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Some Aspects of the Regional Geography of Kerala *

By

GEORGE KURIYAN, B.A., B.Sc. (LONDON)

From very early times, the southern parts of the country lying to the west of the Western Ghats have been designated Kerala. Traditionally it extends from Gokarnam (near Goa) to Cape Comorin and is said to have been regained from the sea by Parasu Raman. Standing somewhere near Gokarnam Parasu Raman is supposed to have thrown an axe¹ with tremendous force right over the sea. By some wonderful miracle it is supposed to have been carried onwards as far as Cape Comorin and all the sea between the two places dried up and was transformed into that tract of level land to which we now give the name of Kerala. I have elsewhere² shown that such legends are not to be merely rejected as altogether puerile, that they chronicle in the imaginative style of the poets the effects of the changes of the shoreline, merely describing in a figurative manner that the lowlands of Kerala have been raised from the sea.³

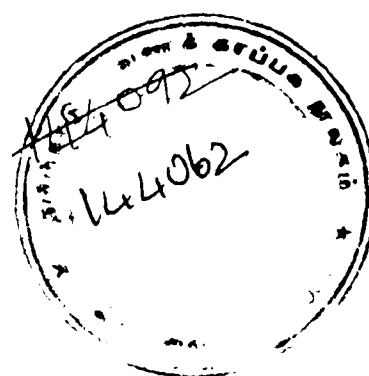
*Presidential Address delivered at the Geography and Geodesy Section of the Indian Science Congress, Baroda, January, 1942.

1. In another form of the legend a rice winnow.

2. Indian Geographical Journal, Vol. 16, No. 4.

3. Trans. Orient. Hist. MSS., Vol. 1, page 153 and Vol. 2, page 55.

According to orthodox Christian chronology, the nearest conjecture we can form regarding the date of Parasu Raman is that he lived sometime during the 1000th year after the flood.



Innumerable suggestions have been put forward regarding the origin of the word 'Kerala' and when authorities of great repute have differed so remarkably, it is difficult to arrive at any definite conclusion. Probably as the Rev. Mr. Foulkes contends, Chera and Kerala denote the same country, Kerala being the Canarese dialectical form of the word Chera. Dr. Rottler in his Tamil dictionary and Dr. Gundhert in his Malayalam dictionary subscribe to this view.⁴

The extent of Kerala varied very considerably in several periods of history. Pliny in the first century A.D. makes a mention of the country without giving its exact frontiers. The Periplus is more definite and states that 'it' extends from Nouro (Cannanore) and Tyndis (Tundi) in the north to Nelcynda (Nirkunnam or Niranam?) and Barake (Bakare, Barakare?, i.e. Porkad? or Mavelikara?) in the south'.

Some of the more remarkable of the vegetable and animal products of the Malabar coast have been known to western nations from times antecedent to the Christian era and have been the objects of maritime enterprise and commerce, through all the succeeding centuries. Perhaps as early as the time of Moses, the great Jewish lawgiver, this commerce existed, for cinnamon and cassia played a part in the temple services of the Jews; and at any rate, the commerce existed in the time of King Solomon (B.C. 1000), for the Bible

4. The word is supposed to have been derived from the word Keram—a contraction of Nalikeram, the Sanskrit name for coconut. The Periplus Maris Erythraei (McCrindle) gives an exhaustive list of the imports and exports of the several trade centres in Malabar and it is noteworthy that there is no mention among these of coconuts or of coconut produce of any description. If the coconut tree had existed at this time in this region, it is certain that the produce of such a notable fruit tree would have been exported and would then have been mentioned. It may thus be safely concluded that coconut—the southern tree as the Malayalees call it—was introduced after the first century A.D. It was probably cultivated on the coast at the time of the Syrian Christian Copper plate grant (early part of the ninth century A.D.), for the professional planters of the coast, the Tiyyar or the Cingalese, organized as a civic guild, were then well established and tradition says that they came from the south, bringing with them the southern tree, the coconut to wit. Vide Logan, *Malabar*, p. 80. (Tiyyar is a corruption of the Sanskrit word Dvipan passing through Tivan, a name which is even now applied to the caste. Simhala was the ancient name for Ceylon and the other caste name of the planters must have passed through Simhala to Sihala and Ihlavan and finally to Ilavan).

Another theory as suggested in the Keralolpathi is that the country takes its name from Cheraman Keralan—one of the sovereigns among the

narrative records that 'silver' was nothing accounted of in the days of Solomon, that everything was of 'gold.' 'The king had at sea a navy of Tharshish... bringing gold and silver; ivory and apes and peacock.'⁵ With the exception of perhaps silver, these are all products of the Malabar coast and the Biblical name for the peacock-tuki—is evidently the Tamil-Malayalam tokei, the bird of the tail. Again Solomon obtained his gold from Ophir. It may, however, be pointed out that Beypore lies at the mouth of a river of the same name which till recently brought down gold from the auriferous quartz regions of S.E. Wynad, the mines of which were well worked in prehistoric times;⁶ that Tyndis, 'the village of great note situate near the sea' mentioned in the Periplus, lies close to Beypore on the southern bank of the same river and the country lying inland from these places is still called Ernad—the bullock—that is grazing country. If Ophir as is generally supposed meant the country of Abhira or cowherds (Kurumbar and Kurumbranad?) then the name Ophir fits the locality exceedingly well. The fact remains that even to this day Jewish colonies are settled on the coast and if their progenitors, often of course replenished by further immigrations, did come with King Solomon's fleet, they have at least traditions which carry back their arrival on the coast to the time of their escape from servitude under Cyrus in the sixth century B.C.⁷

This region of Kerala has a certain peculiarity of its own; it lies on the south-western corner of India, cut off from the east coast and the Deccan by the barrier of the Western Ghats, which is broken only in two places within the limits of the area, in the Palghat Gap (utilized by the S.I.Ry.) and in the Aramboly gap in the south (utilized by the Nagercoil-Tinnevely road). Climatically the whole of the west coast including the Konkan region which lies

Perumals. This is however equally impossible as there is every indication to show that the country had its name long before the advent of this legendary Perumal. Vide Nagam Aiya, *Travancore State Manual*, Vol. 1, p. 2.

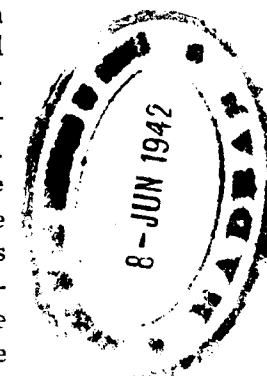
Again in the Puranas it is said that Parasu Raman desired the Trimurthis and the Devas to give a fitting name to this land and Lord Siva called it Kerala in honour of the marriage of the Sea King's daughter to Keralan, son of Jayanti.

It is thus clear that the origin of the word cannot be satisfactorily explained.

5. I King X, 22.

6. In the opinion of the G.S.I. it would be commercially feasible to extract gold from this region even today.

7. Logan, *Malabar*, Vol. 1, page 248.



further north, is clearly different from the adjoining regions. The rainfall in Kerala is ordinarily very heavy and the crops need irrigation but rarely. The Konkan region has apparently much in common both geologically and climatically with the region of Kerala, but the language is Kannada, the customs, manners, mode of dress, the devolution of property; etc. are all different. It has therefore been considered advantageous to limit the scope of this paper to the cultural region of Kerala where Malayalam is the predominant language. I have thus included in this region, the Indian states of Travancore and Cochin and the District of Malabar together with the taluk of Kasaragod which lies in South Kanara—the predominantly Malayalam speaking region.⁸ It extends from 8°4' N. to 12°48' N. and 74° 53' E. to 77° 35' E. It is bounded on the north by the Mangalore taluk of the District of South Kanara, on the east by Mysore, Coorg, the Nilgiris, Madura, Ramnad and Tinnevely and on the south and west by the Arabian Sea. The eastern boundary in general coincides with the watershed of the Western Ghats and this is particularly true of the eastern frontier of Travancore. The distance between the Ghats and the sea varies considerably. It is maximal in the northern parts of Travancore where it is in excess of 60 miles while in north Malabar it diminishes to less than 20 miles and in the south almost tapers to a point at the Cape. The region is well watered by numerous westward flowing perennial torrents all of which have their origin in the Western Ghats. The longest of them is Ponnani (Bharata Puzha) which is only 156 miles in length. Clearly the rivers of Kerala bear no comparison with the much longer rivers like the Cauveri, Kistna or Godavary of the Deccan. Most of the rivers just before they enter the sea are deflected southwards and flow in a generally southerly or southwesterly direction parallel to the coast.⁹

The backwaters and canals are a peculiar feature of the area extending from Tirur in the north to Trivandrum in the south for a distance of about 220 miles. Although they lie detached from one another, canals have been constructed to link them up, thus affording cheap and easy continuous communication. In days gone by, when wheeled and pack bullock traffic was the only means of trans-

8. North of Chandragiri river, Kannada becomes important.

9. Note the contrary feature on the east coast. Possibly this is due to the N. S. direction of the currents in the Arabian Sea along the coast Kerala. It may also be due to this that the lakes and backwaters get wider towards the south while they are narrower in the north. The deposit of river borne material is much greater in the north than in the south.

port known, this system of waterways must have been the cheapest and the best means of communication. It is therefore easily comprehensible how the backwaters system exercised considerable influence on the political, commercial and industrial activities of the country. All the foreign nations who started their commercial enterprises in the West Coast were eager to get hold of sites for factories and fortresses at advantageous positions on the rivers and backwaters.¹⁰ The Europeans were not the only peoples who saw the advantages of settlements on a river bank, or at the mouth of a back-water or 'Kayal'. Mention must be made that more than 90% of the Mahomedan settlements even to-day are situated likewise.¹¹

Geology

The main rock formations of the region are the prevalent and foundational crystalline gneisses, the lateritic formations, the Warkkalay beds and the recent deposits.

Crystalline rocks of the region consist of various kinds of gneisses of which charnockites and leptynites are the most common; north is charnockite and south is leptynite. The leptynites overlie the charnockites in general. Although the prevailing rocks are leptynites in the south, the charnockites are seen to underlie the leptynites in valleys and other depressions, while no leptynites are seen in the north even in deep valleys. In a remote geological age, probably the leptynites extended further north and covered the whole area now overlain by charnockites and other nongranetiferous rocks. It is conceivable that the Western Ghats were formed by a thrust of charnockite magma below a previously formed leptynite crust, which was denuded away in the course of ages.¹²

Laterites.—The gneisses of Kerala have an extraordinary tendency to weather into white, yellow or reddish felspathic clayey rocks which often vary extensively and ultimately became laterites

10. e.g. The Portuguese and Dutch establishments at Cannanore with an outpost at Mt. D'Elh commanding the river navigation of North Malabar, the English factory at Tellicherry, the French at Mahe, the Danish at Edava, the Dutch at Tangassery, etc. The Dutch, Portuguese and English fought for Chettwa, because it stood at the mouth of a broad river with an extensive backwater system in the north.

11. The Mahomedans are mainly commercial in their occupation.

12. The absence of the leptynite in the regions of heavier rainfall suggests this hypothesis.

in many places, but the change from weathered gneiss to this belt is not sharp. There is no doubt that the upper surface generally over large areas is lateritized to a certain depth irrespective of the constitution of the strata. The alteration of the gneisses is irregular and begins at an elevation of about 400' above sea level and it extends as a fringe of varying width along the lower slopes of the mountain. At a still lower level between 200 to 250' there is a better defined belt of more decidedly lateritized form of weathered gneiss, in which the unaltered rock occurs less frequently, and then always in more or less flatly rounded humps and masses, which never rise above a general dead level.¹³ In Malabar the plateau character of the lateritic gneiss is very well developed. It is therefore true to assume as a general rule that lateritization is characteristically found at an approximate elevation ranging from 250' to over 600'. I have elsewhere made a detailed study of the topography of the lateritic regions of Kerala, wherein it has been shown that the narrow West Coast presents unmistakable traces of a plateau or terraced character which is best displayed about Trivandrum, Malappuram and in several parts of the Chirakkal taluk.

Warkkalay formations.—In some parts of Kerala, to the west of the lateritic formations are found the Warkkalay beds¹⁴ which constitute the sea-ward edge of the plateau and they present similar features, bare, grass grown, long flat undulations of laterite, forming the higher ground, about 250' above the sea level. They extend as far north as Kottayam bordering the backwater tract in the east and probably much further northward as is evidenced by the lignite deposits in Cannanore and Beypore. Somewhat similar beds occur further north near Ratnagiri on the Bombay Coast. The Warkkalay beds are, without doubt, aqueous in origin.

The marine lateritic terrace and the Warkkalay formations are probably of upper tertiary age and equivalent to the Cuddalore sandstones of the Coromandal coast, late tertiary or post-pliocene. They mark, like the long stretches of laterite and sandstones on the East coast, the last great or decided elevation of South India, prior to which, as is very probable, the Indian land arose almost directly from the sea by its Western Ghats.¹⁵

13. Records of the Geology of Travancore, Vol. 1.

14. The most characteristic formation of the Warkkalay beds is the lignite bed which is exposed at the base of the cliff at Warkkalay.

15. Logan, *Malabar*, Vol. 1, p. 26.

Recent Deposits.—West of both the lateritic formations and the Warkkalay beds along the coast, occur the recent deposits which are the usual blown sands and alluvial sediments of the low flat country, of perfect stretches of lowland, almost at sea level, marked by sandy and alluvial flats. These widen out north from Quilon until at Alleppey there is a width in excess of 12 miles with the very extensive backwater which stretches far past Cochin. This is continued further north through the Trichur lake, the Taliparamba and Valarapattanam rivers to those on the Kadalundi river. To the south of Quilon and north of Calicut, this formation occurs as a very narrow strip bordering the sea.

Immediately after the upheaval of the Warkkalay formation, this backwater tract north of Quilon must have been an extensive bay¹⁶ breaking its waves on the dry land which now forms its eastern boundary. Into this bay were discharged the waters of the Periyar, Pampa, Chalakudi, Ponnani, etc., heavily charged with sediments resulting in the formation of a sand bank which is represented by the present sea coast, north of Quilon. The lagoon formed between the sand bank and the main land was gradually silted up to give rise to the wet paddy lands and coconut groves which now characterize this tract. The comparatively deep kayals (backwaters) are only the remnants of the lagoons which have not been silted up. The marine nature of the formation is evidenced by the lowlying sands of the sea coast which consist of sea sands and calcareous matter, combined with various kinds of earth and clay.

Based upon the type of the main rock formation like the laterites, the Warkkalay beds and the recent sediments, it is possible to suggest that the region of Kerala has been lifted up from the sea in post-pliocene times. The remains of marine animals and plants found within the region almost conclusively confirm this suggestion. In addition, an analysis of the several place-names on the eastern shores of the backwater shows that the sea coast must originally have run along this area extending up to the foot of the Ghats. The land of Kerala has been literally raised from the sea. The tradition of Parasu Raman having achieved this by superhuman powers is only the description of an apparently miraculous event in grand poetic style, with a considerable amount of embellishment.

16. The presence of coral reefs at Vazhappally in Changanacherry is certainly conclusive evidence of the much wider extent of the sea in those times.



It is thus seen that some general relations exist between the contours and the geological formations. The coastal lowland composed of recent sediments has a maximum elevation of about 250' and east of it is the area of foot-hills ranging in elevation from 250' to approximately 1,000', where lateritization has taken place. Tongues of lowland, however, enter into this area through the course of the main river valleys. The metamorphic rocks of the highland region are generally found in areas with an elevation in excess of 1,000'.

