AN AGRICULTURAL SURVEY OF THE MARKHAM VALLEY IN THE MOROBE DISTRICT.

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This tract of country presents most interesting features, and it merits a detailed description as it appears from many points of view to be one of the most promising in the Territory of New Guinea (together with the Ramu and Purari Valleys) for the grazing of cattle, and the possible development of native agriculture under administrative supervision.

Topographical Features.

A.—Mountain Ranges.

The River Markham flows into the head of the Huon Gulf. Viewed from the sea its valley appears as a broad cleft dividing the high mountain ranges of the Huon Peninsula from the equally high mountain ranges of the mainland.

The valley runs in a north-westerly direction from the mouth of the river. At its headwaters, at an elevation of 1,350 feet, the river is separated from the Ramu basin by a grassy plain, the actual divide being almost imperceptible. The Ramu basin continues on from this point also in a north-westerly direction until the Ramu River enters the sea near the mouth of the Sepik River on the northern coast of New Guinea. The remarkable similarity in type and in direction of the two valleys, points to a common geological origin.

The valley of the Markham about half-way up, changes its direction abruptly through an angle of a few degrees, and in its upper portion runs in a more northerly direction than the lower portion. On the eastern flank of the valley at this point there is a low range of hills with a strikingly regular saw-edge summit—sierras on a small scale.

The Markham basin is bounded on the east by the high mountains of the Huon Peninsula including the Finisterre, Cromwell, Saruwaged and Rawlinson Ranges, and on the west by the Kratke, Kuper and Herzog (Buangs) Ranges. The influence on the climate of the valleys of these large mountain masses on either flank is important, and will be referred to later under "climate".

B.—Rivers.

The River Markham is approximately 95 miles in length, and flows in a general south-easterly direction into the Huon Gulf. Its course follows along on the extreme western edge of the valley bottom, practically hugging the foothills. The plains, therefore, are on the eastern side of the river, and are drained by tributary streams from the mountains on that side. They are all surface streams, some without any clearly defined watercourse, and these are apt to change their course within the limits of a wide bed. The whole width of channel of every stream is covered with water-worn pebbles. None of these rivers has a muddy bottom, and if transport vehicles come to the valley, no difficulty should be experienced in crossing. Normally the streams have little or no water except in the case of the River Leron. They rise and fall quickly, and are in fact, merely

flood channels which carry off storm waters after downpours in the mountains. Except in the case of the western bank of the Leron River which is about 20 feet high, the stream bed in every case is level with, or within a few feet of, the level of the plain.

The following is a list of the tributary streams in order of position beginning at the mouth of the Markham River, with a few notes on each as supplied by G. Bryce, D.Sc. (Edin.), late Director of Agriculture, Rabaul, in a report compiled in 1925:—

R. Munum—at 15 miles from Lae. Width of bed 20 yards. Gravel bottom. Water running only in small shallow channel. Bed level with plain.

R. Ilap—at 28 miles from Lae. Bed ½ mile across. Pebbly bottom. Water running in two channels each 20 yards across and 2 feet deep. Bed level with plain.

R. Mararomi—at 32 miles from Lae. Bed 30 yards across. Pebbly bottom. Water running in channel 2 yards across, and 2 inches deep. Bed level with plain.

R. Narawantopa—at 33 miles from Lae. Bed 10 yards across. Gravel bottom. Only a trickle of water running, stream probably usually dry. Banks 3 to 4 feet high.

R. Shangat—at 34 miles from Lae. Bed 20 yards across. Gravel bottom. Only a trickle of water running, stream probably usually dry. Banks 6 feet high.

R. Wowin—at 38 miles from Lae. Bed 7 yards across. Gravel bottom. Shallow stream occupying whole bed, probably permanent. Bank 4 feet high.

R. Romu—at 40 miles from Lae. Bed about 1½ miles across. Gravel bottom. Water running, in three channels respectively 20 feet across, 3 feet deep, 8 feet across shallow, and in third channel three small streams each 8 feet across and shallow. Bed level with plain.

