were investigated.

In the Botanic Gardens at Rabaul, the following types of rubber were established for trial purposes: Para rubber, *Hevea brasiliensis* (on quite a large scale); Ceara rubber, *Manihot utilissima*; Panama rubber, *Castilloa elastica*; Lagos rubber, *Funtumia* (or *Kickxia*) *elastica*; the rubber creepers, *Landolphia heudelottii* A.D.C. and *Cryptostegia* spp.; *Alstonia scholaris* and finally, quite large plots of Assam rubber, *Ficus elastica.*

In several representative districts experimental rubber plantations were established on a commercial scale, but in most areas more attention was paid to Assam rubber, *Ficus elastica,* than to Para rubber, *Hevea brasiliensis.* In addition to sole plantings of rubber, mixed plantings of cacao, *Theobroma cacao,* under *Hevea* rubber were tried out in almost all districts of the Territory. Also in a few cases plantings of *Hevea* and *Castilloa* rubber were planted together in mixed culture. Other rubbers were tried out commercially in limited areas.

TABLE No. 17.—RUBBER AREAS—MANDATED TERRITORY OF NEW GUINEA.
LATE GERMAN NEW GUINEA—JANUARY, 1914.[39]
Cultivated Area.

Type of Rubber.	Bismarck Archipelago + Kieta.				Kaiser Wilhelmsland–North-East New Guinea.				Total Areas.	
	Planted.		Bearing.		Planted.		Bearing.		Planted.	Bearing.
	Hectares.	Acres.	Hectares.	Acres.	Hectares.	Acres.	Hectares.	Acres.	Hectares.	Hectares.
Ficus ..	787	1,967	467	1,152	730	1,825	629	1,572	1,517	1,096
Hevea ..	365	912	30	75	146	365	25	62	511	55
Castilloa ..	167	47	154	385	50	125	50	125	217	204
Kickxia=(*Funtumia*) ..	3	7	..	..	..	..	..	..	3	..
Totals ..	1,322	2,933	651	1,612	926	2,315	704	1,759	2,258*	1,355†

* Equals 5,248 acres. † Equals 3,371 acres.

Number of Trees.

Type of Rubber.	Bismarck Archipelago + Kieta.		Kaiser Wilhelmsland–North-East New Guinea.	
	Planted.	In Bearing.	Planted.	In Bearing.
Ficus	124,696	73,028	131,124	89,715
Hevea	142,946	8,710	49,816	6,800
Castilloa	42,503	40,633	30,324	30,324
Kickxia (= *Funtumia*) ..	4,649	..	..	..

(In January, 1914, there were 511 hectares or 1,263 acres of *Hevea* rubber planted in the Mandated Territory, of which 55 hectares or 137 acres were in bearing.)

Reference to Table No. 17 will show the areas of rubber planted at January, 1914, while Tables Nos. 18 and 23, showing the amount and value of rubber exports from this Territory to the present day, should also be examined. In German times, the largest individual rubber plantations were established near Madang on the mainland, at Kokopo and in the Bainings, in sub-districts of New Britain, on the Witu or French Islands and near Kieta, on Bougainville Island.

TABLE No. 18.—QUANTITY AND VALUE OF RUBBER EXPORTS—MANDATED TERRITORY OF NEW GUINEA TO 1921.

Year ..	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.
	tons cwt.	tons cwt.	tons cwt.		tons cwt.						
	11 3	20 17	17 1	..	7 4	..	..	..	..	..	..
	£	£	£		£	£	£	£	£	£	
(*a*) ..	4,562	7,787.4	5,980.8	..	1,245	1,001	5,542	1,301	1,749	2,289	*
	..	..	tons 19	..	..	..	..	..	..	tons 29	..
			£		£	£	£	£	£	£	
(*b*) ..	..	..	6,197	..	1,720	5,304	1,673	1,196	1,104	2,900	..

Year ..	1906.	1907.	1908.	1909.	1910.	1911.	1912.
(*c*) ..	kgms. 948	kgms. 1,751	kgms. 5,775	kgms. 6,616	kgms. 6,320	kgms. 15,377	kgms. 21,253
	lb. 2,133	lb. 3,940	lb. 12,994	lb. 14,886	lb. 14,220	lb. 25,598	lb. 47,819

* Exports ceased.

(*a*) From Commonwealth Year Book, Australia, No. 14, 1921.

(*b*) From figures by Dr. Hahl (40); also quoted by Dr. Klein (41).

(*c*) Figures Verhandlungen der Kautschuk-Kommission des Kolonial-Wintschaftlichen Komitees No. 1, September, 1913.

(There seems some variation in the figures submitted as to the actual exports in the period 1911–1921, so figures published by various authorities are included.)

The following translations of sections of the proceedings of the conference of the Caoutchouc (Rubber) Commission of the Colonial Economic Commi tee, Economic Sub-committee of the German "Colonial Society", held in Berlin in March, 1911, and September, 1913, and dealing with New Guinea, were made by Mr. D. M. Scobie of the New Guinea Administration for this article. The sections referring to the establishment of rubber stations by Dr. Schlech er and to the progress of rubber planting in New Guinea to 1913 by Dr. Preuss[36] give a very clear idea of the intentions of the German colonists and of their progress with rubber planting:—

GUTTA-PERCHA AND CAOUTCHOUC (RUBBER) STATIONS IN NEW GUINEA.