Physiographically, it is therefore possible to divide Kerala into three natural units: (i) the coastal lowlands composed of recent sediments where the general elevation is less than 250'; (ii) the foot-hill zone composed essentially of laterites, Warkkalay formations, etc., the elevation of which ranges from 250' to 1,000'; and (iii) the highlands of metamorphic rocks where lateritization has not taken place and where the elevation is always in excess of 1,000'.¹⁷

Climate

The whole region has a very long coast and in close proximity to the sea are the high Western Ghats which in places reach even 8,000'. These high mountains protect Kerala from the dry hot winds of the Deccan and give it an excessive rainfall during the monsoon months.

The most important factor is the uniformity of temperature. On the sea coast the mean annual temperature is 81°F.; it rarely rises above 90°F. and it seldom falls below 70°F.; i.e., it is always hot, sometimes hotter but never very hot. The mean maximum for the year is about 86°F. and the mean minimum about 75°F. Kerala is free from extremes of temperature. On the West coast of India, the annual variation of temperature is small in the extreme south and increases rather rapidly northwards. It is twice as great at Bombay as in Calicut and over four times as great at Karachi. The diurnal range is about 10°F. in Kerala, where we have an almost unvarying warmth, in conjunction with a uniformly moist atmosphere that is especially characteristic of the shores of a tropical sea.

Perhaps the most important cause for the maintenance of this very high temperature throughout the year, is the influence of the

17. See Dudley Stamp, *Asia, a Regional and Economic Geography*, pp. 314-316, where a similar tripartite division is suggested. It is unfortunate that Dr. Stamp does not delimit the boundaries of these regions definitely.

aqueous vapour in the atmosphere. One branch of the ocean current which sweeps the African and Madagascar shores impinges on the West Coast of India somewhere near Goa. This brings with it an atmosphere more or less saturated. And the ocean itself is at hand and the sea breeze, always saturated with moisture flows steadily for several hours every day, in the dry weather. Finally during June, July and August (the season of the south-west monsoon) the wind blows steadily both by day and night from the ocean and rolls up before it, dense masses of vapour. The atmosphere is therefore throughout the year more or less in a saturated condition and the heat radiated from the earth is very largely absorbed by the aqueous vapour held in suspension in the air, which thus acts as a blanket, preventing the heat from being radiated out by night. A cloudless night in this region, generally does not denote a cool night as in most parts of the world. There are compensating advantages for (i) the ocean never becomes superheated and the ocean winds are therefore comparatively cool, and (ii) as the dense masses of monsoon clouds shelter the region from the direct rays of the sun, the south-west monsoon is a season when the temperature of the atmosphere is low, in spite of the fact that the sun then attains its maximum altitude. The uniformity of temperature during this season is chiefly maintained by the latent heat of vaporization liberated by the condensing vapour.

Pressure.—A study of the barometric pressure¹⁸ shows that the highest pressure occurs in January and the lowest in June. In January the pressure progressively increases from south to north and the difference in pressure between Trivandrum in the south and Mangalore in the north, steadily decreases through the months of February, March and April. In May, the pressure is the same throughout the region and in June when the lowest pressure is recorded, the south (Trivandrum) registers a higher pressure than the north (Mangalore). This reversal in pressure distribution continues for two months. After the monsoons, the pressure in the north rapidly increases while that in the south does so, less rapidly, till the highest pressures are recorded in January. This probably accounts for the higher rainfall during the south-west monsoon in the northern parts of Kerala (e.g., Calicut, Cannanore, Tellichery and Mangalore lying still further north) and the predominance of

18. The study is confined to the four stations of Mangalore, Calicut, Cochin and Trivandrum, as no inland records are available,

the north-east monsoon to a much greater extent in the months of October and November in the south (e.g., Trivandrum).

Place	Rainfall in inches during	Total Annual Rainfall in inches	Remarks
Trivandrum	June, July and August	24.85	Notice the evenness of the distribution and the much smaller total in the year.
	September, October & November	21.32	
	December to May	18.23	
Calicut	June, July and August	90.12	Notice the concentration in the season of the south-west monsoon and the poverty during the north-east monsoon.
	September, October & November	23.95	
	December to May	4.78	

The northern parts of Kerala have a much higher aggregate annual fall but the distribution is extremely seasonal, while in the south, although the total rainfall is only half of what it is in the north, yet it is much more evenly distributed throughout the year. This contrast in distribution is fundamental.

Another important factor associated with the climate is the extreme regularity of the seasons. Towards the end of March and the beginning of April, the first distant mutterings of thunder are heard among the hills. In some years, these thunderstorms extend as far as the coastal regions regularly every afternoon; in others, the advent of these is not such a regular daily occurrence, nor is the hour at which they begin so marked. At first, the land wind gets the advantage and blows throughout the night; in the forenoon there is a lull, then as the inland surface of the country gets heated, the sea breeze rushes in. This continues until the thunderstorm commences, or the night sets in. As the season progresses, the western winds from the ocean usually gain in force, while the land winds from the east and north-east tend to fail. Towards the end of May, or the beginning of June, the south-west monsoon ultimately obtains mastery and regular rains begin and are finally ushered in by heavy banks of clouds to seaward, by a heavy swell from the west

and by an electric storm of more than usual violence. In most years the south-west monsoon bursts on the Malabar coast during the first five days of June.¹⁹ Once however the south-west monsoon has asserted itself, the thunderstorms cease, the winds settle steadily in the west and as the season progresses, it veers gently towards the north of west, although inland it blows steadily from the south-west. As the wind strikes the coast it follows the direction of the littoral currents which at this season flow from north to south.

By the end of September the south-west monsoon dies away, nature's pendulum again begins to swing back; by October the north-east monsoon or land monsoon has usually asserted itself and with it, the rain becomes less frequent. The country begins to dry up and by the end of December, the dry weather has as a rule, set in. The period of regular land winds at night and morning, and of sea breezes during the day, then commences and lasts, till with the vernal equinox the period of disturbance again sets in.

Excessive falls of rain are quite common and floods are frequent, but as a rule floods do little damage since the rivers which have cut down deep valleys are in general able to contain all ordinary floods and the common laterite soil of the country is so porous, that within half an hour of the heaviest precipitation, the roads and grounds are all dried up. The rainfall varies from place to place very considerably and much depends upon the latitudinal position and the location with respect to the mountains. It has been shown that the lowest absolute pressure steadily diminishes from Trivandrum to Mangalore during the season of the south-west monsoon and in conformity with this, the rainfall also decreases from north to south. The highest rainfalls occur on the Annamalais and it is more or less correct to surmise that with increasing elevation, the precipitation also increases. It is particularly noticeable in the case of Mahendragiri and the Wynaad hills.²⁰ On the lee sides of the mountains, the rainfall diminishes very rapidly, e.g., Chinnar, Shencotta, etc. The presence of the Aramboly gap and more markedly the Palghat gap explains the diminishing rainfall observed within their vicinity. The moisture bearing winds in these cases are allowed to go into the interior and as there is no great mountain barrier to be surmounted, the precipitation is less. The vagaries of rainfall noticeable elsewhere in India are not found to any remarkable extent.

19. Sundar Lal Hora, *Field Sciences of India*, p. 4.

20. See rainfall map of Kerala, *Journal of the Madras Geographical Association*, Vol. 13, No. 2, p. 131.

In Kerala the regions with a deficiency of rainfall are:—

- (1) the three southern taluks of Thovala, Agasteeswaram and Kalkulam, which practically lie south of the Ghats,
- (2) the taluk of Shencotta on the lee sides of the mountains;
- (3) the Chittur taluk of Cochin State and a part of the taluk of Palghat, both in the Palghat Gap.

Agriculture

Temperature and rainfall are the most important of the climatic factors which govern agricultural activity and in Kerala where the temperatures are uniformly hot throughout the year, no particular influence of temperature can be noticed, except that the crops produced must necessarily be of a tropical type. On the contrary, rainfall is one of the prime factors in agriculture; the variety of crops cultivated and their yield per acre depend to a very large extent on the volume and distribution of rain. In Kerala, much more so than in any other part of India, the success of cultivation depends almost entirely on the reliability of rainfall and its even distribution.²¹ Owing to the late arrival of the monsoons, or the unequal distribution of rainfall during the periods of cultivation, crops in some parts of the country may meet with a partial failure, but the damage caused is not so great or widespread as is often the case elsewhere in India.

Within the region of Kerala are different political units and the tabular statement given in Appendix I gives the main features of each of these parts and of Kerala as a whole. Kerala has a total area of 15,659 square miles, 10,021,760 acres; i.e., very nearly 10 million acres; of which detailed statistics are available only for 9,741,331 acres. More than one-fifth (2,031,958 acres) is forested; more than one-tenth (1,061,305 acres) is not available for cultivation; and cultivable waste other than fallow occupies more than one-eighth (1,390,079 acres) while current fallows account for about one-sixteenth (564,380 acres) of the total area. The net area sown (4,341,702 acres) forms less than 45% of the total.²²

21. This is clearly indicated by the much lower percentage of the area under irrigation in Kerala as compared to any other part of India.

22. This compares with 40% in the province of Madras, 37% in Mysore, 14% in Coorg, 22% in South Kanara and 10% in North Kanara. It is worth noticing that the proportion of cultivated area tends to decrease steadily from south to north.

Forests.—Forests occupy more than one-fifth the total area, but the distribution is rather peculiar. Out of the two million acres which are forested, 1.6 million acres are in Travancore, i.e., 80% of the forests is concentrated in this region and the bulk of the remainder is in Malabar. It is found that 34% of the total area of Travancore is forested while only 10% of Malabar is clad in forest. In Cochin the proportion is still less, while that of Kasaragod is only a half of what it is in Cochin. Certain peculiarities must then account for this abnormal distribution. It is due to:—(1) the difference in rainfall in Kerala. [The total quantity may appear to be nearly the same, but there is a wide disparity in seasonal distribution. In Travancore it is much more evenly distributed throughout the year with no marked season of drought, while towards the north the dry season is about 5 months long]; (2) the greater proportion of high-land in Travancore; and (3) the difference in land utilization. [Outside Travancore the punam and modan systems of cultivation of rice are very important; deforestation has been excessive, with the result that the area under forest is now much less.]

As there are considerable variations in rainfall mostly in excess of 50", Kerala is one of the botanically rich areas in India with 600 to 700 different species, probably more. 'It is impossible to demarcate this region in a botanical sense from the Deccan, for the mountains of the Ghats project sometimes far inland and carry a flora characteristic of the west, well into an area that is geographically Deccan.'²³ As early as 1903 Bourdillon noticed a similarity between the floras of Kerala and Assam, but the intervening ranges of mountains do not form satisfactory connecting links. The economically more useful trees are teak²⁴ blackwood,²⁵ ebony²⁶ sandalwood,²⁷ anjili,²⁸ thambagam²⁹ and venga.³⁰

23. *Field Sciences of India*, p. 86.

24. Found in areas with a rainfall between 120"-150" and at elevations ranging between 1,000-2,000'.

25. Found in areas with a rainfall more than 150" and at elevations ranging between 2,000-3,000'.

26. Found in areas with a rainfall more than 150" and at elevations ranging between 2,000-3,000'.

27. Found in areas with a rainfall between 20"-50" and at elevations more than 3,000'.

28. Found in areas with a rainfall more than 60" and at elevations less than 1,000'.

29. Found in areas with a rainfall between 100"-150" and at elevations ranging between 2,000-3,000'.

30. Found in areas with a rainfall more than 150" and at elevations ranging between 2,000-3,000'.

Within the political units differences are noticeable regarding the area classified as 'not available for cultivation.' In Kasaragod it is only 4% while in Malabar it is 4 times as much. Intermediate lie Travancore and Cochin with 8% and 12% respectively. The why of this is not clear. The statistics regarding 'cultivable waste other than fallow' seem to present still greater complications. It is 2% in Cochin, 8% in Travancore, 25% in Malabar and 28% in Kasaragod. Both in Kasaragod and Malabar, thousands of acres are shown as 'cultivable waste,' thereby making possible the inference that there is room for a great extension of agriculture, but a large part of this 'cultivable waste' is really 'uncultivable'.³¹ The figures regarding 'current fallows' are also suggestive. In general, it is negligibly low, 3% in Travancore and Cochin and 7% in Malabar, but in Kasaragod it is as much as 34%. It is actually found that on proceeding northwards into the other parts of South Kanara and further north, the proportion of the area under 'current fallows' tends to increase rapidly. This is probably due to the fact that in the northern parts, the proportion of lowland is much less and the dry season is much longer. The net area sown in Kasaragod forms only 27%; it is as much as 49.5% in Cochin and 42% and 47% respectively in Malabar and Travancore.

Out of the total area of 9.4 million acres for which statistics are available, it is found that 6.3 million acres are cultivable. Of this, only 4.3 million acres are cultivated, leaving a balance of about 2 million acres in the form of current fallows and cultivable waste. Much of this land is inaccessibly situated and it may be so poor in quality that it may not respond so liberally as the land already brought under cultivation. To a certain extent these defects may be removed by developing the means of communication and by improving the methods of cultivation but it may nevertheless be taken for granted, that the additional area which could be brought under the plough, is not as great as these statistics would seem to warrant.

Irrigation.—Agriculture in India is mainly carried on with the aid of irrigation, but Kerala forms an important exception to this rule. In Appendix II are given the statistics of irrigation. Although it is known that irrigation is practised to a minor extent in Malabar and Kasaragod, no statistical information is available. The irrigated areas in Kerala are found (i) in Nanjinad in the south (with the

31. Innes, *Gazetteer of the Malabar and Anjengo Districts*, Vol. 1, p. 232.

canal system), and (ii) in Shencotta, Chittur and Palghat (with the tank systems). In these parts the distribution and incidence of rainfall are such that irrigation becomes necessary. These regions happen to be the very parts of Kerala where there is a maximum possibility of contact with the Tamilnad with the result that the Tamil language tends to become important.³² Is it then surprising that the agricultural methods of Tamilnad have been introduced into these parts?³³ Apparently therefore there exists a considerable amount of correlation between agricultural practices like the methods of ploughing, irrigation, etc., and linguistic and cultural distributions. It is also interesting to note that the Tamil element has not been able to move into the other parts of Kerala, where the conditions of rainfall and consequently agricultural methods, are different from those on the east coast. The Tamilian thus seems capable of thriving as an agriculturist, only in those parts of Kerala where he finds a climate analogous to his eastern home.

In Kerala the occupied lands are generally classified as either wet lands or dry and garden lands and their distribution is as shown below:—

Region	Wet lands in acres	Dry and garden lands in acres	Total in acres
Travancore ..	598,897	1,948,785	2,547,682
Cochin ..	205,794	274,181	479,975
Malabar ..	496,000 (approx.)	683,461 (approx.)	1,179,461
Kasaragod ..	80,850	53,734	134,584
Total for Kerala ..	1,381,541	2,960,161	4,341,702

32. South of Trivandrum, Tamil becomes important. In Neyattinkara 10% of the population is Tamil speaking. In Vilavankod 75%, in Kalkulam 85%, in Agasteeswaram 90% and in Thovala 99% of the population have Tamil as their mother tongue. In Palghat, less than 25% of the people is Tamil speaking while in Kasaragod the non-Malayalee element forms about a third of the total population.