R. Safeh—at 43 miles from Lae. Bed 20 yards across. Gravel bottom and dry. Banks 12 feet high. A second channel occurs ¼ mile to the west. Bed 60 yards across, gravel bottom. Stream 8 feet across and shallow. Banks 3 feet high.

R. Leron—at 50 miles from Lae. Bed about ½ mile across with pebbly bottom. Three streams each 10 to 15 feet across and 1 to 2 feet deep. Main stream 25 yards at crossing, and 3 feet deep, flowing about 8 miles per hour. East bank level with plain. West bank 18 feet high. Stream bed 4 yards across with sandy bottom. Stream 20 feet across, 3 feet deep. Banks 3 feet high.

R. Iroap—at 56 miles from Lae. Bed 20 yards across with gravel bottom. Stream 20 feet across and 2 feet deep, banks 3 feet high.

R. Manyang—at 66 miles from Lae. Bed 2½ miles across with gravel bottom. Bed level with plain. Four main channels respectively 150 yards across, 100 yards across, 50 yards across, and 200 yards across, each with an insignificant flow of water.

R. Oroboar—at 68 miles from Lae. Bed 30 yards across with gravel bottom. Stream 20 feet across, shallow. Bed level with plain.

R. Markham—Markham crossing at 70 miles from Lae. The bed at the crossing from the Atzera to the Amari district is about 600 yards across with a pebbly bottom. There are three channels, but only one contained water, and this was about 30 yards across, 3½ feet deep with a flow of 8 miles per hour; the stretch from Gabsonket to the sea, down which we travelled by raft, is about 20 miles in length. The breadth of the bed is about ¼ mile, the stream is much broken up into channels by sand and gravel, with banks of considerable size. The channels vary in depth, generally only one channel being navigable by canoes or rafts It is unlikely, therefore that it will prove of any great use for transport.

NOTE.—The Rivers Ilap, Romu, Manyang which are described as having beds of 1 or 2 miles across are in reality surface streams, flowing only after rain in the hills. The whole width is unbroken, the bed being frequently split up by banks of varying depths covered with grass. These rivers, obviously, change their channels frequently within the limits of the bed as indicated by Dr. Bryce, and it probably gives a truer appreciation of the circumstances to set down, as he has done, the whole width of country over which they flow at one time or another. They present no difficulty to wheeled transport, save that of loose gravelly surface and an occasional flood.

C.—PLAINS.

The Markham Valley from the sea to its headwaters forms one plain with a gradual rise in elevation. The elevations noted on this inspection are—

Lae—sea level.
River Wowin—480 feet.
River Leron—600 feet.
River Markham crossing—1,250 feet.

Laterally the valley is level throughout its course, and the valley floor may be represented diagrammatically as an inclined plane rising from the sea level. There are, of course, fluctuations in level, notably slightly undulating country west of the River Wowin, but these are inconsiderable, and the diagrammatic representation may be taken as true for all practical purposes.

With such conditions as to level, it is to be expected that the plain would be well drained, and this is the case. There is an almost complete absence of swampy land, such infrequent marshes that occur being small in size. The largest marsh seen is 6 miles east of the Leron River, and measures approximately ½ mile in diameter.

As the valley floor is level across its width, the foothills on each side appear to arise abruptly from it, though the actual angle of their slope is not great.

The Markham plains are a remarkable feature in a mountainous country like New Guinea, and indeed, considered in conjunction with the topography of the district, they would be remarkable anywhere.

Between the Rivers Ilap and Iroap—a distance of 30 miles—the valley is, on the average, 12 miles wide, and in the vicinity of the River Leron—where there are no trees—the whole sweep of the valley with the mountains towering in the distance lies before the eye.

Similar wide views may be obtained in other parts of the valley, but the presence of trees reduces the area visible at any one time.