Relating to the establishment of gutta-percha and caoutchouc stations in German New Guinea on 30th March, 1911, Dr. Schlechter, Berlin, leader of the gutta-percha and caoutchouc expedition of the Colonial Economic Committee to New Guinea reports as follows:—

> The results of the gutta-percha and caoutchouc expeditions have caused the Colonial Economic Committee to approach the question of the establishment of gutta-percha and caoutchouc stations in German New Guinea. It had been shown that it would be a slow process to interest the natives of Kaiser Wilhelmsland in exploiting bush products because these natives are by nature very indolent and maintain an unfriendly attitude to any attempts to alter their mode of living.
>
> A commencement was made in 1909 in connexion with the expedition which was still in New Guinea by obtaining new Malay instructors to proceed to direct the natives in exploiting gutta-percha and caoutchouc in such a manner that the gutta-percha and caoutchouc harvested would be purchased from the natives of the various villages. This method had stood the test of time very well, mainly because it was possible to proceed hand in hand with the introduction of a head tax which was then instituted by the Government. The natives saw that in this case, the harvesting of caoutchouc and/or gutta-percha would provide a welcome opportunity to obtain the means for paying the head tax and were, therefore, more approachable than they would have been under other circumstances. Encouraged by this success, the Colonial Economic Committee decided to continue to interest the natives in harvesting gutta-percha and caoutchouc by establishing stations which were intended to serve this particular purpose. This decision was made here at the meeting of the Committee on 22nd November, 1910, and it was possible to carry this out all the more easily because funds were available from the gutta-percha and caoutchouc expedition which would ensure that the project planned, in the first instance, for the next three years, would be carried out for the present, at any rate. In the meantime, the Colonial Economic Committee has adopted the preliminary measures which are essential and it has succeeded already in engaging two Malays who are well versed in harvesting gutta-percha and caoutchouc and will probably have arrived already in New Guinea and have commenced their work there. These gutta-percha and caoutchouc stations, two of which were planned, each being under the direction of two Malays, are intended to be temporary stations to be moved from time to time to new village districts. Their task is to instruct the natives of the various villages and then to engage with them in harvesting the gutta-percha and caoutchouc in the forests until the natives are able to undertake the work alone. In this manner, it is intended to exploit the big area gradually. In order to ensure that the work of the natives shall be profitable to them, the Colonial Economic Committee has guaranteed a purchase price of 1 mark per kilogramme (2.25 lb.) at which price the goods delivered by the natives must be purchased. The Committee has also placed at the disposal of the Imperial Government gutta-percha and caoutchouc premiums amounting to 5,000 marks for distribution amongst the natives. The buying will be done by the Government stations, except when private individuals are occupied with it, for which purpose funds have been placed at the disposal of the Government stations by the Colonial Economic Committee. In order to induce the Malays to work well they will participate in the profit in such a manner that they will receive a premium of 50 pfennigs per kilogramme of gutta-percha and caoutchouc delivered and a monthly salary of 50 marks. As it has been shown during past years, those Europeans engaged in small undertakings in the Protectorate have approached the question more and more of purchasing the gutta-percha harvested by the natives, as in that case, they could always count on an acceptable profit because the payment of

the premium to the Malays would soon be discontinued. When the exploitation of the gutta-percha and caoutchouc is directed into the right channel, it may probably assist the Protectorate not immaterially to continue to prosper well because then, of course, other products of the bush would also be exploited soon by the natives. Finally, I should also like to say a few words about the question which was mooted in November, 1910, here at the Colonial Economic Committee concerning the establishing of a gutta-percha plantation in German New Guinea. I regard it as most important that it should be established by the Government because sometime there is sure to be a great demand for gutta-percha, the production of which is on the decline. Moreover, it is also probable that a better and more profitable exploitation of such plantations may be made and that it may be possible to prove thereby that private gutta-percha plantations are payable. In such a case, it would be regrettable if Germany, when the question of the cultivation of gutta-percha is mooted should have to lag behind in comparison with other nations because perhaps there might be no possibility of procuring seed for establishing plantations as has unfortunately been the case when, during recent years, the big rubber boom became noticeable. There is no doubt that in German New Guinea at a suitable elevation, i.e., approximately between 400 to 600 metres above sea level, it would be possible to find an easily accessible, suitable place for such an undertaking which could be established without great expense with the aid of the Botanic Gardens already established in the Bismarck Archipelago. It would be sufficient if not less than an area of 10 to 20 hectares were planted on which, as at Tjikeumeuh in Java, tapping experiments could be made and which would supply the necessary seed for any further plantations.

CAOUTCHOUC (RUBBER) IN NEW GUINEA.

Professor Dr. Preuss, Director of the New Guinea Company, in September, 1913, reports as follows on the cultivation of caoutchouc (rubber) in New Guinea:—

While the low market prices, caused chiefly by over-production in the caoutchouc plantations of India, have led to an economic crisis in our East African and Kamerun colonies, New Guinea has not yet suffered from any similar economic disturbance. Certainly, the owners of the caoutchouc plantations, which are now productive, have suffered an unpleasant disappointment, and particularly those planters who planted caoutchouc up till quite recently, look to the future with anxiety and apprehension, but the low prices for caoutchouc have not succeeded in exerting any noteworthy influence on the economic life of New Guinea. The reasons for this agreeable economic phenomenon are of various kinds. Firstly, there are in New Guinea no plantation enterprises which are concerned solely or even mainly with the cultivation of caoutchouc, but everywhere the coco-nut palm constitutes the basis of the planting industry. Caoutchouc comes second, or even third, after cacao. Furthermore, the quantity of caoutchouc produced in New Guinea is very small at present.