33. Mention must also be made of the fact that Kumeri, (the equivalent of Modan in South Kanara) is cultivated everywhere in the District of South Kanara without the soil being touched by any implement of any kind while in Kasaragod taluk alone is the land ploughed for the same as in Malabar. Vide Statistical Atlas of Madras Presidency, 1936, p. 942.

It is thus seen that the wet lands constitute slightly less than one-third the total area under occupation; in the wet lands rice is practically the only crop cultivated and in the dry and garden lands are grown the perennial crops like coconut, arecanut, jack, mango, cashew-nut, etc., and some root crops like tapioca, yam, and vines like pepper and betel.

The characteristic feature of agriculture is that the tenant lives on the land because (i) the permanent crops like the coconut, arecanut, jack, etc., which are assured by the heavy rainfall of the region can be well secured only by the ryot living on the land itself and (ii) the climate and rainfall are specially conducive to the growth of trees, roots, etc., but not of rice and other cereals.

On a study of the agricultural statistics³⁴ of the region, it is seen that rice is pre-eminently the most important crop of the region occupying slightly less than 50% of the gross cropped area, but it is also seen that both in Cochin and Malabar the culture of rice plays a much more important part than in Travancore. In Travancore the proportion of the area under rice to the total cultivated area, is only approximately half of what it is in Cochin and the areas further north. This appears to be anomalous. Climatic or edaphic factors could not account for this; the population is essentially rice-eating, if rice could be had. In Travancore rice is mainly a crop of the lowlands, tapioca and other root crops replacing it outside the lowlands; but in the regions further north, rice is cultivated even on the slopes of the mountains (modan and punam systems of cultivation).³⁵ Heavy soils are by their nature suited to rice. This possibly explains why in general, in the coastal strips where the soils are too sandy, rice is absent. Notable exceptions to this occur at the mouth of large rivers like the Ponnani, Periyar, Pambayar, etc., due to the sediments brought down. It is only in the Ponnani valley (probably due to the low relief in the Palghat gap) that rice is cultivated right up to the eastern frontiers of Kerala.

Methods of Cultivation.—Manifold are the systems of cultivation found, but a few of them deserve special mention.

(1) *The Nanjinad cultivation* found in Thovala, Agasteeswaram and Shencotta is almost identical to the one found in the Tamil region

34. Vide Appendix III.

35. See map showing distribution of rice in Kerala in the Journal of the Madras Geographical Association, Vol. 13, No. 2, p. 134.

of Tinnevely; even the plough resembles the Tinnevely type; here rice is almost exclusively grown under irrigation. The lands are single cropped or double cropped. In the former sowing takes place in June-July, the seedlings are transplanted in July-August and the harvest follows six months after transplantation. The land is left fallow for the rest of the year and the yield is 15-fold. In the double cropped lands, the crops are harvested in September-October, and February-March. After the March crop is gathered, the lands are left idle for about a month or more, exposed to sun and winds. In April, the field is ploughed for the first time and the stubbles left in the previous reappings are gathered and burnt. The field is then ploughed continuously for three times and levelled with a rake. The seed should be sown before the end of April, on an average about 100 lbs. to the acre. Immediately after sowing, the field is again ploughed and smoothened. Raking should be repeated after the third, fifth and seventh days of sowing. The seed begins to sprout on the fifth day, but is generally visible only on the seventh day. The field is then exposed to the scorching sun for about 25 days when the south-west monsoon sets in, bringing large quantities of water through the irrigation canals and it is therefore true to say that the crop is dependent on the south-west monsoon. The drying should not be disturbed by falling rains during the 25 or 30 days after sprouting, as the yield will suffer materially, if rain falls during this interval. Fifteen days after water has been supplied, weeds begin to appear and these have to be removed some 50 days after sowing. About 90 days after sowing, the crop comes fully into ear and within a month it ripens and is fit for reaping. All this time, the field is kept under water about 2" deep, till just before harvest, when all the water is drained. The yield on fair land is about 20-fold.

As soon as the September-October crop is harvested and the straw stacked, the fields are got ready for the next crop. Ploughing, raking, manuring and other operations are all done under water which has to be supplied in large quantities. It is usual to sow the seeds thick in small nurseries and transplant the seedlings to the fields got ready. Before sowing, the grain is soaked in manure and water for several hours and then put into a basket or vessel covered with straw. A little water is then sprinkled upon it and it is exposed occasionally for three days when it begins to germinate. The seeds are then sown and water is allowed to stand in the soil for a day after which it is drawn off for four or five days until the shoots have made a good start. From this time the plant requires

a constant supply of water for its growth, which is served every alternate day, a couple of inches of water being allowed to stand until the time of ripening. Transplantation takes place after the crop has been about four or six weeks in the nurseries when the plant will be 10" or 1' in height and the seedlings are plucked and planted in the miry field. A few days later weeds appear and they are removed. Weeding takes place about three times and the plants are also thinned out to avoid overcrowding, if necessary. The ears begin to form in January and the crop is gathered in February-March. The nursery system of cultivation is highly remunerative and should be preferred to the ordinary broadcast system. 'Paddy sown yields but a fourth of that planted.'

(2) *The Kuttanad cultivation.*—(Punja system). The extent of fertility of these punja lands varies with the inundation to which they are annually subject. Fallow is essential and the area so left, serves as a reservoir of water to the neighbouring fields. The level surface is separated into blocks of 15 to 20 acres, the rank vegetation of grass and other aquatic herbs that here spring up during the rains, is removed by first scraping the bed with a long hoe and secondly, by ploughing the field three or four times. This is then followed by encompassing the field with embankments which is a very difficult and tedious undertaking. The draining of the fields always submerged is a laborious process and protecting them with bund works is both difficult and anxious. A couple of ploughings are then given and the space divided and smoothed into beds. Seeds soaked in water for a period of about five days which have slightly germinated are sown broadcast. The less watery seedlings are transplanted in the vicinity of the higher ground where a few hot days are requisite to quicken the vegetation. This is accelerated by occasional inundations which are again repeated on the ninth or tenth day; the field remains overflowed for a month, then the water is drawn off for a short time and again restored (the plant being about three-fourths covered) till the crop is nearly ripe. Kuttanad yields but one crop, reaped in the latter part of April or the beginning of May. Rice is the only cereal sown; it yields more than 20-fold. Any unexpected rise of the streams would force the slender embankments of the crops, but the regularity of the season gives a tolerable security to the farmer.

Reclamations have also been made from the backwaters and the cultivation in such lands deserves notice, if only for the singular struggle of human industry against the forces of nature. From the

subsidence of the floods of one year to the commencement of the rains in the succeeding year, the interval of time is rarely sufficient for the garnering of a crop. At the close of the rains, the water in the Kayals (Vembanad, Enamakal, Trichur, Muriyad, Mukundapuram) is drained off by ceaseless labour day and night, either with the indigenous type of Persian wheels or, of late with oil or steam pumps. Every foot of ground that can be obtained is protected by fences of wattle and mud and is planted up with well-grown rice seedlings. Spaces are left between the fields and into these channels, the water drawn from the field is poured. Boats have to be employed to visit the different fields, the dry beds of which lie some 3 or 4 feet below the level of the water in the canals. With the early rainfall in April, the struggle recommences with the slowly but steadily rising floods and thousands of people continue this day-and-night struggle with the rising floods, for the preservation of their ripening crops. Occasionally the bulwarks of the fields are breached and the unmaturing crop drowned. Often a large area has to be reaped by simply heading the stalks from the boats, but as a rule an enormously rich crop rewards this remarkable industry.

(3) *Nilamkrishi or the cultivation of Viruppu lands or Ela lands.*—(The wet lands between the Ghats and the backwaters). Cultivation begins in the middle of April, the seed being sown generally broadcast, by the end of the month or early in May. The crop matures in about four months, the harvest occurring in September. Immediately after this, the field is again turned up and prepared for a second crop, which is reaped in January. The September crop yields 12-fold, but the January crop only 8-fold. Generally the land lies fallow in February and March, otherwise a third crop of gingelly or farinaceous roots very often succeeds; they come to maturity in March and their culture is careless, cheap, and comparatively unprofitable. In very rare cases a third crop of rice is cultivated. Thus it is seen that the two crops depend upon the copiousness and even distribution of the rains of the south-west and north-east monsoons respectively. If the rainfall is excessive during the south-west monsoon, the first crop is liable to be destroyed by flood, while the failure of the north-east monsoon tends to dry up the second crop.³⁶

36. In Malabar the September-October crop is generally sown broadcast and the seedlings are planted out for the January-February crop. The former crop is weeded once, the latter not at all.

(4) *Mundagan lands* are those occupying the borders of the lakes of stagnant waters, but slightly elevated above the punja lands; they retain considerable moisture and yield one tolerable crop. The culture is more difficult as the soil has to be worked with a spade. Paddy is raised from seedlings sown in June and July, transplanted in August or September and reaped in February or March. The grain grown is of an inferior kind.

(5) *Kaipad cultivation*.—A peculiar feature of Chirakkal and Kottayam taluks in Malabar and the taluks of Cochin-Kanayannur and Cranganur in Cochin State is the Kaipad cultivation (otherwise known as Pokkali) practised on the low lying lands near the coast which are subject to annual inundation from the backwaters. In the hot weather the soil is heaped in small mounds about a foot in height and 5' in circumference, on which the seeds are sown just before the onset of the monsoon. When the seedlings are about 5" high, the heaps are dug up and the whole field levelled. The soil and the seedlings planted on the tops of the mounds thus get the benefit of passing showers without being damaged by the salt water which overflows from the backwaters during these months. When the monsoon bursts, continuous rains keep the water in the fields comparatively fresh and the seedlings can be planted out. The cultivation is precarious as an unusually high tide may destroy the seedlings and the crop is more dependent than others on the seasonal distribution of rain. The cultivation expenses are not high as there is neither manuring nor ploughing of the fields. It takes a long time to mature and the crop can generally be harvested only in October.

(6) *Malankrishi: Modan, Punam, etc.*—Rice is cultivated on the summits and slopes of hills that are cleared of trees and shrubs. Preparation for modan cultivation begins in August, although the sowing takes place only in the following April. The jungle is cut immediately after the rains and the trees and stumps are left to dry for two or three months, when they are set fire to, in February. The ashes increase the fertility. The ground is rudely turned up sometimes with a peg, more generally with a hoe, but with a plough only on the lower slopes, where it may be ploughed as many as twelve times. The seed is sown with ten times its own weight in ashes and cowdung. The fields have to be strongly fenced for protection from wild animals and rabbits. The weeding takes place only after the 40th day and the gathering of the crops is done about 140 days after they are sown, i.e., in September. The cultivation can be repeated in the year to follow, but the land becomes infertile afterwards. If the crop is not repeated, gingelly is sown and harvested

in December or January. The samai crop which is not of great value is raised in the following May or June and the land is allowed to lie fallow for 2, 3, or 4 years according to its fertility. It has therefore got to be a migrating cultivation. The chances of getting or losing the crop are equal. The ryot mainly calculates upon the conserved energy of the soil which has lain fallow for nearly 12 years. Modan is thus grown on the low hills which abound in all those parts, north of Travancore. The rotation is generally modan, gingelly and samai, but on the best lands a ginger crop frequently precedes the modan.

It is thus seen that various methods are practised by the ryot, to bring under the plough all those parts which he could possibly manage to, the kuttanad cultivation, the kaipad cultivation and the malankrishi being specific examples. It is well nigh impossible to suggest an increase in acreage to augment the present production.

Yield.—The average yield of rice in Kerala is 540 Madras measures per acre; in North Arcot it is 800. This low yield is due to several factors the most important of which are the following:—

(i) The principal crop, that of September-October is hardly in the ground for 4 months. (ii) Poor crops are often raised at a minimum cost on terraces, high up above the double crop lands. (iii) The standard of cultivation is lower than on the east coast, because there is a considerable amount of overcropping without fallow and the wastage is not replenished by manure. (iv) Under the influence of unfailing rains, the soil responds too readily to inefficient cultivation with moderate crops and the ryot's wits are not sharpened by a constant struggle against nature.

Other cereals.—The area under cereals other than rice is negligibly small. Cholan is found in the southern taluks adjoining Tinnevely and in the drier parts of Palghat taluk, especially in the black loamy soils. Ground is prepared about April-May and sowing takes place a month later. The crop is dependent on the rains, but a light rainfall is sufficient and the crop matures in four months. No nursery is required and the straw makes very good fodder. Under a suitable system of irrigation, ploughing and manuring, several crops can be raised from the stalks of the same plant.

Coconut.—In Kerala, the cultivation of the coconut palm forms one of the most important features of agriculture. Slightly less than one-fourth the gross cropped area is under coconut and as a crop it is second only to rice.

Based upon the variety and the enormity of the uses to which its products are put, it is not untrue to say that the rural economy of Kerala depends on this tree.³⁷ None of the oil seeds are cultivated to any large extent so as to deserve mention.

Tapioca and other root crops.—The crops are mostly found in the region of the foot-hills. Tapioca is a plant that thrives in the poorest of soils like laterite, despite gross neglect on the part of the farmer. A moist climate is essential. The cuttings are generally planted during the two monsoon seasons, usually on heaps of earth with trenches around for the water to gather and flow away. The crop matures in 9 to 11 months and gives a net income of about Rs. 75 per acre. It is only of late that its culture has proceeded north of Travancore into Cochin and Malabar, but it is regrettable that detailed statistical information is not yet available. It forms a staple food especially of the poorer classes; it supplements but does not supplant rice. Along with tapioca, other root crops like yam, chembu, chena, etc., are cultivated; besides plantains of different types are also cultivated.

Plantains are widely distributed and found almost in every household; the most suitable soils are those in which sand and clay are mixed together. The low banks of rivers with an annual silt deposit forms the best soil. It grows almost anywhere without much care and about 500 of them can be planted to the acre. All the varieties other than the banana should be planted in March-April, while the banana should be planted two months earlier. The period of fruiting follows about 11 months later. As little or no time is involved in its culture, the ryot gets an average additional income of Rs. 70 to 80 per acre in the year.³⁸

Ginger.—The suitable soil is one which is free from gravel and is good and heavy. Rain is essential, but superfluity of rain must be avoided. The ground must be ploughed to a depth of one foot during the latter part of December; in March-April, the ground has to be slightly turned and harrowed. Cultivation begins at the commencement of the south-west monsoon, the plant matures in about 8

37. For a fuller discussion on the coconut cultivation in Kerala.

See 'Industrial Crops of Kerala,' the Journal of the Madras Geographical Association, Vol. 11, No. 4, pp. 284 to 286.

38. In Cochin, the average income per acre of banana cultivation is about Rs. 100 but it requires more care and in some cases there is a need for irrigation.

to 10 months. Its culture requires considerable amount of care and intensive manuring. The average yield is 20-fold and the profit per acre varies anywhere between Rs. 80 to Rs. 150. Ginger is usually cultivated in small patches, not more than half an acre in extent and the labour expended on it is generally that of the cultivator and his family.