The estimated area of the plains of the valley as shown, may be taken conservatively—

Gabsonket to the River Wowin ..	..	378	square miles
River Wowin to River Leron ..	..	243	„ „
River Leron to River Iroap ..	..	97	„ „
River Iroap to River Markham	..	110	„ „
River Markham to the valley-head	..	100	„ „
River Watut Valley	..	120	„ „
Total	..	1,048	„ „

The forest area at the river mouth is not included here, and it must be remembered that the River Watut comes in on the west side of the Markham River.

To obtain the cultivable position there requires to be deducted the areas of river beds from which the soil has been denuded. The areas occupied by the above rivers are estimated as under—

River Markham	..	95	square miles
River Ilap	..	27	„ „
River Romu	..	27	„ „
River Leron	..	36	„ „
River Manyang	..	20	„ „
River Watut	..	20	„ „
Others streams, say	..	100	„ „
Total	..	325	„ „

The total area of cultivable land is, therefore—

1,048 less 325 equals 723 square miles or approximately 450,000 acres.

D.—Geological Features.

It has been suggested elsewhere from time to time, that the valleys of the Markham and the Ramu owe their origin to a great fault or rift in the terrain, although, incidentally, this fault has been utilized by both rivers as a convenient means of access to the sea.

The valley is bounded on either side by high mountain ranges which reach an altitude of 12,000 to 13,000 feet, and exercise a profound influence on the climate of the valley plains below.

The sierra in the Leron region is composed of conglomerates, soft friable sandstone and mudstones with fossil shells. Many water-worn pebbles of these rocks were seen in the bed of the Leron. These sedimentary rocks probably continue down the valley towards the coast, though they do not form in other places this remarkable saw-edge summit. In the stream flowing through the forest region near the mouth of the Markham River brown coal has been picked up. The deposit has been known for some considerable time. This deposit probably comes from the same geological formation as that of the sierra.

The rocks forming the high mountains behind the sierra and on the Huon Peninsula are apparently mainly diorites, as the greater portion of the large pebbles in the river-beds is derived from this rock.

No metamorphic rock specimens were seen. On the western side of the valley outcrops of crystalline limestone occur.

The geological history of the region in recent times gives the impression that the Huon Peninsula was an island, and at this stage the corals were formed. As the land rose the sandstones and conglomerates of the sierra of the Leron region were deposited, and at the same time the fine loam of the valley bottom was laid down. Subsequent uplift must have been rapid as the valley still presents these features in its present condition. It seems probable that the soil of the valley was laid down under estuarine conditions, and the presence of brown coal near the mouth of the valley tends to support this theory. It does not seem to be possible otherwise to explain the great depths of fine loam that are to be seen in the river-bank sections, where the surface loam is found unchanged at depths of 20 feet or so, below soil level. Many profiles were examined over various parts of the valley, and in no instance was the transition from soil to sub-soil in any such sections observed.

E.—Soil.

The soil of the valley is one of its most outstanding features. In view of the type of soil deposition it would be natural to expect the valley to be extremely fertile, but actually the fertility is anything but consistent throughout. The so-called Markham Valley is really a rift, and the whole country is geologically very new, and shows evident signs of recent uplift.

The Markham and its tributaries have not yet had time to carve out beds for themselves, and at present they are shallow and turbulent streams flooding over the surrounding surface. In some cases they have actually built up a bed for themselves that is higher than the level of the surrounding country. The current is in all cases very swift.

Considering the moderate volume of water these rivers usually carry, their beds cover a very wide area since they frequently change their courses. The Manyang River, for instance, has a course which is 3 miles wide, and flows in two or three channels. It brings down large quantities of stones, gravel, and coarse sand, and frequently bursts its banks, tearing out fresh channels, and depositing large quantities of rubbish, thereby ruining much good agricultural land. The Ramu is another example, but in this case the stream passes through foothills of sandstone, and consequently alluvial deposits of sandy loam are beginning to form in the lower reaches of its course.