In the year 1912, only 21¼ tons valued at approximately 170,000 marks were exported and the total quantity produced since the commencement of caoutchouc cultivation amounted to little more than 54 tons apportioned as follows:—

	Kilogrammes.
1906	948
1907	1,751
1908	5,775
1909	6,616
1910	6,320
1911	11,377
1912	21,253

The fact that New Guinea caoutchouc has hitherto always sold readily at the market because of its good quality is of great moment. This is particularly noteworthy because most of the New Guinea caoutchouc which held its own with the produce of *Hevea* was obtained from *Ficus* and *Castilloa* caoutchouc, although according to experience such medium qualities suffer much more than first-class qualities when market prices tend to fall. At the end of August, *Ficus* was sold at 4.80 marks per kilogramme, *Castilloa* at 4.65 marks in September and *Hevea* at 4.80 marks per kilogramme. These prices leave the planter a profit, although it is very small, and which, particularly in the case of *Hevea*, is reduced to a minimum because the expense of producing caoutchouc from this variety is greater than with *Ficus* and *Castilloa*. The tapping of the latter two varieties is carried out in New Guinea by

native Melanesians and Papuans while for the more difficult tapping of *Hevea*, which calls for greater precision and skill, it is necessary to engage Javanese who are much more expensive than natives. A skilful Melanesian or Papuan will tap approximately one kilogramme of caoutchouc per day from mature *Ficus* trees, inclusive of scrap, and in medium *Castilloa* his daily performance will amount to 400 to 500 grammes, while a Javanese will obtain from *Hevea* trees, which are certainly still young, only 250 to 400 grammes. The exploitation of mature *Ficus* trees still proves, therefore, to be profitable in New Guinea on an emergency. The expenses in maintaining and cleaning a *Ficus* plantation are also very small and are greatly limited to regulating the aerial roots. *Castilloa* requires considerably more attention and expenses to work it than *Ficus*, and *Hevea* is also still more exacting. With regard to the caoutchouc yielded for a planted area of certain size, the *Ficus* is certainly much less satisfactory than *Hevea* and *Castilloa* for from 1 hectare of *Ficus* one can scarcely expect a yield exceeding 50 to 80 grammes of caoutchouc, but from a hectare of *Hevea* four to six times as much, or even more. On the basis of these considerations the cultivation of *Ficus* and *Castilloa*, which was most zealously carried out up to the year 1905, gradually ceased in New Guinea and attention was directed more to the cultivation of *Hevea* in accordance with the *Hevea* seed which was available. Groves of inferior *Castilloa* were even converted to *Hevea*. At present, only 175 hectares are still covered with genuine *Castilloa*. The *Ficus* plantations take up an area of 1,594 hectares and those of *Hevea* an area of 463 hectares. *Hevea* is also planted as a shade in cacao and the total number of trees is 205,300 of which, however, only 7,000 have attained the age when they can be tapped. In addition to the three varieties referred to, *Funtumia elastica* is also planted but only on an area of 12 hectares. The total area planted with caoutchouc is at present 2,245 hectares. Up to the year 1905, New Guinea, with a planted area of approximately 1,000 hectares, held the undisputed leadership in the cultivation of caoutchouc in the German colonies as compared with 300 hectares in Kamerun and 500 hectares in East Africa. Soon, however, it allowed itself to be outstripped by the two latter colonies and turned more and more to the cultivation of the coco-nut palm, the advantages and favorable prospects of which as compared with the threatened over-production of caoutchouc, were becoming increasingly apparent. Even the caoutchouc boom of 1919 only caused a temporary increase in caoutchouc cultivation. After the year 1911, however, in which the area planted increased to 2,415 hectares, a reaction became noticeable. A commencement was made to cease planting *Hevea* amongst the *Castilloa* trees and to plant coco-nut palms instead and also to replace the youngest plantations of *Hevea* with coco-nut palms. Since 1911, the area planted with caoutchouc has decreased by 169 hectares and the cultivation of caoutchouc in New Guinea has ceased.

With the object of ascertaining if gutta-percha producing plants existed in New Guinea, the German Colonial Economic Committee had, in 1902, maintained an expert, Dr. Schlechter, in New Guinea, and trees were discovered in Friedrich Wilhelm's Harbour and on the Ramu River. In 1906, a more thorough investigation was made and, on the mainland, he found gutta-percha growing over large areas. Five other varieties of rubber plants were also discovered prior to 1909.

Professor Neuhauss 1911[37] also mentions the native rubbers in old German New Guinea:—"In order to make profitable use of the wild caoutchouc creepers and gutta-percha trees and thereby simultaneously to open up a source of wealth for the natives, the Government taught the blacks how to obtain the rubber and gutta-percha. Naturally, the product is not first class, and in the case of gutta-percha is even of very low grade, yet the purpose was fulfilled. Again, the quantities obtained must always remain too insignificant to play an important part in the economic life of the country."

In 1915, in referring to the exploitation of wild products in New Guinea in the Bulletin of the Imperial Institute,[38] it was stated that the activity in the collection of rubber and gutta-percha was very small in comparison with the resources available.

In reference to plantation agriculture, Table No. 19 shows the areas of plantations established in the German Pacific Territories in 1915, and the distribution of plantations according to Territory. It will be seen that, at that time, by far the greater proportion of plantation agriculture was to be found in the islands now comprising portion of the Territory of New Guinea.

TABLE No. 19.—PARTICULARS OF PLANTATIONS—GERMAN PACIFIC POSSESSIONS, 1912.(42)

Part of Colony.	Plantations Laid Out.	Cultivated Areas.
	acres.	acres.
Bismarck Archipelago and Solomon Islands (Bougainville) ..	270,000	55,750
Kaiser Wilhelmsland	180,000	17,475
East Carolines, Marshall Islands and Nauru	6,500	3,850
West Carolines, Pelew and Marianne Islands	4,250	3,725
	460,750	80,800 (*a*, *b*)

(*a*) Represents an increase in area under cultivation of 10,408 acres over the previous year of which 7,750 acres were in the islands now comprised in the Territory of New Guinea.

(*b*) Of the total cultivated area of 80,800 acres, the coco-nut occupies 73,000 acres, leaving 7,800 acres for other plants, such as rubber (*Ficus*, *Castilloa*, *Hevea*) and cocoa, but a certain amount of rubber is also grown as a mixed cultivation with coco-nuts, the area being included in the figures quoted for the latter crop.