Pepper was one of those commodities which played a very important part in the trade of the Roman Empire with the East.³⁹ Kerala practically enjoys a monopoly in the production of pepper and the well-being of the people of Kerala has been described as having been pickled in pepper for the last 2,000 years.⁴⁰ There are no pepper estates at all and it is grown with many other crops in most of the households. The statistical information about the crop, can at best be only a rough approximation. It requires a hot moist climate, more than 100" rainfall. Copious rain is essential in the blossoming season between the 20th of June and the 5th of July but in the 3 months before picking (the gathering season is from January to March), a heavy downpour injures the soft pulpy berries. In July-August, and in October-November, the soil of the garden is turned up with a hoe and plantains are cultivated between the props to provide shade for the growing vine. Subsequently the crop requires little attention. Manuring is not generally resorted to in Kerala.

Betel vine.—Black sandy soil is the best suited for its cultivation, the soil being a rich mixture of sand and clay. It will not grow in elevated places. Although it involves a good deal of labour, it is still a very profitable crop and forms the most important by-product like pepper, especially in Trivandrum, Mavelikara and Shertalla. Watering has to be done for a period of at least 4 to 6 months in the year, and in the hot weather as frequently as twice a week. In the monsoon months, the vine is most fruitful.

Areca palm is indigenous to Kerala. It grows most luxuriantly in stiff clayey soils and hence is always found in the banks of rivers, canals and low valleys. About 500 to 800 palms can be cultivated in an acre and it requires little or no attention. It yields three crops in January, February and March, giving an yield of about 300 to 350 nuts per plant and is thus a very profitable crop. The price of the nuts varies very considerably, but even on a con-

39. Warmington, 'The Commerce between the Roman Empire and India'.

40. M. E. Watts, *Asiatic Review*, 1939.

servative estimate, the annual yield per acre is about Rs. 300 to Rs. 500.

The plantation crops of rubber, tea and cardamoms⁴¹ are found mainly in Travancore. Rubber is typically a foot-hill crop grown in areas where the elevation varies from 700' to 1,000' and the rainfall between 80" and 120". The yield is only about 300 lbs. per acre and is approximately half the yield in Ceylon and one-third that of Java. Because tea demands copious rains and complete drainage, hill slopes are generally suitable for the cultivation of tea. Outside Travancore, in Wynaad alone is some tea grown. It is only in Devicolum that there is high grown tea (4,000' to 5,000'), while elsewhere it is medium grown (2,500' to 4,000'). On an isohyetal basis, it is true to say that tea is grown only in those areas where the precipitation is in excess of 100", generally 150". The yield of tea is about 500 to 800 lbs. per acre. Cardamom is also another crop found on the higher reaches of the Annamalais, the optimum elevation is 3,000' to 3,500', but it is grown in areas between 2,000' and 4,000'. As it cannot stand wind, the best crop is obtained in sheltered ravines and hollows. The total quantity of rainfall does not seem to be fundamental (60" in Ceylon and 175" in Travancore) but what is of the highest importance is, that there should be a few good heavy showers to thoroughly moisten the soil between the middle of January and the middle of May. A long hot dry season always means a bad crop. A heavy south-west monsoon is considered favourable. The yield ranges from 100 to 200 lbs. per acre.

Besides the aforementioned crops, there are several others like cashew-nut, jack, lemon grass, pulses like black gram, green gram, etc., and it would be impossible in the short space available even to give some passing mention of these. The variety of crops cultivated together with the agricultural practices of this region have already been indicated and some mention must now be made of the crop associations prevalent therein.

On a talukwar analysis of the proportion of the cultivated area to total area, it is found:—

(i) that all taluks in which the cultivated area is more than 80% of the total area, generally lie within the lowlands (e.g. Ambalapuzha, Shertalla, Cranganur, Karthikappally, Karunagappally, Parur, Ponnani, etc.). The crop association within this unit

41. The Journal of the Madras Geographical Association, Vol. 12, No. 1, pp. 1-8: 'Industrial Crops of Kerala.'

of lowland is a combination of rice with coconut, the two together accounting for 80 to 90% of the total cultivated area. The type of soil in many cases seems to be the main factor associated with the relative predominance of the one over the other. Where as in the river valleys (e.g. Pamha at Ambalapuzha, Parur at the Periyar mouth, Ponnani mouth, etc.) clays and loams abound, rice tends to predominate; but where the soils are mainly arenaceous (as in Karunagappally, Shertalla or Cranganur with a backwater lying to the east), coconuts have a preference. It is nevertheless true to say that the lowland unit is primarily a rice-coconut region. There are minor exceptions to this. Quilon, Thiruvella and Mavelikara have all more than 80% of their total area under cultivation, but they do not lie entirely in the lowlands. It is worth noticing that the crop associations of these regions are such that rice occupies less than one-third the total cultivated area and coconuts and the root crops (tapioca, yams, ginger, etc.) have each an almost equal share. This then is the peak of production possible in a part with 10 to 20% of its area under the foot-hill zone, but the differentiation in the crop production is noticeable, in spite of the apparent similarity in the proportion of the gross cropped to the total area. Obviously an extension of agriculture within this region is out of the question. The only suggestion for increasing the production would be in the direction of improved methods of farming and also by a fuller utilization wherever possible, of the mine of food that is available in the form of fish, both in the backwaters and the sea;

(ii) that in taluks where the percentage of cultivated area to total area is between 60 and 80, generally the lowlands constitute three-fourths the total area, while the foot-hills account for the remaining one-fourth. In this region (e.g. Neyattinkara, Trivandrum, Chirayinkil, Kottarakara, Kottayam, Vaikom, Minachil, Talapalli; etc.) invariably coconut and rice together occupy about 50 to 60% of the total cultivated area and the predominance of either of these over the other, is dependent on elevation and soil factors (mainly the presence of river valleys). Probably a slightly higher altitude accounts for the low proportion of rice in Kottarakara, Minachil and Neyattinkara and the presence of sandy soils limits its culture in Chirayinkil. In these taluks rice occupies only about 20% of the cultivated area and coconuts nearly twice as much. But in Kottayam and Talapalli, the area under rice is greater than under coconut. Yet in all these taluks, other crops tend to become important. As the proportion of lowland diminishes root crops dominate. This is however peculiar to those parts of Travancore lying south of

Minachil and Kottayam. Further north as in Muvattupuzha⁴² and Kunnathunad⁴³ and parts of Cochin and Malabar, rice and coconut are the only important crops. Neither the soil nor the elevation seems to play any important part in the type of crops cultivated. Is it then true to say that rice tends to dominate in those parts where the standard of cultivation is poorer? To some extent this is evidenced by the distinction in the agriculture of the two adjoining taluks of Minachil and Muvattupuzha; Minachil has more than 40% of its cultivated area under coconut and an equal proportion under tapioca, ginger, pepper and rubber conjointly, rice is almost an unimportant crop. The valleys in Minachil taluk are in most cases exactly similar to those of Muvattupuzha and Kunnathunad, but the ryot in Minachil has a more advanced type of agriculture with the result that he grows a better and a larger variety of crops;

(iii) that in taluks where the cultivated area is between 40 and 60% of the total area (e.g., Agasteeswaram, Muvattupuzha, Calicut, Palghat, Kunnatur, Changanacherry, Mukundapuram, Trichur, and Kurumbranad) the lowlands constitute half to three-fourths the gross area, the bulk of the remainder being in the foot-hill zone. As a rule in these regions, it is found that rice and coconuts together occupy slightly more than 40% of the total cultivated area, but the proportion of the area under rice to that of coconuts is nearly as 3:1⁴⁴. Where irrigation is practised as in Palghat and Agasteeswaram, rice is fundamentally more important. In Kunnatur and Changanacherry the root crops have together an area more than 40% of the gross cultivated area and they exemplify the characteristic foot-hill cultivation in Travancore. Is it therefore true to conclude that as the proportion of lowland diminishes, the extent of area under coconut decreases more rapidly than that under rice? Apparently it is so;

(iv) that taluks in which the cultivated area is between 20 and 40% of the total area (Thovala, Kalkulam, Nedumangad, Kunnathunad, Chittur, Chirakkal, Kottayam in Malabar, Ernad, Walluvanad, Shencottah, Thodupuzha and Kasaragod) generally the lowlands constitute less than one fourth the total. It is surprising to notice that in spite of the poverty in lowlands, in general, rice dominates as the main crop; coconuts together with the roots and vegetables

42. Nearly 60% of the cultivated area is under rice.

43. Nearly 85% of the cultivated area is under rice.

44. Except in Kurumbranad.

occupy about one-third the total cultivated area. Such however is not the case in Travancore. In Nedumangad the root crops together account for 80% of the cultivated acreage; but it is not so great, either in Thovala or Kalkulam, probably because of the difference in the nature of agriculture due to irrigation; but nevertheless, the distinction between the type of agriculture in the northern parts of Kerala and the south is clear. The effects of the northern type as has already been shown, are found even as far south as Muvattupuzha and Kunnathunad in north Travancore. It seems justifiable to conclude that the agricultural practices in the north and the crops cultivated are such that only the rice lands are being fully utilised. The foot hill zone of laterites is, not being tapped to its fullest extent;

(v) that those taluks in which the cultivated area is less than 20% of the total area lie either entirely in the highlands as in Devicolam, Peermade and Wynaad, or have the bulk of the area in the highlands with about 10% of the area in the foot-hill zone as in the case of Pathanamthitta. It is found that as the area under the foot-hill zone increases, the percentage of cultivated land to total area, correspondingly increases. Devicolam, Peermade and Wynaad are the only taluks which are completely in the highlands and in these only about 10% of the total area is cultivated. In Devicolam and Peermade, the entire area cultivated is under plantation crops (85% tea, 10% rubber and the rest under cardamoms) while in Wynaad, in spite of the elevation, rice is the most important crop occupying more than half the cultivated area; tea claims only one-fifth the acreage and coffee one-tenth. This is partly due to the lower absolute elevation of Wynaad, but also to a certain extent depends on the poorer types of land utilisation in Wynaad.

Thus, if a classification on a talukwar basis is adopted according to the extent of the use of land, one finds that but for very few exceptions the extent of cultivated acreage directly depends upon the nature of the taluk and its position with respect to the natural regions to which Kerala has been divided. As the proportion of lowland within the area of the taluk increases, the percentage of cultivated land increases in a direct ratio, and as the proportion of highland increases, agricultural utilization tends to diminish. The physical regions based on contours and soils then, tend to delimit land utilization. As agriculture is pre-eminently the most important occupation, it seems true to conclude that these physical regions also delimit economic regions.

In our study of regions we are particularly concerned with the interaction between the physical and biological conditions on the one hand and the nature of the human response on the other. An attempt must be made for classification into regions which will facilitate this study. The major regions in a vast sub-continent like India are constituted by a harmonious but complex combination of many different elements, but the smaller regions within them are generally distinguished by the prevalence of some particular characters or relations. The West Coast of India is definitely a unit in the vast sub-continent of India and in it are the smaller sub-regions of Kerala in the south and the Konkan region further north. In the former are three different natural regions of the 'pays' class, each of which tends to develop the type of rural economy most appropriate to its particular climatic and edaphic conditions; a physical unit tends to be an economic unit and the more developed the means of communication, the more pronounced is regional specialization.

Population

Kerala is one of the most densely peopled parts of the world.⁴⁵ In an agricultural region like this, the factors that govern the density of population are chiefly those concerned with the cultivation of the crops and the distribution of the produce. Rainfall seems to have very little influence directly on the density; the highest densities are found in those parts where the rainfall is about 90 to 100". The nature of the soil and its fertility have a direct bearing on the kind of crops cultivated. As has already been shown the lowland division of recent sediments is a rice-coconut region, the lateritic foot-hill zone is one in which the root crops tend to predominate together with rice and coconuts and in the highland zone, the plantation crops are the most important. It is found that the density of population varies directly as the extent of rice cultivation, particularly so, in those parts of Kerala lying to the north of Travancore. The variation in density however is not quite proportional to the area under rice. Rice which is the staple food of the people is cultivated most extensively in the lowlands; coconut, the chief money crop, is cultivated here more extensively than elsewhere, and the chief cottage industry of coir yarn is almost exclusively confined to this tract. Due to the proximity to the sea and the backwaters fish

45. The Journal of the Madras Geographical Association, Vol. 13, No. 2, 1938: G. Kuriyan, 'Population and its distribution in Kerala'.

which is an important supplement to rice in the dietary of the majority of the population is more abundant in this tract. Owing to these circumstances, the population which a square mile of land in the lowland division can support is considerably more than what the proportion of cultivated area either to the total, or the cultivable area, would seem to warrant. Again the lowlands with the cheapest forms of transport have the highest densities and the highlands with the least accessibility have the lowest densities.

A close connection seems to exist between the density of population, the proportion of the cultivable and the cultivated lands and the kind of crops cultivated.⁴⁶

Division	Proportion of cultivated to total area	Density of population per square mile of total area	Density of population per square mile of cultivable area
Lowlands	.. 75 to 80%	About 1,750	About 2,000
Foot-hills	.. 65 to 70%	" 900	" 1,000
Highlands	.. Less than 15%	" 80 to 100	" 200

The proportion of cultivated area to total area or cultivable area is only about 10% greater in the case of the lowlands than in the case of the foot-hill zone, but the density is nearly twice as much in the former, the reasons for which have already been pointed out. Besides rice, tapioca is an important item of food and it is most extensively cultivated in the foot-hill zone. Although in comparison with the lowlands, the foot-hill zone produces less rice and coconuts, it specialises in the production of the root crops, fruits, vegetables, pepper and rubber. Hence the density of population is less than in the lowlands, but decidedly greater than in the highlands. The highlands contain the least proportion of food-crops, but it specializes in the plantation crops of tea and cardamoms, but these are mostly in the hands of the European planters. Consequently, although the opening of these estates has increased the proportion of cultivated land to the total and the cultivable area in the highlands, it has not correspondingly increased the number of persons supported by

46. Figures are based on the 1931 census. Accurate statistics are published only in Travancore. The others are approximations.

agriculture. Between the foot-hill zone and the highlands, the variations in density correspond almost exactly with the variation in the proportion of the area under food and money crops (excluding rubber and tea) to gross cultivated area.

A correct idea of the number of persons a particular tract can support and is now supporting can only be had by a study of the densities on the cultivable and the cultivated lands. In the lowlands, more than 90% of the cultivable land is being cultivated, while in the foot-hill zone and the highlands the respective proportions are 80 and 40.

Region	Density of population per square mile of cultivated land in			
	Travancore	Cochin	Malabar and Kasaragod	Kerala
Lowlands ..	2,186	2,733	Approximate 2,000	More than 2,100
Foot-hill zone ..	1,303	1,126	1,000	1,000
Highlands ..	591*	365	400	400

*Notice the much higher density in the highlands of Travancore.

These figures more or less show that the lowlands have reached the highest point, perhaps even exceeded it; there seems to be some scope for the absorption of the population in the foot-hill zone, where about 20% of the cultivable land is still available for cultivation. There is decidedly much better scope for the accommodation of a larger population in the highlands where the density on the cultivated land is low; and where about 60% of the cultivable land is still available for cultivation. The number of persons a square mile of cultivated land can support varies directly as the proportion which the land cultivated with ordinary food and money crops bears to the gross cultivated area, provided there are no disturbing factors, such as the existence of industries or the availability of other sources of food supply like fish, or the cultivation of plantation crops like tea and rubber which benefit the foreign investors more than the indigenous population.