The Markham itself is so swift flowing, and has such a steep bed, that it has not yet had time to deposit much alluvium on its banks, and its flood plains are consequently covered with stones and layers of coarse gravel.

To the casual observer the vast plains of waving grasses will convey an impression of luxuriance and deep fertile soils, but the hasty survey the patrol was able to make showed that this was not the case.

Large areas of fertile soils do occur, but equally large areas consist of shallow stony soils, which would probably not be worth cultivating, although they should eventually prove to be of considerable value for pastoral purposes.

The land on both sides of the Leron River several miles in width, consists of gravel patches covered with a thin layer of soil varying from 3 inches to 1 foot in depth.

Away from the river banks the soil often improves, but generally speaking the extent of good soil is larger between the Wowin and the Ilap rivers than it is between the Wowin and the Leron. However, about a mile north of the Wowin River, a stretch of exceptionally fertile soil occurs which appears to have been an old lake-bed several square miles in extent.

The soils in the valley are generally black, chocolate or grey coloured medium loams with good sub-soil drainage, towards the headwaters of the Markham River. Large areas of this type of land with a foot to 18 inches of soil may be worth experimentation with shallow rooting crops, more especially as they are not deep enough for bananas, taro, yams and other root crops, and so are not likely to interfere with the native food supply.

The deep heavy soils are usually denoted by a heavy growth of Kunai or "blady" grass (*Imperata arundinacea*), heavy swamps carrying cane-grass (*Saccharam spontaneum*) and a reed.

Soils of medium depth carry a heavy growth of Kunai mixed with a large kangaroo-grass (*Themeda gigantea* or *Anthistera sp.*).

Shallow stony soils carry sparse short kangaroo-grass probably *Themeda elatior*, and a smaller annual species.

The incidence and growth of the above grasses afford a very good guide to the character of the soil in the valley.

Sufficient was seen to indicate that when this valley is opened up and land settlement is undertaken, as presumably will be the case, one of the first things to be done will be to make a careful soil survey of the whole area, since the character of the soil varies greatly and within short distances.

F.—The Climate.

No accurate information of the rainfall, temperature, and humidity are available since it is only recently that this area has really come under control. There seems to be no doubt, however, that the lower part of the valley has a different season from the middle and upper portions.

However, an average rainfall of 100 inches per annum was recorded over a period of five years at Kaiapit (approximately 70 miles from Lae) by the Lutheran Missionary stationed there, whilst at Sangan Experimental Station in 1926, about 55 miles from Lae, and in the centre of the valley, an average rainfall of 70 inches was recorded. In both cases practically the entire rainfall was recorded during the north-west season.

The average annual shade temperature noted was 86 degrees.

The dense heavy rain-forest around Lae and for about 28 miles inland has a much greater rainfall than the upper reaches of the Leron River during the south-east season, i.e., from June to October.

The dividing line between the two regions is somewhere about the line of the Ilap River, which is 4 miles beyond Gabsonket village, and about 28 miles from the sea. From here up the valley there are signs of a much drier climate, and it is believed that the majority of the rain falls during the north-west season, November to May. There is no record of the total annual rainfall, but it is obviously very much less than lower down the valley or in the ranges that bound the valley on either side.

One peculiar feature of the climate is the prevalence of winds. The occurrence of high winds from the north-west at certain seasons has been remarked by the Reverend Oertel, Lutheran Missionary at Kaiapit, and likewise the prevalence of winds from the opposite direction during the south-east season. This was particularly the case in the treeless region in the neighbourhood of the Leron and Wowin rivers.

Two other climatic factors are worthy of mention. They are atmospheric humidity, and the prevalence of cloud and of early morning mists, as in the Wampit and Bulolo valleys.

The two main climatic seasons in this territory are controlled by the north-west (monsoonal), and the south-east winds respectively.

The north-west period is generally regarded as the wet season, but there are places in the territory where the position is reversed. The coastline fronting the Huon Gulf from the mouth of the Markham River to Cape Fortification enjoys a dry spell in the north-west monsoonal period, and gets all its rain in the south-east season.