Table No. 20 presents a comparison of the value of rubber and gutta-percha from the various German colonies in 1912. It is obvious, that, by this time, the Government had decided to grow more rubber in the other territories and to concentrate more on copra production in New Guinea.

TABLE No. 20.—VALUE OF RUBBER AND GUTTA-PERCHA EXPORTS IN 1912 FOR ALL THE GERMAN COLONIES.

Colony.	Value.
	£
Cameroons	573,611
German East Africa	421,310
Togoland	48,787
German New Guinea	8,145
Samoa	5,538
Total	1,057,391

This information given in the Bulletin of the Imperial Institute,(42) shows that although in 1905 New Guinea had more rubber planted than in any other German colony, by 1912, the value of exports from New Guinea ranked very low compared with the African colonies and was only £3,000 more than from Samoa.

Areas Planted to Rubber—New Guinea.

The figures supplied by planters as to the amount of rubber under cultivation are unreliable and must be accepted with reservation. At the 30th June, 1937, in answer to an inquiry from the Commonwealth Government, the area under rubber cultivation was said to be 1,074 hectares. This area is likely to be more nearly accurate than the ordinary plantation statistics as the inquiries were made, to a large extent, personally.

The latest figures supplied by planters are to the 30th June, 1939, but there is no differentiation between areas planted with *Hevea* and *Ficus*. The total area planted was, according to the figures supplied, 945 hectares, divided amongst the districts as given in Table 21.

TABLE No. 21.—PLANTATION STATISTICS OF RUBBER—NEW GUINEA.

——	1938–39.	1939–40.	
		Area Planted.	Area being Tapped.
	hectares.	hectares.	hectares.
New Britain	288	300	(*a*) 113
New Ireland	20	20	..
Madang	491	511	511
Kieta	119	119	(*b*)
Morobe	25	54	20
Total Area	945	1,004	644

(*a*) Mostly being tapped now. (*b*) A greater area now in tapping.

As pointed out, the more reliable figures obtained were in 1937, and, as these were better differentiated, they are herewith included (*see* Table No. 22).

Types of Rubber Planted.—Several types of rubber including *Manihot* and *Castilloa* were originally planted in German times, but at the present time only *Hevea brasiliensis* and *Fiscus elastica* are being tapped. There is a large proportion of *Ficus elastica* in the old areas planted during the German régime.

Area now being Tapped.—The latest figures available from returns supplied, which are not strictly reliable, are that at 30th June, 1939, when the total area being tapped was 348 hectares, an area of 116 hectares was on New Britain, 212 hectares in the Madang District and 20 hectares in the Morobe District. It is certain that the full area being exploited at the present time is not included as new areas are being brought in at Kieta and on New Britain.

A comprehensive table is supplied which shows the areas planted in New Guinea as far as can be determined (*see* Table No. 22). Two columns showing the areas of *Ficus* and *Hevea* rubber in tapping at the present time are also appended. These figures are later than those above and have been estimated from the areas on estates known to be tapping rubber and not from figures supplied. It will be seen that most of the old rubber in this Territory is either being tapped or arrangements are being made to tap it. It is explained that not all of these areas are in tapping at the one time and that owners of some of the areas have only recently commenced tapping.

TABLE No. 22.—1937 RUBBER STATISTICS FOR NEW GUINEA.

Section.	Plantation.	*Ficus*.		Para (*Hevea*).		Total Area. Hectares.	Area in Bearing.		
		Trees.	Hectares.	Trees.	Hectares.		Hectares.	*Ficus*. Hectares.	*Hevea*. Hectares.
New Britain	Gire Gire	14,000	39	..	..	39	39	39	..
	Gunanur	5,600	16	487	2.3	18,3	18.3	16	2.3
	Matanatar	74,400	199.5	600	7.5	207.0	207.0	199.5	7.5
	Tobera	1,800	5	..	..	5	5	..	..
	Meto	2,300	6.5	..	..	6.5	6.5	6.5	..
	Lama	12,250	34	..	..	34	34	34	..
	Ilia	7,177	20	..	..	20	20	20	..
	New Mobisberg ..	8,640	24	..	..	24	24	24	..
	Upper Seebergh ..	9,000	25	..	..	25	25	..	..
	New Massawa	5,040	14	..	..	14	14	14	..
	Old Massawa	..	..	3,200	25	25	25	..	25
	Lassuls	12,960	36	..	..	36	36	36	..
Madang	Magaria	19,248	132	21,335	147	279	279	132	147
	Modilon	11,542	140.87	5,771	71	211.87	211.87	140.87	71
	Potsdamhafen	4,469	12.5	..	..	12.5	12.5	12.5	..
	Bogia	..	..	..	..	10	10	10	*
	Alexishafen	..	..	..	..	3	3	3	..
Kieta	Aropa	13,157	86	14,329	94	180	180	86	94†
	Arawa	..	..	..	4	4	4	..	..
Morobe	Singawa	..	..	3,600	20	20	20	..	20
		188,583	790.37	49,322	370.8	1,174.17	1,174.17	773.37	366.8

* Type not known. † About 7,000 *Hevea* trees were ill-advisedly cut out at Aropa by the owner.

N.B.—To these areas of *Hevea* approximately 50 hectares should be added to allow for the very new areas already planted bringing the total to 420 hectares.

Anticipated Increases in Areas coming into Production.—Other than the old areas indicated, no increase in the area likely to be tapped can be expected for four-five years, when tapping is expected to commence on some recently planted areas. As indicated in an original memorandum, little increase in planting will occur here unless some guarantee is forthcoming that rubber will not fall below payable levels. It is now expected that the international situation will slow up any anticipated development until the position becomes clearer.

As to future plantings, one company had planned to plant 2,000 hectares, eventually, but the war blocked this extension. Another large company has been making continued inquiries in regard to planting out large areas and will do so if the international situation permits. The manager of a third company with extensive resources has also had rubber-planting in view and said that some form of guarantee would be a definite inducement and undoubtedly would lead to expanded rubber cultivation. Two syndicates, with plantation interests here, are interested in rubber-planting. There have been numerous inquiries from private individuals, one of whom has already cleared 600 hectares, a great part of which he would be prepared to devote to rubber-planting.