Recent estimates have shown that in Germany, every man supported by agriculture cultivates 2 acres of land, in France 2.3 acres, in Italy 2.4 acres, and in Belgium 1.7 acres giving an average of 2.2 acres per head of population supported by agricul-

ture. The corresponding world estimate is 2.5 acres.⁴⁷ In 1931, the total population of Kerala was 10.14 millions of which 3.98 millions were supported by agriculture. The total cultivated area was about 4.3 million acres. Since then the population has increased by about 20% approximately,⁴⁸ and as no large venues of employment have come into existence since 1931, it is estimated that the population dependent on agriculture at the present day is about 4.75 millions. There has been no increase whatever, in the area under cultivation. A very conservative estimate thus shows that at present each person supported by agriculture has about 0.9 acre of land. It may be argued that the nature of the land and the tillage in Kerala are entirely different from those in Europe, due mainly to the fact that double and treble cropping is possible here, while such is never the case in Europe; yet in point of acreage, Kerala is much worse off than most of the European countries. It is slightly better off than Japan in regard to the average area of cultivated land per head of the total of agricultural population. But the outturn of crops per acre in Japan is at least four times that of Kerala and the Japanese have industrialised themselves to an enormous extent in comparison with Kerala, which results in bringing a not inconsiderable subsidiary income to the community at large. Neither the increase in the yield of crops, nor the acreage under cultivation has actually kept pace with the growth of population, with the result that the pressure on the land is now much greater.

The development of local agriculture by extending the area under cultivation and by improving the methods of farming will increase the means of subsistence and enable the country to maintain a larger population on a better standard of life. Out of a total cultivable area of 6.3 million acres, about 2 million acres including 'current fallows' and 'culturable wastes' still remain uncultivated. Much of this however is so poor in quality or so inaccessibly situated that it will not respond so liberally as the land already brought under cultivation. These defects may be removed to some extent by the development of communications and it is probable that such new lands will be able to support a density of about 600 persons per square mile on the present standards. The maximum population capacity of the whole region should be somewhere in the neighbourhood of 12 millions. During 1921-1931, the population increased at an average rate of 2.16% per annum and if it has continued

47. Edward M. East, *Mankind at the Cross Roads*, p. 70.

to increase at about the same rate since then⁴⁸ the saturation point has already been reached. What solution can then be offered for feeding these increasing millions?

Conclusion

As has already been shown, it would not be generally advisable to encroach upon the reserved forests to increase the area under tillage, particularly as the maintenance of these forests is essential in the interests of rainfall and consequently of agriculture itself; and every attempt must be made to conserve the soil which would otherwise be completely denuded away by the torrential rains of this region.

The solution to this problem is by no means easy. The obvious remedy that one can suggest is an attempt at a conscious check on the growth of population by practising the principles of birth control. To profess this is easy, but it is very doubtful if it could be brought into practice in any part of India, due to a host of factors.⁴⁹ Nor is emigration easy. Internal migration from the thickly populated to the sparsely populated parts within the region is taking place, but not to such an extent as to afford substantial relief to the congested lowlands. The scope for external migration is very much more limited; to regions outside India (Burma, Ceylon, etc.) it is almost impossible. In the adjoining province of Madras, the Malayalee is looked upon as an intruder, who is by no means welcome. The next alternative is to suggest industrialization so as to bring in a subsidiary source of income to the community at large. With the development of the Pallivasal hydro-electric power scheme and the consequent supply of cheap power throughout Travancore and Cochin, some industries will naturally develop. Malabar could be supplied by Pykara, once the Papanasam project comes into operation. Most of the industries themselves will indirectly depend on agriculture; the coir and associated industries perhaps will continue to retain the predominant place; rubber industries, wood industries, paper manufacture, etc., are all possible; but it is my considered view that these are not likely to solve the problem of

48. In Cochin the increase is 18.1%, in Travancore more than 19%. The exact figures for Malabar and Kasaragod have not yet been made available; the estimates show that the rate of increase is approximately 20%.

49. Vide Census of Travancore, 1931, Part I, Report, pp. 46-47, where Dr. Kunjun Pillay gives his considered opinion of this problem.

poverty in any part of Kerala. With its very limited mineral resources, India has little chance of becoming an industrialist country like Great Britain or Germany, and Kerala is no exception to this. The development of industries will alleviate the suffering, but it may not in itself be able to cure the ailments. Agricultural improvements are certainly called for, and perhaps they are the fundamental sources which are likely to yield results of a more permanent value.

The time-honoured method of suggesting improvements is the recommendation that western methods should be practised. The western methods cannot be transplanted due to the size of the holdings in Kerala. About 10% of the holdings are less than 50 cents, 38% less than 1 acre, 87% less than 5 acres and 96% less than 10 acres. In any country, the size of an economic holding varies with the standard of living and the type of crops cultivated, but for a family of five in Kerala, the estimated figures is about 5 to 8 acres.⁵⁰ Hence nearly 90% of the holdings are uneconomic. In addition the ryot is ailing from chronic indebtedness. What is actually needed is a new outlook on agricultural enterprise among the governments and the landed aristocracy in the region. They should press into service the help of science in the agricultural industry as freely as it is done in the case of all other industries. It is indeed a pity, nay a tragedy, to think that the owners of an industry that is giving employment to the 300 out of the 400 millions of India's population have not, generally speaking taken advantage of what science has shown to be possible in its development. All other industries put together in India, could never hope to give employment to such a vast population as the agricultural industry does today. Yet, it is the most unorganized industry.

The possibilities of increasing the acreage under tillage are admittedly few, the chances of improving the size of the holdings to make them more economical are perhaps fewer. Yet another method of looking at the problem would be to try and determine the extent of employment which the ryot actually has at present to find out if he is fully occupied during the 12 months of the year; and if he is unemployed to suggest some suitable sources of employment for him, either industrially or agriculturally. I have not made a sufficiently intensive study of the industrial potentialities of the

50. Vide 1931 Census of Travancore, Part I, p. 46, where the figure suggested is 10 acres.

region, but apparently they do not seem to be very great and the chances of such industries removing unemployment on a large scale, are to my mind remote. I am however prone to suggest that if the agricultural ergographs⁵¹ are constructed, either for the region as a whole, or for the three natural regions into which it has been divided, one notices certain remarkable features. There is the absence of satisfactory employment during the months of May, June, July and August in the bulk of Kerala.⁵² This season of agricultural inertia with its incessant rains also happens to be the season of poverty in coconuts. It is mainly during this season that the agricultural population requires employment. On the coastal regions it is possible to suggest the remedy of fishing to a certain extent, but it must be admitted that this is again the one season when the seas are really stormy, so that fishing is most dangerous. Unless modern methods of fishing with trawlers are adopted, it is not likely that fishing could develop remarkably in this season. And even if it does develop, it would provide occupation only for the coastal peoples. Admittedly the coastal lowlands are the most densely peopled parts and relief there is more pressing than anywhere else, but nevertheless, attempts should be made to secure something which is likely to benefit the whole of Kerala. The suggestions which I venture to put forward here are of two types (i) a more intensive type of cultivation of the several crops now grown in the region, and (ii) the introduction of new crops.

The area under betel leaf and arecanut cultivation could be increased. At the present day, there is an enormous demand in India for both these commodities. With fast transport, and who knows electrically cooled railway carriers, it would be possible for

51. For a detailed discussion of these ergographs see Dr. A. Geddes, *International Congress of Geography, 1938, 'The Chotanagpur Plateau and its bordering plains.'* I must here express my most profound thanks to the Directors of Agriculture, Madras and Cochin for the trouble they have taken on my account, in obtaining for me the full details of agricultural activity in Malabar, Kasaragod and Cochin. I regret, that in spite of repeated requests no information of any sort was available from the Department of Agriculture in Travancore.

52. Except in Nanjinad in the south where the first rice crop is then grown under irrigation. Perhaps it is best to construe this as a region of transition between Kerala and Tinnevely. In Kuttanad, May is a busy month because of the onset of the monsoon when the water has to be kept at bay and the harvest has to be gathered.

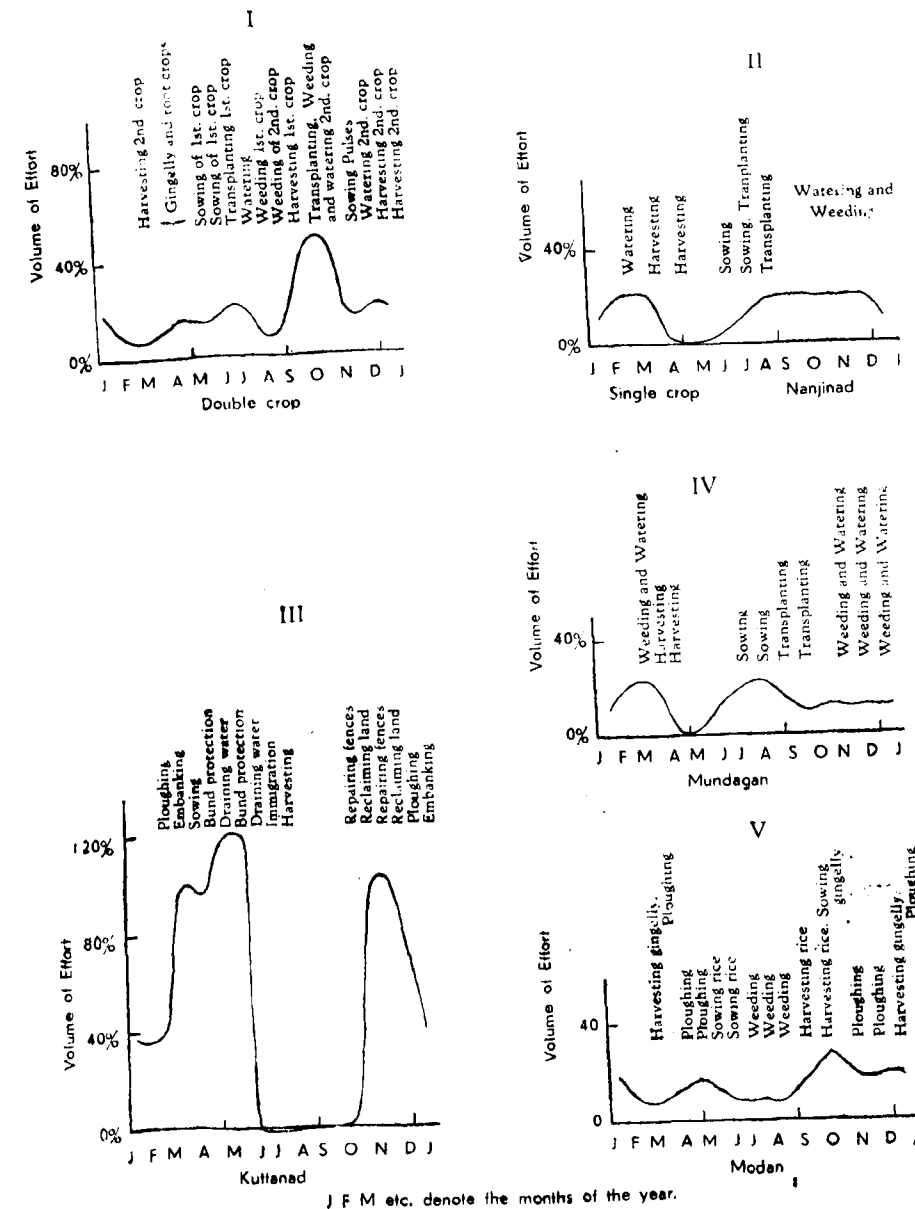
this region to cater to a very large part of India's demands on the pan industry. Fruit trees like the bread fruit tree could be grown in larger numbers in the home gardens and an attempt must be made to promote the culture of the jack tree. Robusta coffee has been introduced into the foot-hill regions of Travancore recently. As a garden crop its cultivation has been very successful. I do not advocate the growth of coffee estates, as it is not likely that such estates in Kerala could compete with those of Coorg or Mysore, but as a garden crop of the foot-hill zone, it will be very advantageous and sufficient to meet the home demands. Black gram and green gram are found to grow luxuriantly in soils with a limy constituent mainly in the less leached soils of the south. These are sown in March-April, to be harvested in June-July. A second sowing takes place in October-November with the harvest in December-January. The cultivation of these pulses, fruits and vegetables is generally done during the period of agricultural inactivity; it is therefore true to some extent to say that agricultural unemployment is less in those parts where the variety of crops is greater, as in the foot-hill zone of Travancore.⁵³ Parts of Kerala lying further north would do well to emulate the agricultural practices of the south. The extent of the area under the pulses should be increased and other pulses like the soya bean should be introduced. According to Decandolle, the soya bean is indigenous to Cochin-China and Java. In Manipur and Naga hills, it is sown in November or December and harvested in March or April. Is it impossible to evolve a type of soya bean which would grow under the climatic conditions of this region? On the calcareous soils, fodder crops like alfalfa or lucerne can be cultivated to great advantage.⁵⁴ Other crops like cheena, buckwheat, cowpea, etc., could all be grown in the region. Buckwheat is grown in Darjeeling hills and in Bihar and Central Provinces. Sown at the end of June in roughly prepared land, it is harvested in October. Since the seed sheds easily when it is ripe, an early harvesting is necessary. It grows best on granitic soils and it is scarcely ever manured. As such it is most suitable for the hillier parts of north Kerala. It is a nourishing grain and is specially appropriate for feeding hens, as it induces them to lay eggs earlier. It should always be utilized

53. Compare the graphs X and XI.

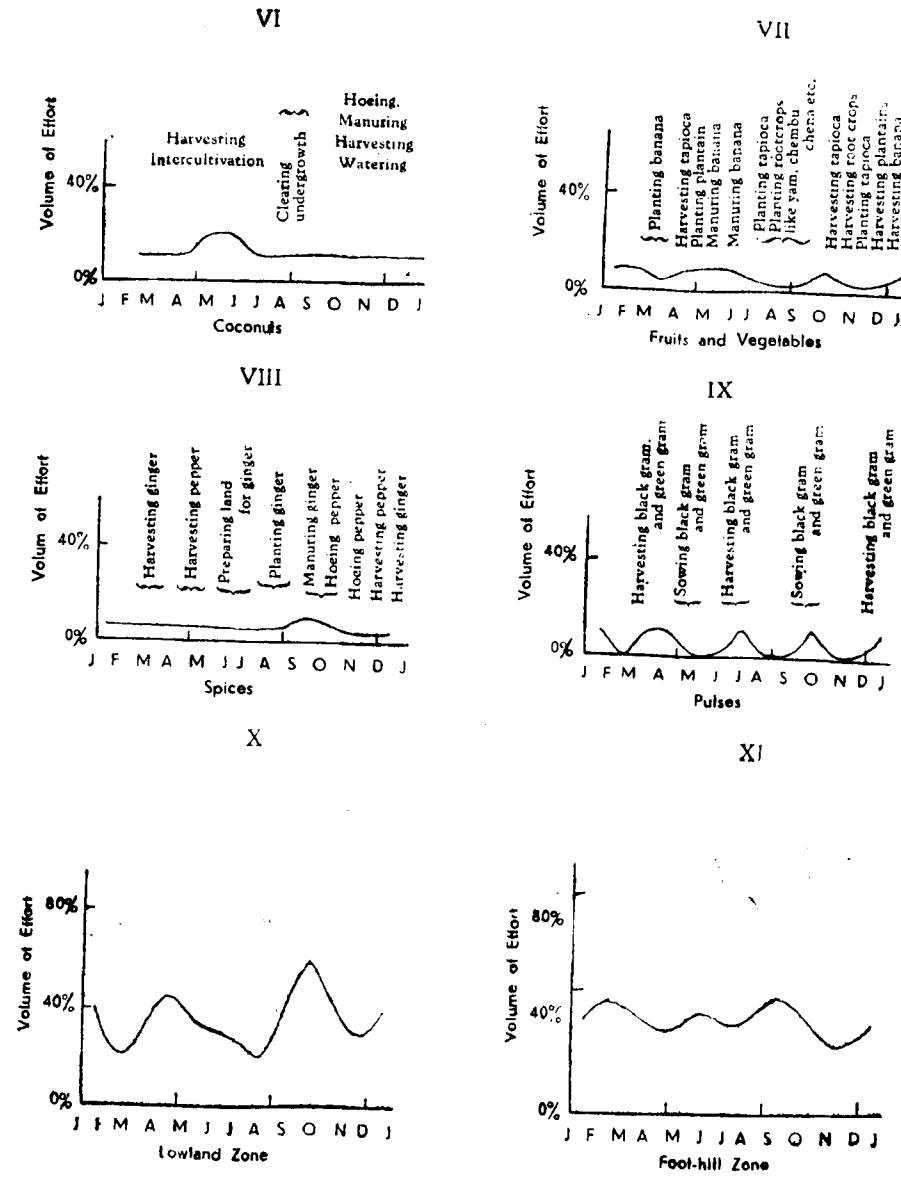
54. *Statistical Atlas of the Madras Presidency, 1936 edition, page 913.* 'The remedy lies in the growth by the ryots themselves of fodder crops in the dry season.'

as a catch crop. Lac culture is possible, especially with turmeric and ginger being grown under the shade of the trees. The inoculation can take place in November or December and the crop harvested in June or July.