Prevailing winds are the decisive factor, governed by the coast and inland mountain ranges, for the annual rain period, and for this reason, contrasting conditions appear at small distances apart. Thus as might be expected over such large land areas as are found in this valley, the climatic conditions vary considerably.

During the north-west monsoonal period, although the Huon Gulf country is undergoing a dry spell, the inland mountain ranges are being subjected to continual heavy rains, and it is during this season that the Markham River becomes a raging torrent, overflowing its banks for many miles, and inundating low-lying country for weeks at a time.

G.—Botanical Features in the Valley.

Although no definite data is available as to the origin of this grassland, the presence of old devoru (*Alstonia scholaris*) and other trees are proof that the land was once covered with intermediate forest, and that the present growth has been artificially caused by the shifting agricultural methods as practised by natives in the past.

Grass cannot ordinarily compete with weed-trees, and were it not for the annual burn-off, to which this valley is regularly subjected, it would not be so very long before the valley would be converted back from grassland to secondary forest.

Unfortunately, the native pursues only one system of agriculture throughout the whole Territory of New Guinea as he has not yet learned the use of modern implements and methods. This system comprises the cutting down of bush, burning it off, and the planting of tuber crops. When the ground is thoroughly worked out grass and weeds and small trees take hold, but before the latter can become permanently established, fires are lit by the natives in the dry season to drive out the bush rat, pig and wallaby, which are hunted for food. Thus the natives have come to rely upon these annual burnings as one source of food supply. Were the native to forego burning the grasslands for a few years, the weed-trees (low secondary bush) would doubtless re-establish climatic conditions and environment; woodlands have a decided advantage over grasslands.

Throughout the whole of the areas examined weed-trees were seen struggling for existence, and of the many varieties observed, the extraordinary predominance of *Albizzia procera* in the drier, and *Sarcocephalus* (*Nauclea*) in the wetter areas were noted species. Here and there in the valley, but more particularly east of Chivasing village, thick barked *Clerodendrons* flourish despite fire, whilst *Erythrina* thrives along the higher banks of watercourses.

Grasslands occur sporadically between Kaiapit and Sangan, but it is only after leaving Sangan that the first of the large areas of grasslands occurs. Between the villages of Chivasing and Sangan lies a considerable flat stretch of country comprising the cleanest stand of pure grass in the valley. This stretch is broken by the Leron River and its confluents, which are timbered along the banks, but apart from these, the land is free from tree growth.

Along the foothills of the mountains to the north and stretching down into the plain for perhaps 2 miles, a cycad (*Cycas media*) is to be found, and this gymnosperm is so numerous as to give character to the landscape. The area of this stretch of country would be about 60 square miles, and in this area there are no pure stands of kunai grass (*Imperata arundinacea*) to be seen.

The flora on this portion of the valley contains an admixture of grasses, the main two being "kunai" (*Imperata arundinacea*), and a species of "kangaroo" grass (*Themeda* or *Anthisteria sp.*). The proportion of the two grasses would be approximately 25 per cent. kunai to 75 per cent. kangaroo.

In addition to these two grasses many more were seen, including a species *Saccharum spontaneum*, which occurs in damper lands, and a wild sugar-cane *Saccharum robustum* predominates along the low-lying stony river flats where the land is subject to flooding. *Saccharum spontaneum* grows profusely, and takes up all the marshy land, and in March and April the banks of the Markham, and most low-lying land in the valley are white with tasselled tops of this species. This grass is closely related to the Pollinia grasses of which possibly many more occur than were seen, owing to the nature of the country and the limited time available for inspection.

On the better quality and deeper alluvium, kunai grass takes a firm hold, but on the poorer stony soils such as those found on the slopes of the valley, kunai grass is gradually replaced by kangaroo grass, and as one ascends higher the kunai is completely eradicated by this species.