Two or three planters who are now tapping old rubber are going ahead with new plantings. One has taken up and commenced clearing 200 hectares for this purpose. Five other planters, to our knowledge, have established rubber nurseries with selected seed and are awaiting the international position to clarify before going ahead with any planting. One of these has about 2,000 trees planted from selected seed and these are flourishing; a further area is cleaned, lined and holed, to receive 20,000 trees.

It is quite evident that the activities in this Territory, as far as rubber-planting is concerned, are almost negligible and are likely to remain so unless a vigorous policy is pursued. Actual new plantings up to the present time have been comparatively small. At Keravat Demonstration Plantation, 10 hectares of selected *Hevea* have already been planted and extension of the areas to 40 hectares, at least, is proceeding. At Rabaul, selected bud-wood nurseries of 1 hectare are laid down. To the present, 30 hectares have been planted in the Bainings District. About 20 hectares have been planted at Lae and Morobe, and another 10 hectares in New Ireland by individual planters, bringing the total of new plantings up to approximately 90 hectares.

The Area in the Territory Suitable for Rubber Cultivation.—In German times, *Hevea* rubber (also *Ficus*) was established in the following districts, and, as stated previously, most of this is now being exploited:—

New Britain (Gazelle Peninsula, Bainings and Witu Islands).
Madang.
Morobe.
New Ireland.
Kieta.

It is thus certain that in all districts of New Guinea there are extensive areas suited to rubber-growing.

The Department has established test areas for breeding purposes at Rabaul and Keravat, and it is intended to establish another fairly large area at the Government Experimental Station, at Bainyik, near the Sepik River, and at the Government Station, Talasea, New Britain. More experimentation is necessary with rubber in the foothills adjoining the Sepik River, which are too far inland for coco-nut cultivation, but where there are plenty of areas available at the correct altitude for rubber cultivation. Lavongai Island possesses heavy soils which are not optimum for coco-nut cultivation and rubber culture should be feasible here. Also there are several large areas of virgin freehold country on this island, but labour would need to be recruited from the mainland to develop them.

Rubber has thrived relatively well in the deltaic areas of the Astrolabe Bay area and near the Markham River on the mainland of New Guinea where more extension is warranted and new areas are being planted there by some individual planters. There are certain areas in the valley of the Waria River, Morobe District, which should prove valuable for rubber-planting.

There are many thousands of acres of suitable land in the soils flanking the present coco-nut plantations in New Ireland. Here only a comparatively narrow strip of foreshore is suited to coco-nuts. The heavier soil areas where coco-nuts do not flourish would warrant extended trials with rubber and other crops more suited to such conditions.

Rubber should thrive well in all districts of the Territory up to an altitude of 2,000 feet, where topography and other facilities permit. It cannot be stressed too much that more experimentation is necessary to determine the most suitable areas for rubber in this Territory.

At a conservative estimate there is an area of, at least, 10,000 hectares available on the remaining virgin country of expropriated and freehold properties in the Territory without reference to leasehold areas alienated or available for alienation. The properties in view are situated in Madang, Sepik, Morobe, Bainings, Bougainville Island, Lavongai, Talasea and New Ireland. Judging from the fact that only about 50 per cent. of the land held under freehold title in New Guinea is planted, there is probably more land available than the estimate given.

The area of leasehold land which could be devoted to rubber has not been absolutely determined as this would entail an extended survey to ascertain the areas available, which will be discussed under recommendations. In the Territory of New Guinea, it is safe to assume that there are decidedly more than 40,000 hectares, or approximately 100,000 acres, which could be devoted to rubber-planting, if the economic conditions were favorable and sufficient and suitable labour available. A great proportion of the land which could be devoted to rubber cultivation is unsuited to coco-nuts or cacao.

Particulars of Rubber Exports from New Guinea.

The information available concerning the rubber exports from New Guinea during the period 1906 to 1921 have been already tabulated in Table No. 18. Other information as to rubber exports during the German period of occupation was also given previously in the translation of the proceedings of the German Rubber Commission.

In Table No. 23, the quantities and values of copra, cocoa and rubber exports from the Territory of New Guinea from 1911 to the present time are compared, as the history of rubber-planting in this Territory during German times up to 1911 has already been presented.

TABLE No. 23.—TERRITORY OF NEW GUINEA—COPRA, COCOA AND RUBBER EXPORTS COMPARED FROM 1911 TO 1940.

Year.	Copra.		Cocoa.		Rubber.		
	Tons.	£	Tons.	£	Tons	cwt.	£
1911	9,397	163,090	..	..	11	3	4,562
1912	11,428	198,338	..	..	20	17	7,787.4
1913	14,299	302,186	138	7,571	17	1	5,980.8
1914–15	..	..	111	7,935	..		..
1915–16	11,062	161,119	186	9,005	7	4	1,244
1916–17	18,582	267,277	†	10,277 (or 8,664)*	†		1,001
1917–18	19,708	369,837	144	10,810 (or 11,159)*	†		5,542
1918–19	14,886	244,314	112	11,901 (or 8,464)*	†		1,301
1919–20	22,708	745,057	137	13,629 (or 15,530)*	†		1,749
1920–21	23,735	664,045	133	9,105	29	0	2,989
1921–22	25,894	474,110	152	9,465	..		..
1922–23	34,648	619,715	83	3,734	..		..
1923–24	34,974	686,519	70	3,603	..		..
1924–25	39,151	815,938	135	6,944	..		..
1925–26	45,806	1,016,930	113	6,510	..		..
1926–27	47,613	849,852	67	3,500	..		..
1927–28	65,285	1,176,040	73	3,859	..		..
1928–29	60,435	933,769	72	3,816	..		..
1929–30	63,832	864,358	84	3,074	..		..
1930–31	62,303	716,543	88	3,074	..		..
1931–32	59,452	618,298	82	3,060	..		..
1932–33	59,040	543,906	65	2,292	..		..
1933–34	62,270	283,329	98	3,479	..		..
1934–35	56,251	361,413	95	3,479	..		..
1935–36	66,684	761,309	127	3,810	..		..
1936–37	76,409	1,231,309	133	6,610	..		..
1937–38	73,716	847,734	183	4,475	4	0	242
1938–39	73,345	727,949	235	6,580	54	0	4,050
1939–40	59,368‡	504,627	(360)* 315	11,340	119	0	13,328
To 30th April, 1941..	..	..	..	..	128	0	..