'It even required the exercise of the autocratic powers of Fredrich II of Prussia to effect the introduction of the potato into the sandy districts of Pomerania and Silesia.'⁵⁵ Likewise, it required a Napoleon to introduce beet-root into France. Some revolution in agricultural methods and crops is necessary, if the region is not to suffer from poverty and pestilence, and it is high time the governments, enlightened as they are, should become emboldened to attack this problem of land utilization and pressure of population, from an angle not hitherto looked at. A land utilization survey should be conducted and its results would be of far-reaching value. I may be considered to be an arm-chair theorist with no conception of the conditions in the field and the difficulties associated with agricultural propaganda among the uneducated millions of India's peasants to make such sweeping suggestions. Kerala has the highest standard of literacy in India, both among men and women, and it would therefore be the very region where agricultural reforms are easiest. I submit that these facts, however theoretical and unorthodox they may appear to be, deserve some consideration at the hands of the administrators.



55. Chisholm, 'Commercial Geography,' p. 135.



J F M etc. denote the months of the year.

APPENDIX I

	Area.	Forests.	Not available for cultivation.	Cultivable waste other than fallow.	Current fallow.	Net area sown.
Kasaragod	...	20,274	21,062	143,934	167,543	134,584
Malabar	3,591,675	357,949	60,087	862,866	256,031	1,514,742
Travancore	4,714,985	1,593,925	363,101	371,816	117,158	2,220,350
Cochin	944,053	59,810	76,995	11,463	23,648	472,026
TOTAL for Kerala	9,441,220	2,031,958	1,061,305	1,390,079	564,380	4,341,702

APPENDIX II

Region.	Total area irrigated.	Canals.	Tanks.	Wells.	Other sources.	Rice.	Crops, cereals and pulses excluding wheat, barley, jowar, bajra, maize.	Other food crops.
Kasaragod	...	...	...	...	...	...	...	...
Malabar	...	...	...	...	...	...	...	...
Cochin	344,579	188,064	20,937	14,725	120,853	213,090	25,033	45,827
Travancore	814,720	303,399	114,536	10,432	386,353	...	431,105	320,309
TOTAL	1,159,299	491,463	135,473	25,157	507,206	213,090	456,138	366,136

APPENDIX III

Name of Taluk.	Total area.	Total cultivated area.	AREA UNDER								
			Rice.	Coconut.	Tapioca.	Sugar-cane.	Rubber.	Tea.	Coffee.	Pepper.	Ginger.
Thovala	92,774	29,483	14,127	480	1,414	10	...	387	65	...	...
Agasteeswaram	68,228	33,073	24,762	8,241	70	...	...	...	...	...	...
Kalkulam	146,810	51,975	20,480	12,342	15,510	1,150	1,176	823	...	213	234
Vilavankod	105,702	49,743	8,494	17,886	14,762	50	2,341	...	...	99	...
Neyattinkara	149,334	95,284	14,912	31,416	48,508	...	...	...	...	311	137
Trivandrum	62,246	41,996	10,010	22,785	8,485	...	75	...	...	635	6
Nedumangad	234,253	91,470	14,196	7,694	46,275	...	2,418	2,746	...	18,225	16
Chirayinkil	93,760	61,732	13,504	28,588	18,157	...	...	...	...	1,513	...
Quilon	94,342	75,539	14,611	49,885	10,038	...	...	...	...	...	...
Kottarakara	129,299	90,366	16,791	26,427	37,038	33	685	...	...	6,387	5
Pattanamapuram	272,429	63,818	12,580	5,294	27,341	416	7,477	3,131	...	4,520	59
Shencotta	72,650	15,674	7,729	1,109	6	3	2,727	1,050	50	...	...
Pathanamthitta	574,822	82,175	8,209	20,668	29,575	1,847	12,193	3,365	...	3,272	46
Thiruvella	140,896	116,025	32,198	43,150	38,510	6,546	1,221	...	...	1,400	10
Kunnatur	96,294	48,319	14,289	9,262	14,180	28	4,113	400	...	3,029	14
Ambalapuzha	94,374	80,933	54,118	23,762	53	...	...	...	...	...	...
Kartikapally	46,514	43,945	24,686	16,259	...	...	...	...	...	...	...
Mavelikara	71,115	69,791	21,972	19,070	25,553	130	66	...	...	...	...
Karunagappally	56,960	51,936	21,197	23,818	3,789	...	...	...	...	13	27
Changanacherry	168,819	102,151	31,647	23,347	17,540	969	24,917	1,531	...	...	...
Kottayam	133,986	99,858	36,772	27,175	20,086	1,864	4,495	...	...	4,238	2,028
Shertalli	74,970	61,555	22,145	34,941	269	...	...	...	...	...	...
Vaikom	92,198	69,512	26,682	22,831	11,472	...	722	...	...	...	...
Minachil	181,382	130,806	16,587	58,875	12,542	205	11,956	1,030	4,082	15,367	7,062

APPENDIX III—Continued.

Name of Taluk.	Total area.	Total cultivated area.	AREA UNDER									
			Rice	Coconut.	Tapioca.	Sugar-cane.	Rubber.	Tea.	Coffee	Pepper.	Ging er.	
Muvattupuzha	279,974	130,095	75,113	9,823	25,130	212	5,975	...	297	5,361	4,684	
Thodupuzha	311,642	80,077	31,166	9,936	11,519	45	6,284	780	433	15,261	1,523	
Kunnathunad	231,452	74,081	63,535	817	1,100	105	1,673	...	...	1,953	1,098	
Parur	62,595	61,990	31,404	19,057	2,295	1,100	138	...	...	...	...	
Devicolam	426,899	38,327	3,107	...	...	12	783	33,611	914	...	...	
Peermade	288,576	35,235	3.3	5	...	...	5,261	29,095	...	...	...	
Cochin Kanayannur	101,423	75,360	32,115	25,400	5,400	...	...	...	...	...	...	
Cranganur	11,209	9,454	2,382	6,495	520	...	...	...	...	...	...	
Mukundapuram	322,247	116,123	57,163	18,432	14,060	...	5,000	970	65	1,634	...	
Trichur	156,736	87,735	5,503	9,250	6,605	...	2,000	...	...	...	...	
Talapalli	163,946	115,565	71,211	3,165	3,216	...	...	...	...	...	...	
Chittur	181,492	61,005	52,180	1,610	3,260	340	3,000	1,627	2,006	440	...	
Chirakkal	436,271	168,767	87,443	39,513	21,290	26	...	...	...	31,063	57	
Kottayam	308,032	106,891	34,878	39,917	16,419	...	182	...	...	23,892	38	
Kurumbanad	323,456	188,775	53,861	103,348	10,122	...	2,003	...	3	9,090	682	
Wynaad	524,831	74,969	40,080	...	9,463	5	470	12,295	4,345	8,035	367	
Calicut	242,477	110,037	40,125	40,442	7,236	...	2,955	...	168	5,698	719	
Earnad	618,476	20,927	110,412	37,372	12,519	...	5,072	433	...	5,451	3,659	
Walluvanad	562,045	201,036	156,088	17,236	12,507	...	1,544	51	342	6,742	4,060	
Palghat	411,539	204,931	207,445	10,807	9,126	3	900	124	1,397	291	677	
Ponnani	272,093	219,766	129,906	61,593	4,055	1	...	...	...	1,756	1,061	
Cochin	11,158	897	190	598	...	...	...	...	...	...	...	
Kasaragod	490,618	151,685	106,950	21,500	...	...	...	...	...	6,050	...	
TOTAL for Kerala	1,010,098	4,314,462	1,923,228	1,015,020	441,047	15,489	119,872	93,083	14,513	86,416	34,091	

Geography of the Cotton Zone of Bombay Karnatak*

By

C. D. DESHPANDE,

Karnatak College, Dharwar (Bombay Pr.).

That cotton has played a vital role in the economic life of the people of Karnatak can be gleaned from the ancient Inscriptions. Cotton was in extensive and general use in India as much as twenty-seven centuries ago, and was known to the Greeks and Romans, as an article of import in the finished form of fine cloths. Bombay Karnatak must have participated in this prosperity of cotton and cotton manufacture ever since the earliest commercial contacts of India with Europe, for the local cotton became well-known through the exporting port of Kumta and the cotton consequently earned the name "Kumta" which even now has a wider currency than the local "Jawar."¹ We have little direct information relating to cotton production of Bombay Karnatak under the early Hindu Mohammedan and Maratha rulers, but the growth and prosperity of local centres of textile handicrafts, like Ilkal, Guledgudd, Kamatgi, Betgeri, Rabkavi and Gokak, in this period, could not have taken place without the necessary support from the cotton cultivation. Articles of rough texture like 'Gudars' the famous Ilkal Saries, and the dyed cloth of Rabkavi and Gokak were well-known during the Maratha rule. Most of the cotton seems to have been consumed at home although there was an appreciable export to Maharashtra by land routes and to coastal regions and European countries through the Kumta port.

The influence of British rule however has brought about a fundamental change in the position of cotton. By the time Bombay Karnatak was annexed by the Company, England had already become an industrial nation; and under the aegis of the growing cotton textile industry of Lancashire, commercial bonds with

U. S. A. and India became closer. Raw cotton of U.S.A. supported Lancashire, but political relations were not harmonious. The events of 1773 and 1812 induced the industry to seek for a stable source of supply from the Empire countries. It was under these circumstances that cotton of Bombay Karnatak, like that of other cotton-growing tracts of India, attracted the attention of the Western Commercial Community in India. But indigenous cotton was of an inferior quality especially in staple, and was often marketed in adulterated condition. This explains the series of attempts made by Lusk (1829) Shaw (1841), Mercer (1841), Hawley (1844), Brook (1860), Forbes (1862) and Shearer (1867)² to introduce American and Egyptian cotton in order to improve the quality, while their experiments were attended by a gradual success, the American Civil War stimulated the export of Indian cotton and marked the beginnings of the textile industry in India.³ Cotton production received a stimulus with this expansion of home markets; and the progress of the textile industry, the rise of Japan as a consumer of Indian cottons, and the War of 1914-18 have brought in a period of prosperity to the cotton growing tract of India including Bombay Karnatak, in spite of several periods of trade depression.

Position of Cotton in the Agriculture of Bombay Karnatak

From the point of view of area under cultivation and economic advantages, the position of cotton is unique. It is the premier cash crop of the province, and in area is the second best crop. Out of the total gross cropped area of 70,00,000 of acres, cotton occupies an area of about 12,00,000 or more than 1/6 the total cropped area. The proportion becomes more significant if the three cotton growing districts of Belgaum, Bijapur and Dharwar only are taken into account. Nearly 1/5 of the total gross cropped area is under cotton in these districts. Jawar, with an average of nearly 25,00,000, is the leading crop of Karnatak, and next to it comes cotton. Again cotton compares very favourably with other leading cash crops. Wheat occupies 6,50,000, while oilseeds nearly 3,00,000; Tobacco 60,000, and sugar-cane only 47,000 (Vide Table I). How far is the prosperity of Bombay Karnatak dependent on cotton can be seen from these figures, when it is also well-known that agriculture is the mainstay of the people.

*Paper contributed to the Geography and Geodesy Section of the 29th Session of the Indian Science Congress, Baroda: January 1942.

1. Dharwar Gazetteer, p. 281.

2. Dharwar Gazetteer, p. 286 ff.

3. Vakil Bose & Deolalkar: Cotton Textile Industry.

Distribution of Cotton: influence of soils and climate.

Of the four districts of Bombay Karnatak, cotton cultivation is restricted to the three plateau districts, owing to their favourable position in relation to soil and climatic factors. Geological history and the consequent distribution of soils exercise a primary influence in the region. Although the major part of the Karnatak plateau belongs to ancient crystalline gneisses and granite, the outcrops of rocks of the Dharwar and Kaladgi series introduce local variations in relief and soil characters, while the Northern half of Belgaum and Bijapur are covered by the Deccan trap flows characterised in places by the high laterite on the Western borders.⁴ In regions of moderate rainfall, the famous black soil prevails almost all over the tract, except on the outcrops of Dharwar and Kaladgi series where it gives way to red, grey, and reddish brown soils of the poorer quality.⁵ It is unnecessary to dwell upon the fertility of the black cotton soil; for its argillaceous character, retentivity of moisture and natural tendency to regain fertility after a season of hot sun, are well-known. This is the soil that primarily controls the distribution of cotton cultivation in Karnatak owing to its natural adjustment with the crop under specific climatic conditions, although red soils of Western Dharwar promote to some extent cotton cultivation.

Equally important though not more is the climatic factor which definitely controls the distribution of cotton cultivation on the West, and determines the quality of the crop produced in different parts of Karnatak. Temperature favours the growth of this sub-tropical plant throughout the year, but the limiting factor is the rainfall both in its amount and regime. The 40" isohyet skirting round the towns of Belgaum and Dharwar marks the western limit, because cotton, generally requiring a rainfall between 25-30" in sub-tropical countries, can be grown under a slightly heavier rainfall in the tropics owing to greater evaporation. East of this isohyet rainfall rapidly dwindles in amount and there is also a transition from the summer to winter maximum.⁶ From the point of view of area under cotton cultivation it makes little difference since nowhere in Karnatak does the average rainfall decline below 22" in the normal times. But the season of cultivation, the quality

4. Foote Geology of the S. M. Country, p. 201, 203.

5. Sahasrabudhe: Soils of the Bombay Presidency, p. 70 ff.

6. Statistical Atlas 1924.

of crops, and the security of the season are undoubtedly influenced by these climatic variations.