This grass extends into the hills on either side of the valley, and, aided annually by the natives' hunting fires and clearing operations, has reached an elevation of approximately 3,000 feet in places. Thus, with the help of this kangaroo grass, the savannah of the Markham Valley has extended up into the mid-mountain forests. Two varieties of this grass were seen, and have since been identified as *Themeda gigantea* and *Themeda amboinensis*.

On leaving this area and proceeding out into the valley towards the Markham River about 50 miles from the coast, we find that the admixture of kunai and kangaroo grass is gradually replaced by *Saccharum spontaneum* (wild cane of Asia), and the dense matted rhizomes of these two main grass species form those grasslands which prevent the establishment of the rain-forest timber species.

These grasslands are not natural xerophilous regions, but are converted rain-forests, whilst on the less fertile land secondary weed-tree growth has established itself. Thus throughout the valley there are large areas of grasslands dotted with trees which, from a distance, give the appearance of natural savannah forest.

That cultivation began and hunting fires finished the conversion of this area is evidenced by the presence of significant devoru (*Alstonia scholaris*) and various living trees on all parts of the valley. Thus on land which has evidently been farmed continuously for many years we find *Macaranga spp.* cropping up, and to a lesser extent *Kleinhovia hospita, Alstonia longissima* and *Ginginsia pruinosa.*

Originally the gully forests were made up of hygrophyllous trees, but now only fire-resisting species such as Clerodendrons can establish themselves in open forest formation.

Albizzia sp. are treelets which spring up all through these grasslands, Chivasing and Wowin, and as previously stated, are present in extraordinary quantities. These are not large trees, and with the exception of *Albizzia alba,* which yields a valuable hard wood that is white ant resisting, the wood is of no consequence. They are a savannah forest type, and become leafless in the dry season when they also seed prolifically.

Various varieties of *Albizzia* were noticed throughout the valley of which possibly the commonest is *Albizzia moluccana,* and *Albizzia alba,* but perhaps the most predominant variety is *Albizzia procera* which occurs on the moister lands, and all grow as well here as in the rain-forest.

Two other varieties of trees which are worth mentioning were noticed in the valley. They have no known commercial value, and are only mentioned because of their recurrence throughout the valley.

The first *Rhus simarubaefolia* occurs in wooded gullies or edaphic regions of the grassy hills in the valley, and the second, known as *Diplanthera tetraphylla* is to be found in grass patches up the slopes of the valley between 1,000 and 2,000 feet.

Many other varieties of trees were seen along the edges of the valley, and these will be mentioned later.

Prior to enumerating the various Gramineae found in the valley it is necessary to indicate this important fact, that, apart from several small isolated stands of pure kunai of only a few hundred acres in extent, it was found that the Markham Valley is covered with a very mixed stand of grasses, the predominant species in their order of importance being—

Imperata arundinacea (*Imperata cylindrica*).
Themeda gigantea.
Saccharum spontaneum.
Imperata exaltata.
Eragrostis vars.
Paspalum vars.
Polliniae spp.

On the poorer types of soil bordering the upper reaches of all rivers or confluents, and on all grass-covered hills, *Anthistiria gigantea* predominates, completely eradicating kunai grass.

On higher land a species of the sub-family *Andropogoneae*, identified as *Andropogon serratus*, is to be seen, and to a less extent *Cymbopogon nardus var-Flexuosus*, and it is quite possible that many more varieties of *Andropogoneae* thrive in these regions than were observed.

In addition to *Imperata arundinacea* (kunai) in the valley, another grass was noticed occurring with it, but more particularly in the moister areas, which very closely resembles kunai grass, and this is probably a variety known as *Imperata exaltata*.