* From another source.
† Not recorded.
‡ 70,583 tons produced.
§ *See* Table 18 as the statistics vary from different sources.
‖ Sixteen years no rubber exports.

It is obvious that the rubber exports from this Territory have always been of very limited economic importance compared with the copra industry. Rubber appeared in the annual exports continuously from 1906 to 1921 when the exports ceased altogether for sixteen years.

Present Exploitation.—In 1937, a small export of rubber was again commenced when old rubber grown here, chiefly *Ficus* and *Hevea,* was tapped. The quantity of rubber produced from these sources has mounted steeply under the

higher prices prevailing during the war years. Four tons of rubber were exported in 1937-38 and 54 tons in 1938-39. One hundred and nineteen tons of rubber exported in 1939-40 brought £13,328 as against £11,340 for the 315 tons of cocoa exported.

The figures for rubber and cocoa production for 1941 are not yet available, although by the end of April, 1941, 128 tons of rubber had been exported. If this rate of export continues it is estimated that over 150 tons of this product will be exported by the end of the year, which, at £112 a ton, would be worth over £16,000 to New Guinea.

It might be pointed out that two years before the exploitation was actually commenced, it was urged by this Department that the old stands of rubber present here be tapped, and through neglect to do this, more than £10,000 of revenue was lost to this Territory. The stands of rubber found in various plantations had not been brought into bearing although only a limited expenditure and low cost of production would have been necessary to produce such rubber.

In the early days of the rubber-planting industry the relative values of the various rubber trees had not been determined and *Ficus, Castilloa* and other types of rubber were widely planted until about 1909. It would seem also that *Hevea* seed was in such demand that the planters in New Guinea during the early part of the German régime were unable to get supplies and some large areas were planted with Assam rubber, *Ficus elastica,* on various plantations as indicated. The rubber obtained from this species was readily marketable at that period when the greater proportion of the rubber used in industry was obtained from Brazil and other countries as a jungle product. It eventually proved to be far less satisfactory as a plantation crop than *Hevea* and extension of its culture was abandoned, though a little rubber is still obtained from it in Assam and Burma. The chief reason why this rubber was not satisfactory was because there is a resin, ranging from 4 per cent. to 20 per cent. (grows less with age), in the rubber, which, hardening in the course of time, annuls the elasticity. The trees are tapped by slashing or incision and after three months of this the trees require a rest or they will suffer badly. As a rubber yielder *Ficus elastica* is far inferior to *Hevea brasiliensis.*

When the prices for rubber increased to around 1s. per lb. owing to war demands and other causes, the Director of Agriculture was of the opinion that the areas of *Ficus* lying idle should be put to profitable use. Tapping tests and demonstrations to planters were made in a stand of *Ficus elastica* in the Botanic Gardens, Rabaul, and the samples of rubber obtained were examined and commented on by manufacturers in Australia. Payable prices were offered and circulars were despatched to all plantations where *Ficus* areas were present, outlining the market position, methods of tapping, packing, &c. The first exports were made from a plantation near Madang where a considerable area of Para rubber was also being tapped, and the rubber prepared and sold as smoked sheet. Working the two kinds of rubber in conjunction proved very profitable to this particular planter. Upon recommendation from the Department, tapping of the *Ficus* rubber has been carried out on most plantations where sufficient areas are present.

TABLE No. 24.—AREAS OF COCO-NUTS AND RUBBER UNDER CULTIVATION—PAPUA AND NEW GUINEA.

Year.	Total Areas Planted to all Crops.		Area under Rubber.		Area under Coco-nuts.		
	Papua.	Territory of New Guinea.	Papua.	Territory of New Guinea.	Papua.	Territory of New Guinea.	
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	
1907	1,467	..	..	..	‡	..	
1908	4,955	..	1,698	..	5,365	..	
1909	7,740	45,064	1,886	..	6,716	39,595	
1910	10,053	..	2,889	..	9,513	..	
1911	15,881	58,837 / 64,599*	4,496	..	15,993	51,510	
1912	24,707	73,317	6,256	..	21,958	55,133	
1913	35,363	85,940	6,606	..	29,030	64,822	
1914	42,921	84,941	6,203	5,618	32,722	76,847 (or 77,695)	
1915	44,447	‡	7,671 (Para 1,277)	..	34,016	‡	§
1916	44,959	‡	7,760	..	34,686	‡	§
1917	47,319	‡	8,311	..	42,675	‡	§
1918	57,593	‡	8,598	..	43,560	133,960	§
1919	58,347	‡	8,363	..	46,101	‡	§
1920	62,162	‡	7,250	..	44,328	‡	§
1921–22	60,314	173,272	7,465	..	46,515	168,060*	
1922–23	60,044	172,218	7,171	3,001	46,360	167,428	
1923–24	60,863	179,163	7,481	..	46,797	172,374	
1924–25	61,180	176,460	7,846	..	48,022	171,526	
1925–26	62,981	182,118	7,728	..	50,506	174,030	
1926–27	63,000	186,006	7,981	2,757	50,218	177,621	
1927–28	61,370	195,530	8,212	..	49,244	187,650	
1928–29	60,136	197,942	8,804	..	48,363	192,377	
1929–30	59,487	200,263	9,012	..	49,072	198,043	
1930–31	58,904¼	204,075	9,075½	..	47,838	204,075	
1931–32	61,219	210,907	10,320	..	49,413	209,326	
1932–33	59,751	222,062	8,796	..	49,305	214,290	
1933–34	58,244¼	221,205	8,993	..	47,921	213,315	
1934–35	59,445	230,360	8,933	..	49,032	221,338	
1935–36	58,628	239,370	9,591	..	47,641	231,922	
1936–37	59,945	243,364	10,270	..	48,188	233,343	
1937–38	57,636	250,114	11,836	3,101*	45,207	239,869	
1938–39	59,945	261,672	12,809	2,335†	44,188	255,385	
1939–40	60,827	273,867	12,964	2,481†	44,527	261,676	