East of the 40" isohyet therefore lies the cotton zone of Karnatak, dominated by the crop with which is linked the prosperity



Map. 1

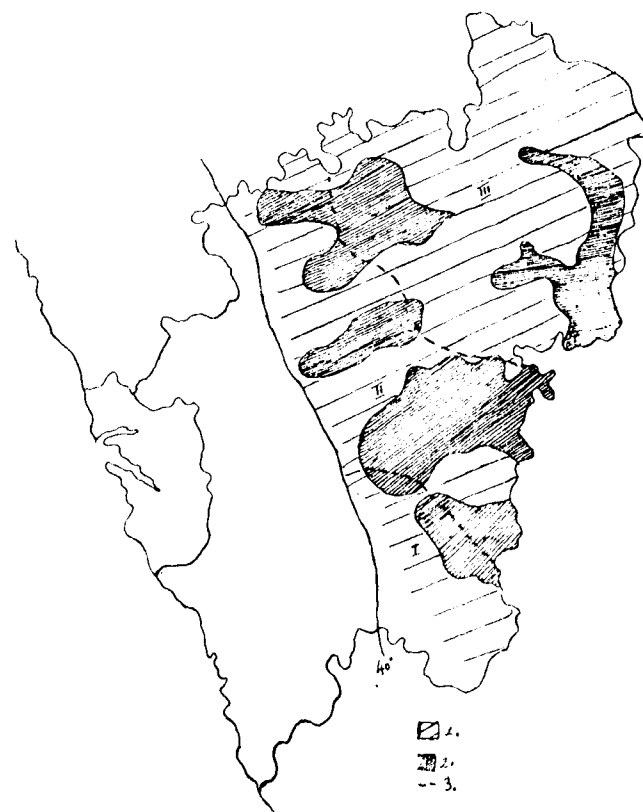
Distribution of Cotton

One dot represents 100 acres.

of the people. (Map 1). Local variation, both in quality and predominance in cultivation, exists owing to variation in soil. In general three sub-regions can be distinguished. (Map 2). In the South-West lies the red soil region of Haveri and Ranebenur where kharif cotton can be grown because greater rainfall compensates the comparative poverty of the soil, and where suitable conditions promoted the earlier extension of American varieties.⁷ With a

7. Fletcher: Preliminary note on Bombay Cottons, p. 11.

steady rainfall characterised by early showers in June, on a well-drained soil, and the moderate character and Rabi rains,⁸ this region favours kharif cultivation. The crop does well in its early stages of growth, but the picking season is beset with difficulties. In the



Map. 2

Cotton Belts

1. Cotton Zone
2. Regions of Intensive Production
3. Boundaries of Minor Belts
- I. Kharif Cotton Belt
- II. The Central Belt
- III. The Eastern Tract

normal season, pickings are over by January if the cold season continues to be dry, while Rabi rains which frequently visit this

8. Kottur: "Dharwar American Cotton," p. 9-10.

region delay the picking operations till April; but moderate rabi rainfall gives the best yield, while heavy showers in this season produce a poor-typed cotton. On the whole, however, the kharif tract has a good cotton area extending to about 1,20,000 acres of land in the four Western Districts of Dharwar. A distinguishing feature of this belt is the stable area under cotton from year to year, due to the fairly steady annual rainfall, a sharp contrast to the cotton areas of the Black soil belt.

Further east lies the central Black soil belt extending from Gokak to Gadag and Ron in south where cotton reaches its maximum production. Soil and moderate rainfall spread over the summer and winter months offer a very favourable setting to the cultivation of cotton; and almost ideal conditions prevail in certain patches where the soil has matured to the highest degree. In the surroundings of Gokak, irrigation by a clever process of inter-culturing, has been adapted to the cultivation of superior type of cotton. Further south are the Bailhongal, Bennihalla, and Gadag-Ron regions where best soils promote a better type of cotton. Here $\frac{3}{4}$ cropped area is devoted to cotton. Rainfall regime influences the sowing and picking operations. Generally late August and early September is the sowing time, cotton crop consequently takes a rabi character. It all depends on the rains. Early good showers lead to earlier sowing, but not at any rate before the 1st half of August for early sowing although advantageous in certain ways presents difficulties at the picking season owing to rabi rains. The advantages of good early showers can be well retained by this soil and hence late sowing does not matter much from this point of view, although the operation cannot be long delayed as rise in temperature in January and February causes early flowering of the plant in that case. The case of very late rains, happily not very frequent, because major rainfall of this tract comes in summer, and failure of these rains amounts to famine conditions irrespective of any crop. In a normal year, the plant flowers by November and December and yields two or three pickings up to the end of April. Easterly winds in the growing season, and rainfall during the picking intervals, however, present difficulties. Such winds promote diseases of which the Red Leaf Blight is the most prominent, and unseasonal showers naturally reduce the commercial quality of the crop. In spite of these disadvantages, however, cotton conditions are par excellence in this belt.

Beyond the residual hills of Malaprabha and Ghatprabha valleys, lies the third major cotton producing area of Bombay Kar-

natak. Athani, Jamkhandi, Mudhol and the Districts of Bijapur underlain by the true "regur" produce cotton to a great extent. But although the whole of this region, owing to uniform regime of moderate rainfall, can be grouped into one cotton producing belt, local variations due to different stages in maturity of the regur soil and outcrop of Kaladgi sandstone introduce regional differences.⁹ Cotton cultivation is restricted to the low-lying areas of mature regur, like the valleys of the Krishna, Ghatprabha, Don, and their smaller tributaries. The Don Valley in particular is a region of intensive production. The sowing season in this belt is naturally delayed by the late rains and picking operations too come later than in the Western tracts.

Beyond the borders of Bombay Karnatak, in the North, East and South, the cotton zone merges into the cotton growing areas of Maharashtra and Nizam's territories owing to similarity in geographical conditions.

Changing area under Cotton cultivation

Along with a survey of the distribution of the crop and belts of intensive cultivation, reference must be made to annual change in the area sown due to a variety of influences. Easily the most prominent of them is the variation of rainfall from year to year. This variation increases towards the eastern parts with the consequence, that the area under cotton suffers violent changes in the Bijapur belt. Equally important, but more uniform in its influence, is the economic factor. Fluctuations in the price of cotton reflect in similar manner, though somewhat slowly, in the area under the crop. To a certain extent however competition of other crops influence the area through subsistence nature of agriculture, rain failures and plant diseases. In the Bijapur region where famine conditions are frequent, the need to raise food and fodder crops, restricts cotton cultivation a good deal in spite of other favourable conditions. On the other hand in the western and central cotton belts, with a failure of early Kharif rains, the farmer turns to rabi crops of which cotton obviously holds much attraction. Plant pests on Jawars and other food crops and diseases influence the area both negatively and positively. It all depends on plant diseases an area happens to experience, which discourages the farmer to play with cotton, while pests and diseases of the

9. Simkins: Agricultural Geography of the Deccan Plateau: p. 6.

food crops more frequently turn the scales in favour of cotton. The general tendency of the plant diseases appears to favour on the whole cultivation of cotton at the expense of other crops. Little statistical information is available in this direction. But it would be instructive to analyse this problem from the stand-point of crop planning and balanced crop production, so often emphasised by agricultural experts.¹⁰

Qualitative Distribution of Cotton



Map 3

Cotton Tracts on the basis of quality

1. Kharif Dharwar American Belt
2. Dharwar-American Belt
3. Kumta Bagalkot Belt
4. Kumta Bijapur Belt.
5. Kumta Dharwar Belt.

10. Burt: Economic Problems of Modern India (Ed. R. Mukerjee).

Commercial crops are important both from the point of the view of quantity and quality. Often it is the quality that counts. Owing to peculiarities of temperature and rainfall, the indigenous cotton does not compare favourably (Table 6) with the American varieties.¹¹ Of the two indigenous varieties 'devkapus' (*Gossypium arboreum*) and 'javari hatti' (*gossypium indicum*), Jawar is the crop known to commerce and indigenous industry as the 'Kumpta' cotton. In the pre-British days, Kumpta seems to have been grown almost all over the plateau tract of Bombay Karnatak, and used by the handloom industry of Bijapur, Jamkhandi, and Gokak tracts. Although most of such handloom production consisted of coarse cloth for local consumption, some selected cottons were definitely useful in the production of finer fabrics for which certain centres were well-known, for Marshall reporting in 1820 on the conditions of Bagalkot tract speaks of looms as turning out "nothing but cloths of very coarse fabric, such as constitute the common dresses of the agricultural society. The defect seems to be chiefly in the spinning, the country-people being totally unaquainted with the art of drawing a fine thread, whilst weavers are to be found who can produce cloths of superior quality from good thread; it is certainly not the fault of the material for the very same cotton goes to Naraenpet (in the Nizam's dominions) and comes back in the form of beautiful muslins."¹²

Was Kumpta cotton of the pre-British days as poor in quality as present day indigenous strains? There is reason to suppose that the cottons of those times, owing to imperfect means of communication and transport, were of a purer strain and a better quality. The practice of large scale adulteration of the local cotton with inferior Indian types during the cotton booms of the last century must have seriously damaged its earlier quality, in spite of the strenuous efforts to improve the position by adaptation of American and Egyptian varieties to local environment. At the same time there are no two opinions that Kumpta cotton both of the earlier and the present varieties, due to unfavourable natural environment, is inherently inferior to the American and Egyptian strains. Machine industry has widened the gap in favour of the longer stapled cottons, for, on the hand-loom, a cloth of finer texture can be woven even though the cotton belongs to shorter stapled variety. Marshall's observation is full of interest on this point. "The decid-

11. Fletcher: p. 28.

12. Marshall Statistical Report, p. 145.

edly inferior cotton of the Ceded Districts spun and woven at Kurpa, Gudwel, and Tarpurtree, affords cloths that can bear exportation to Bagalkot and find a ready sale there, from their superiority to those made at home.¹³ Hand-loom and hereditary skill were mainly responsible for the manufacture of famous Indian cloth types that were known all over the civilised world before the Industrial Revolution. Modern textile industry however requires a cotton type with a longer staple and better twist.¹⁴ Most of the Indian indigenous cottons in their purer strain are unable to fulfil these requirements.

This therefore explains the strenuous efforts to improve cotton during the 19th century in Bombay Karnatak where American types were introduced because Kharif and rabi rainfall introduced conditions almost similar to those prevailing in the Southern States.

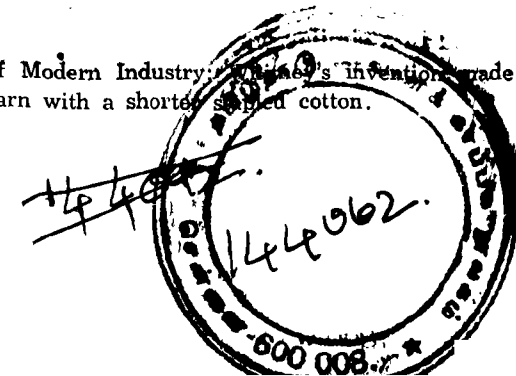
The shorter staple and lower grade of Indian cotton is attributed to the shortness of the growing season, which largely depends on the amount of the annual rainfall, its distribution and the retentivity of the soil.¹⁵ Happily however conditions unlike in other cotton growing tracts of India are modified in Bombay Karnatak by the even distribution of rainfall through the rabi as well as Kharif rains, which makes cotton growth possible in an area with even as low a rainfall as 22 inches per annum. Retentive regur strengthens this advantage. It is largely for this reason that American varieties were introduced here as early as in 1830. Of the many varieties Brazilian, Sea Island and American, the New Orleans met with a success in 1843, and in its acclimatised form it became known as the Dharwar-American which by 1918, had an extension of 2,50,000 acres owing to its popularity as a superior type to local Kumpta. But its regional distribution was restricted to a small area in southern tracts, as soil and rainfall advantages enjoyed only by this tract were particularly suited to the American variety. Further improvement in 1910 and 1913 by means of hybridisation and selection have produced upland or Gadag No. 1, which has now become famous over the Darwar-American tract owing to its better giving percentage and staple.¹⁶

13. Marshall, p. 145.

14. Hammond: Rise of Modern Industry. "Ginning's invention made it possible to spin a better yarn with a shorter stapled cotton."

15. Fletcher, p. 28.

16. Kottur, p. 21.



But it is clear that the Dharwar—American could not solve the problem for the whole tract, owing to unfavourable rainfall and soil characteristics, and hence the need to find a better substitute to local Kumpta remained as keen as ever. With the success of Dharwar—American, improvements in Kumpta began in 1904 and crossing and selection gave Dharwar I in the first instance, and recently Jayawant in 1928-29 which has been successfully developed in the remaining parts of Bombay Karnatak.

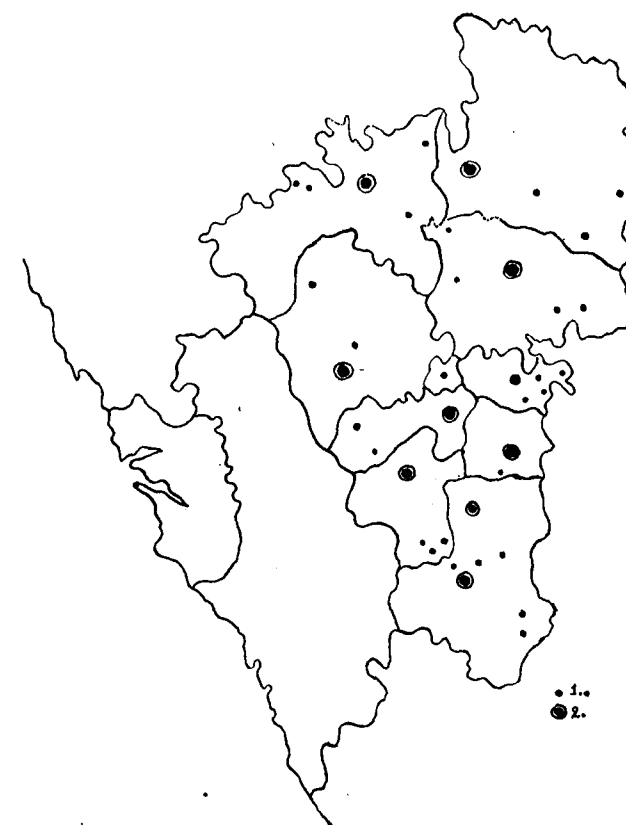
Thus these two varieties Gadag I and Jayawant now find favour with the Agricultural Department to whom goes the credit of improvement, and are now getting increasingly popular with the agriculturist. From the distributional point of view however these two major zones must be distinguished into five tracts on the basis of season of cultivation and quality of the fabric: (1) Kharif Dharwar—American forming the Karajgi, Haveri, Ranebennur and S.M.C. states. (2) Dharwar—American or Gadag I, belt of Ron and Gadag where deep soil seems to have promoted this type. (3) Kumpta—Dharwar tract of the Eastern Belgaum and N.E. Dharwar districts, the largest of all belts, and yielding the best Jayawant. (4) Kumpta—Bagalkot Belt characterised by late sowing operations of the crop, and its lower ginning percentage, giving moderate results in Jayawant. (5) Kumpta—Bijapur where poor rainfall tends to give the least favourable results in Jayawant both in giving % and yield. In general therefore climatic environment seems to give best results in Dharwar—American and Kumpta—Dharwar belts, and the quality seems to deteriorate both towards the West and the East.¹⁷ (Vide Table 6).

But in spite of these local differences, these two varieties on the whole are distinctly superior to their predecessors and compare favourably with most of the Indian Cottons. (Vide Tables 2 and 3).