Other *Gramineae* identified were *Coix lachyrma-jobi* (a native of India) which was found in waste areas; *Eragrostis elongata* and *Chrysopogon aciculatus* (Love grasses); *Eleusine indica* (finger grass) was also noticed on wet, moist places; *Manisuris granularis* was seen vieing with kunai in places, and another variety known as *Manisuria cylindrica* found growing on marshy areas. Pigeon grasses *Setaria aurea* and *Setaria glauca* (based on *Panicum glaucum var. elongatum*) occur all through the valley as do Panic and Paspalum grasses of which the most common is *Panicum pilipes, Panicum distachyum, Paspalum conjugatum* and *Paspalum longifolium*. Both these grass types occur on open plain country. Two other grasses identified as *Polytoca macrophylla* and *Apluda mutica* were noticed frequently amongst the taller perennial grasses, and to a lesser extent *Pogonatherum crinitum*.

A good fodder grass known as *Pennisetum marcostachyum*—closely resembling the well-known *Pennisetum ruppellii*—occurs, together with *Sorghum plumosum*. This latter is a wild sorghum found in most tropical countries, and often referred to as *Andropogon australis*.

Several *Ischaemum* grasses were seen to be thriving well in thickets bordering low-lying wet lands, the only one identified being *Ischaemum muticum*; but possibly varieties such as *Ischaemum intermedium* and *Ischaemum turneri* also are to be found, as conditions are similar here to other localities in the territory where these varieties are known to exist.

The mountains south of the Markham River and running parallel to it are clothed in forests, into which in some cases, as previously stated, grass has forced its way; but the mountains along the northern boundary of the valley are almost entirely clothed in artificial grassland. On the north-east corner of the valley, however, a lot of natural forest still remains, and here an indication as to the nature of the tree growth was obtained.

In flying over this country it is most startling to see such a large sea of grassland country lying adjacent to a typical rain-forest, in some cases completely surrounding it, whilst on the slopes of the valley at no greater height than 2,000 to 3,000 feet, areas of the conifer known as Hoop Pine, *Araucaria klinkii*, are to be seen growing alongside *Sarcocephalus* species.

On the lower slopes the following species were seen:—

Afzelia bijuga (*Intsia bijuga*).
Gnetum gnemon.
Pometia pinnata.
Breynia cernua.
Albizzia moluccana and *Albizzia alba*.
Chisochaeton biroi, *Dysoxylum* spp., *Baccaurea* spp. } affinities.

In addition to these, other trees forming the rain-forest belt on lower-lying country are enumerated as under:—

Celtis philippensis.
Pterocymbium spp.
Octomeles sumatrana.
Bombax malabaricum.
Vitex cofassus.
Morinda citrifolia.
Chrysophyllum roxburghii.
Planchonia timorensis.
Alstonia scholaris.

Of the above there appears to be a predominance of *Celtis philippensis.*

Several herbs occur amongst the grass, the more common being *Osbeckia chinensis* and *Exacum tetragonum*, whilst another small plant known as *Bola (Baca) lanuginosa* was noticed in abundant quantities in the grass hills. *Urena lobata*, a mallow, was also seen in the valley but not in large quantities.

Many years ago the Administration commenced a roadway from Lae to Gabsonket village, but this scheme was abandoned in favour of aerial transport, and at the present time this road is impassable for traffic; indeed it is with the greatest difficulty that one is able to traverse the road on foot.

The usual method of transport down the Markham River is by raft, for owing to the swiftly flowing nature of the Markham, and its many confluents—which are of an extremely shallow nature, and contain snags and debris in great quantity—boats or canoes are impracticable.

The favoured method of transport to-day is by aeroplane, as there are many aerodromes and emergency landing grounds situated throughout the valley. The same may also be said for the Ramu Valley.

Should a time come when these valleys are occupied and cultivated by settlers, it will be necessary to re-open the road from Lae which was originally commenced by the Department of Agriculture, in 1926, as a means of communication to the "Cotton Experimental Station" situated at Sangan.

In conclusion, it may be stated that the Markham and Ramu valleys have a healthy climate suitable for white settlers, a soil of great potential fertility, and a climate suitable for the grazing and fattening of cattle.

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