* This is the most reliable estimate of rubber area in recent years.
† Incomplete.
‡ Not available.
§ Period of military occupation. Figures incomplete.

N.B.—The acreage figures for Papua are incomplete and usually represent areas taken up for cultivation—not under cultivation. Those from the Territory of New Guinea are from figures supplied by planters and are for areas under cultivation.

There have been some inquiries as to whether collection of bush rubber would be practicable at the present time. It is known that the identification of various species of *Ficus* has not been wholly clarified by botanists, as far as New Guinea is concerned, nor have all of them been tested as to quality of latex. Most of the species of *Ficus* yield latex, but the majority have a much higher resin than rubber content; in fact, some of them contain very little true rubber at all.

As stated before, there are two vines, one a *Ficus* species and the other an *Apocynaceous* vine, *Landolphia* spp., which are present in New Guinea and yield a good-quality latex. It is extremely doubtful whether they are present in sufficient quantity to make commercial rubber collection possible. Collecting rubber from bush *Ficus* would not pay unless large stands of such rubber-yielding trees are available. It is just possible that it would pay the bush natives to collect bush rubber under supervision, but it would be necessary to provide a collecting depot and packing shed.

The market for *Ficus* rubber, at June, 1941, is becoming much more limited and certain firms are not buying it at all. This, apparently, indicates that rubber supplies to America and elsewhere are being fulfilled, though the price of Para rubber still remains above 1s. per lb. This makes it certain that the exploitation of *Ficus* rubber is only likely to be a temporary phase in New Guinea.

The Average Yield a Hectare.—Owing to irregular methods of planting and loss of stand in the old plantings, it is extremely difficult to give a reliable figure for this item as far as New Guinea is concerned. The old areas under *Hevea brasiliensis* in New Guinea should give about 950–1,000 lb. a hectare (300 to 400 lb. an acre) where the trees are in fairly good condition. The average yield in Papua is about 1,050 lb. a hectare. The yields from *Fiscus elastica*—Assam rubber—are very variable, but would probably range from 3–5 lb. and occasionally up to 10 lb. a tree and here there are usually 150 trees a hectare planted (say, 400–800 lb. a hectare). When tapping *Ficus elastica* heavy yields may be harvested for a good period, then whole areas will need resting during cessation of flow. Several areas have already had to cease tapping for extended periods owing to this cause.

It is not intended that the extension of *Ficus elastica* planting should be carried out as this tree is not nearly equal to *Hevea* for planting as a plantation culture. *Ficus* culture is only of importance as far as present exploitation is concerned and is dealt with under that heading.

Hevea brasiliensis is the only rubber tree which can be recommended for any future plantings here, hence, the main objective is to determine the prospects and possibilities of this crop.

A comparison of the areas under coco-nuts and devoted to rubber in Papua and New Guinea and the extension of areas devoted to these crops from 1907 to 1939-40 is presented in Table 24. Owing to the different régimes and types of administrative control in the history of the Mandated Territory of New Guinea, many of the figures for areas under crop are incomplete. During the period of German occupation fairly reliable statistics were kept until the first world war started in 1914. During the period of military occupation here, very few complete acreage statistics were kept.

Under civil administration, since 1921, statistics have been kept regularly, but, owing to lack of any compulsion to send in proper returns, the acreage figures are only approximate, in most years.

In Papua, acreage under crops is not recorded at all so the figures given only represent areas " taken up " for cultivation of various crops each year. Allowing for this situation, the total area under cultivation in New Guinea is much greater than in Papua and the disparity has been increasing.

In 1912, the total area under cultivation in Papua was about 25,000 acres compared with approximately 73,000 acres in New Guinea. By 1924, the comparison was 60,000 acres (or roughly three times as much) in Papua as against 180,000 acres in New Guinea; by 1934, there was practically no increase in the planted areas in Papua, while in New Guinea, the acreage had increased to 239,000 acres (or approximately four times as much). Up to 1940, this ratio of increase had not changed very appreciably though there was about a 30,000-acre increase in total acreage planted in New Guinea and comparatively little in Papua.

The difference, however, in distribution of crop acreage between the two Territories is very great. It is readily seen that most of the planted area in New Guinea is devoted to coco-nuts, e.g., 240,000 acres out of a total of approximately 250,000 acres were devoted to coco-nuts in 1937-38 or, roughly, 96 per cent. of the total planted area. Roughly the same ratio can be seen for the other years tabulated. No greater argument could be put forward as to the necessity for diversified agriculture in this country instead of putting all our resources and trust in one crop. The table shows very clearly how the area under coco-nuts has increased in New Guinea. In 1909, the area under coco-nuts was approximately 40,000 acres and this increased to 77,000 acres by 1914. By 1925-26, the area had further jumped to 174,000 acres and then increased to over 200,000 acres in 1930, while now, ten years later, the area is over 260,000 acres.

Since about 1917, the area under coco-nuts in Papua has increased to a relatively small extent, though there was a considerable increase from 1910 to 1917, cf., 10,000 acres in 1910, approximately, with 43,000 acres in 1917. From 1930 to 1940, the planting of coco-nuts in Papua has been practically at a standstill, if reliance can be placed in the figures given.

In the first part of this article (*New Guinea Agricultural Gazette,* Vol. 7, No. 3) particulars of the rubber areas in cultivation and in tapping in Papua have been discussed (*see* Table No. 3). To compare the planting position with that in New Guinea, the following summarized facts are again mentioned. In Papua, 3,808 acres of rubber, as compared with 7,740 acres total area planted with all crops, or nearly 50 per cent., was devoted to rubber. By 1912-13, the total area under cultivation had increased to over 35,000 acres of which 6,275 acres (equal to 19 per cent.) was under rubber. It will be seen that, in common with New Guinea at that period, more interest was being centred on coco-nuts. From 1919 to 1929 the acreage under rubber remained around 7,250 acres, and, owing to the low state of the rubber market, very little new planting was done.

About 1930, the area of rubber was increased to 9,000 acres, with a further increase to 13,000 acres planted in 1940. This latter figure would tend to show that about 23 per cent. of the planted area in Papua is devoted to rubber. Besides these figures the 3,000 acres approximately of old rubber present in the Mandated Territory of New Guinea make a very poor showing; this is especially emphasized when it is pointed out that a great proportion of this area is devoted to *Ficus elastica* (there are roughly 800 hectares of *Ficus* and 400 hectares of *Hevea* present), and that since January, 1941, the area of old rubber present has been reduced by over 2,000 acres, due to dying off, cutting out, &c. It seems that there must be decided economic reasons for this disparity between the attention devoted

to rubber-planting in Papua and the almost total neglect of this crop in the Territory of New Guinea. What are, probably, just as important factors are the lack of enterprise and knowledge of rubber-planting on the part of the companies and planters in this Territory as compared with the planters who have had long experience with the crop in Papua. This subject will receive separate attention when the economic possibilities of the crop are discussed.

It has been pointed out previously, that, in the Mandated Territory, by far the greater proportion of the plantation agriculture is found on islands where the soils are geologically newer. In Papua, the greater proportion of the agricultural development is on the mainland and rubber appears to be the most suitable crop for the older soils found there.

The relative acreage on the mainland of New Guinea on the Mandated Territory side would change considerably if the inland plateau approaching Mount Hagen and the Ramu was developed to cultivate highland crops such as coffee, rubber and other suitable cultures.

It would appear that good-production soils are nothing like so plentiful in Papua as in the Mandated Territory, and, because large areas for producing coco-nuts were not available, this largely turned their attention to rubber. It is certain that there are decidedly greater areas available for development of rubber culture on the newer and richer soils found in the Bismarck Archipelago, Bougainville Island and other islands at present than on the New Guinea mainland. It would be desirable, however, from the territorial point of view, to see rubber-growing started on the heavier soils of the mainland, where coco-nuts do not flourish and rubber grows well. It must be decided whether the economic factors are favorable to rubber production. It was, apparently, similar reasoning which caused the German New Guinea Company to plant out larger areas of rubber on the heavier estuarine deposits around Astrolabe Bay and near Madang.

Future Instalments.

The individual coco-nut planters, and the copra industry generally, have been greatly affected by the war position. It is, however, obvious that, at the present time, there are few funds available for further plantation development, nor does it seem that the present time is opportune to commence large-scale planting. Nevertheless, there have been numerous inquiries received in this Department as to the possibilities of rubber-planting in New Guinea; these inquiries are mainly received from planters who are tapping their old rubber stands at present. In view of this, it is considered advisable that further correlated information as to the economic prospects, cultural particulars, the position of the rubber industry in other countries, and possibilities of replacement by synthetics, should be made available to local planters.

In a partly developed country like New Guinea, the economic prospects of the various crops require elucidating before definite recommendations can be given as to what crops are worthy of large-scale cultivation.

The Department has been closely investigating the possibilities of this crop for some years. The Director has indicated on several previous occasions that certain provisos existed before rubber cultivation could be unhesitatingly recommended for this Territory. It was pointed out, however, that these difficulties were

not altogether insuperable. The probability that rubber was being over-produced in certain countries, and that, prior to the war, heavy restrictions made relatively high prices possible, were among the threatening circumstances present. The fact that high-yielding planting material is not yet available is another handicap in this country.

It is certain that war requirements and the extra demands of highly mechanized armies are largely responsible for the present payable world prices obtaining.

In future instalments of this article, it is intended to present the various cultural and economic aspects of the rubber industry as indicated.

In normal times, the area under cultivation for all crops, and, consequently the labour force required, are much greater in the Territory of New Guinea than in Papua. Papua has, however, increased the area under rubber while there has been little parallel development in the Mandated Territory. The plantations in the latter Territory are predominantly devoted to coco-nuts and the areas under cacao, and to a lesser extent coffee, are now being increased while rubber-planting is very limited.

The value of all agricultural exports from the Mandated Territory usually ranges between £800,000 to £1,300,000, while those from Papua have seldom exceeded £375,000.

The price of rubber and returns from the product have greatly benefited Papua at a period when it has only been possible to ship a proportion of the copra from either Territory, owing to the war and shipping position. The copra was utilized on the world's markets, whereas the main outlet for Papuan rubber is in Australia.

The economic position of the Territory is not now being maintained by agricultural produce. The quantity and value of gold produced has been the main factor in this, e.g., 238,000 ounces valued at £A2,193,438 in 1939, while the value of gold exported from this Territory during the period of May, 1921, to June, 1939, was valued at £A13,500,000. The increasing quantities of timber exported (chiefly New Guinea walnut, *Dracontomelum mangniferum*), and also the increase in quantity and value of cacao exports have greatly helped the position.