Even with these advantages, purely from technical point of view these are vital problems awaiting solution. As compared to other cottons of India the cotton of Bombay Karnatak is superior in many respects, but still cannot compete with the longer staple varieties of the Punjab and Madura. Is it not possible to improve the staple by progressive application of Genetics? Cannot the yield be improved in a similar way? Have the possibilities of reaching this goal by means of irrigation, in spite of the skilful method of inter-

17. Nayak: Indian Central Cotton Committee: Tech. Paper, No. 6.

cultured irrigated cotton of Gokak canals, been practically exhausted? Further, there is the question of resistance to diseases. Of the many diseases to which cotton is susceptible in this region, wilt and red leaf Blight severely curtail cotton production. Gadag I and Jayawant are more resistant than their predecessors, yet these are not completely free from them. Great scope lies in this direction; and the Agricultural Department's "New Jayawant," yet in an experimental stage, may partially give us a solution very soon.



Map 4

Seed Distribution Scheme of the Agricultural Department

- 1. Sub-Centre
- 2. Centre

Boundaries indicate area in charge of each centre.

There can be no dispute that production of better types is a difficult art. Far more difficult however seems to be the task of successfully retaining what has been gained from Nature. Every success in improvement seems to have encouraged adulteration in seeds and lint. Commerce must be blamed for bringing the local cotton into disrepute on many occasions. Not that the practice is peculiar to our country, but it seems to have occasioned greater harm to the farmer in India than elsewhere. The Cotton Transport Act of 1923 with its subsequent amendments and provincial additions, aims at controlling this "traffic" in cotton. Already import restrictions, supervision at various points on roads and the system of licensing movement of seed and kapas under the supervision of the Cotton Superintendent and his staff have achieved substantial results. For the purpose of keeping the varieties purer, Bombay Karnatak is classified into two separate regions, and every effort is made to isolate these areas by prohibiting import of seeds and kapas from outside areas and inter-transfer of seed within these areas.

The success of technical improvements is mainly judged by the public response that it evokes. Publicity therefore is often necessary. In order to acquaint the public with the success of the expert in agriculture, the Agricultural Department is charged with the responsibility of publicity and multiplication and distribution of seeds of new types, under special schemes, which are done by the Cotton Superintendent with his staff of Overseers, approved agents and Sale Societies. The seeds of the third generation developed at the Cotton Breeding station are given to the registered seed growers, with a stipulation that they must sell all the seeds to the Department. The seed supply of 3rd, 4th and 5th generations, thus multiplied every year, is distributed to the general public at the 6th generation when it is in the best condition to grow the commercial cotton.

Cotton in Industry and Commerce

From the economic point of view transport and marketing of an agricultural product is as important as the problem of raising quality crops. Often success in agriculture depends on the transport and marketing system.

The fact that cotton was exported before the development of railways, by East-West routes, through N. Kanara Ports, and the time-honoured industrial centres as Ilkal and Guledgud, bear testimony to the role of cotton in the commerce and industry of the

region. Although some of it was used locally by villagers for their own requirements, which explains the mode of distribution of cottage spinning and weaving industry, a large proportion found its way to centres of well-known textile handicrafts. Marshall gives a good description of the prosperity of these centres during the last years of the 18th century.¹⁸

With the development of the roads in the interior followed by railway construction during the last century cotton gained great commercial importance. Every nodal point in the cotton tract became a commercial centre where cotton from the rural interior was gathered by the Adatyas and transported to the bigger centres which were connected by railway to Bombay. Old centres like Bagalkot, Gadag and Hubli, the nodal points in East-West routes, gained a new importance with railway development. Commerce paved the way to industrial processes. By the end of the 19th Century cotton prosperity attracted capital from Bombay. Gins found their way to smaller marketing centres. Presses, a more costly proposition, were established in bigger centres. Spinning and weaving processes on large scale basis made their appearance at Gadag and Hubli, factors of localisation being raw materials and nodal character of these places. Sholapur industry claimed an allegiance of the Bijapur tract, while a spinning mill was established at Gokak Falls under European enterprise owing to the advantage of Hydro-Electric power from the Falls. The prosperity of the cotton mill industry is due to supply of local labour and raw material; but the limiting factors seem to be want of indigenous capital and enterprise. Almost all such concerns have been owned and financed by Bombay merchants. At present the industry employs about seventeen thousand workers in 241 factories,¹⁹ and the spinning and weaving units consumed bales of home-grown cotton. Considering the large home market, there is a great scope in development, particularly in Bagalkot region where water-supply is an additional advantage.

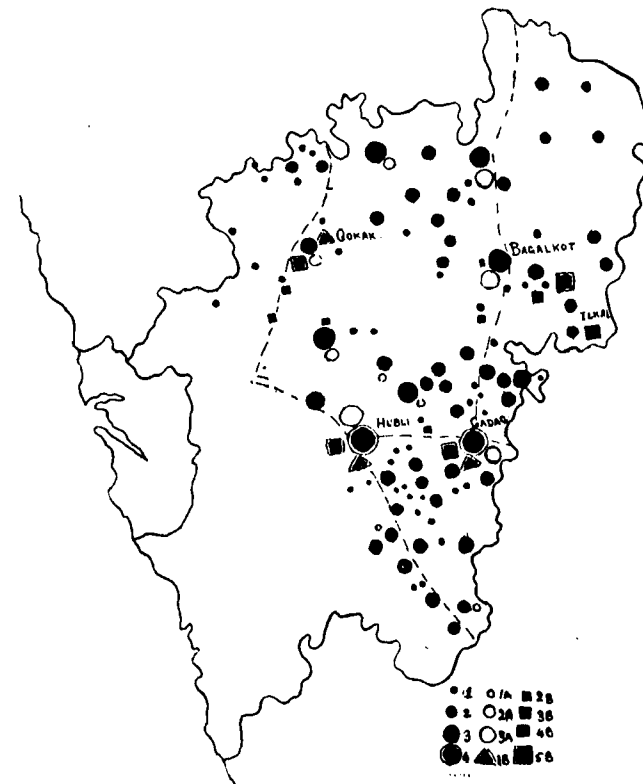
It is difficult to assess the influence of the new textiles over the old handloom industry. Contrary to general expectations, Bijapur seems to have gained in number in the industry.²⁰ With the introduction of higher counts of the mill spun yarn and the synthetic

18. Statistical Report, p. 146.

19. Bombay Economic and Industrial Survey Committee; p. 53.

20. Bombay E. & I. Committee, p. 58.

dyes, hand spinning and local dye industry have perhaps declined. But handlooms have secured an advantage in the finer counts. Apart from the village looms of the agriculturist (used for domestic purpose), nearly 21,000 looms localised in the chief centres (map 5)



Map 5

Distribution of Ginning and Pressing Factories Mills and Handloom Centres

1. 1 Gin; 2. 5 Gins; 3. 5-10 Gins; 4. 10-25 Gins.
- 1A. 1 Press; 2A. 2-5 Presses; 3A. 5-10 Pressing Factories
- 1B. Mills
- 2B. Handloom Centres with 200-500 looms
- 3 B. " " 500-1000 "
- 4 B. " " 1000-2500 "
- 5 B. " " 2500-3500 "

use yarn of 25 to 40 counts and produce goods worth Rs. 32,000 per year. The industry survives, in spite of competition, owing to specialised products such as saris and khans which have made Ilkal and Guledgud famous; and the efforts of the A.I.S.A. with

its branch at Hubli, and specialised training facilities offered by the Department of Industries are expected to improve the economic position of this ancient industry representing the hereditary skill of Karnatak.

Commerce and Industry have their problems. Adulteration of cotton, the scandal of the last century, persists though on a smaller scale. It is difficult to maintain the quality of the cottons, owing to indifference of the cultivator and wanton adulteration of the seed by the middleman. Indifferent picking reduces the commercial value. Quantity is more tempting than quality. Marketing offers difficulties in the way of storage, weights and commissions, which hardly leave any margin of profit to the cultivator. The Departmental supply scheme, regulated markets and co-operative sale societies are the hopes of the future. The Bailhongal Regulated Market and the Cotton Sales Societies of Gadag have produced substantial economic results, while the seed supply scheme has been able to maintain the distribution of the quality seed.²¹ Competition of the private Adatiyas and the indifference of the cultivator towards the need to produce quality crops, have yet to be overcome, just as there is the urgent need of local capital and enterprise in the development of large scale industrial units.

Cotton in the Economic Life

How significant is the role of cotton in the Economic life of the people may be judged not only from the foregoing account of the extension of cotton as compared to other crops, and its importance in commerce and industry, but from the dominant position the crop occupies in certain zones. In a typical village of the Black soil country, out of the total cultivated area of 17,000 acres, 8,000 are given to cotton, wheat and Jawar come as a poor second and third.²² Its position as a cash crop, tempts the former to cultivate it, but exhaustion of the soil, the need to raise subsistence crops, the desire to 'distribute the eggs in different baskets' and the evident fluctuation in cotton prices, are restraining influences. Cotton is rotated except in few parts with other crops as Jawar and oilseeds. This balanced cropping has prevented agriculture from taking a speculative turn.

21. Dantawalla: Marketing of Raw Cotton in India.

22. Survey of the Hombal Village (Gadag Taluka).

How keen is the influence of cotton prices on prosperity of the country was well demonstrated in the last agricultural boom and depression. The post-war boom ushered in a period of prosperity and optimism that reflected in the growth of commercial towns like Bijapur, Bagalkot, Gadag, and Hubli. The boom was followed by a depression in 1930. Cotton suffered the worst decline in prices. There was a decline in land values and an increase in rural indebtedness. Happily however other crops supported the population at subsistence level. It is clear therefore that in periods of booms and steady prices, cotton can bring economic prosperity to the people. The problem is one of retaining it and passing it on to the cultivator. This can be achieved to a great extent by placing the emphasis on the quality of cotton rather than on its quantity, along with commercial and industrial developments within the region.

TABLE 1

Area (in acres) under leading crops

Region	Total Area	Gross cropped Area	Cotton	Rice	Wheat	Jawar	Oilseeds
Plateau tract of Bombay Karnatak	9,539,531	6,847,636	1,125,309	280,115	639,043	2,485,480	288,353

(Season & Crop Report 1934-35)

TABLE 2

Comparative analysis of Leading Cotton Types

Type	Staple in parts of 32	Sp. Capacity	Marketing season
Punjab & Sind American 289 F.	34	30's to 49's Weft	October-March
Cambodia	32	30's Warp	March-August
C. India	22 to 26	16's to 20's Weft	October-April
Dhollera Wagad	26	16's Warp	February-June
C. P. No. 2 Oomaras	12 to 18	10/12's Warp	September-April
Khandesh Oomra	18	16½'s to 20's Weft	

TABLE 3

Cottons of Bombay Karnatak

Name	Staple	Maximum Warp counts	Ginning	Yield of kapas per acre
Herbaceum control				
1. Kumta	25	24's	25.4	227 lbs.
2. Jayawant Kumpta	29	40's	28.6	252 lbs.
3. <i>Hirsutum</i> Dharwar-American	22	20's	29.0	224 lbs.
4. Gadag No. 1 Dharwar American	25	33's	32.0	231 lbs.

TABLE 4

Extension of Jayawant and Gadag I

	Jayawant	Gadag I
1936-37	1,00,717	84,410
1937-38	2,45,318	92,410
1938-39	3,24,197	1,12,944
1939-40	6,28,713	1,33,515
1940-41	5,55,544	1,51,480

TABLE 5

Spread of Jayawant

(under the Seed Distribution Scheme of the Agricultural Department)

Centre	1936-37	Jayawant	1939-40
1. Hubli	2,094		1,08,188
2. Navalgund	22,000		1,42,312
3. Haveri	33,292		1,00,100
4. Bailhongal	10,531		55,000
5. Athini	22,400		79,399
6. Bagalkot	5,000		45,551
7. Bijapur	5,400		98,168
		Gadag I	..
1. Gadag	35,300		87,335
2. Ron	29,110		46,180

TABLE 6

Influence of Rainfall on quality

(adapted from M. Naik)

Fibre & Agronomic characters	Haveri (kharif belt)	Dharwar (Bt central belt)	Bailhongal central Be	Bagalkot (Bijapur belt....)	Bijapur	Athini
	R.F.	30"	35"			
Fibre length	0.938	.920	.913	0.887	0.872	0.893
% of Mature Haira	55.5	66.3	58.2	61.5	65.2	59.3
Ginning %	28.7	29.5	27.3	27.3	28.6	28.4
Yield of Kapas (lbs)	368.7	525.7	400.7	330.0	171.0	206
Yield of lint (lbs.)	106.0	155.3	108.7	90.3	49.0	59.0

That fibre length and yield show a tendency to decline with rainfall is clear from this table.

TABLE 7

Hand Loom Centres and Production (adapted from Telang)

Centre	No. of looms	Counts used	Kind of cloth	Daily production in value
1. Bagalkot	350	30's to 64's	Khans, Saries, fine dhoties	3,500
2. Kamatgi	800	20's, 32's, 40's, 64's	Khans mercerised	5,000
3. Ilkal	3,025	60's & 80's	Silk Saries	1,700
4. Guuledgud	3,500	30's, 32's & 40's	Khans & Phetas	10,000
5. Kerur	1,100	20's, 32's & 40's	Cotton & Silk Khans	1,500
6. Gadag	3,300	20's, 32's, 40's 64's	Silk Saries & Khans	1,250
7. Rajendragad	2,050	20's, 30's, 40's, 60's	Saries and Khans	1,500
8. Hebsur	250	2's, 4's, 6's, 8's 10's, 20's 30's	Gudars	500
9. Ranibennur	2,000	20's, 30's, 32's and 64's	Khans Saries	1,250
10. Hubli	3,500	20's, 30's, 40's, 60's 64's 84's	Khans Saries, Dhoties	2,000
11. Belgaum	270	mercerised yarn 20's, 32's, 40's, 60's	Khans, Dhoties Pitambers Saries	800
12. Bailhongal	400	20's & 30's	Dhoti and Saries	800
13. Pachapur	200	20's & 30's	Dhoties	500
14. Gokak	725	16's, 20's & 30's	Cotton and Silk saries	1,000

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The author is much indebted to the Deputy Director of Agriculture S. D. and the Cotton Superintendent, and their staff for their constant help and for the uniform courtesy shown to him in the preparation of the paper.

Battle of the Kangdali*

By

SWAMI PRANAVANANDA

(Of the Holy Kailas and Manasarovar)

The Northern part of Almora District beyond Khela (which is one hundred miles north-east of Almora) and the villages of Chhangru and Tinker on the north-western frontier of Nepal, adjacent to British India, northern part of British Garhwal beyond the villages of Bhavishya Badri and Mana, and the villages of Harsil, Nilang, and Jadang in Tehri State,—all this area is called *Bhot*. In other words, the northern British borderland in the Sub-Himalayas between Nepal and Punjab States, at the mouths of the passes leading into Tibet is *Bhot*. The people that inhabit these tracts are called *Bhotias*. Johar and Dārma Paraganas constitute Almora Bhot. Darma Paragana, also known as Eastern Bhot is again sub-divided into three pattis—Chaudans, Byans, and Darma. These have nothing to do with the independent States of Bhutan or its people. The word *Bhotias* is used indiscriminately for those Tibetans domiciled in Nepal, Sikkim, and Bhutan States on the borderland of Tibet. It is also used for Tibetans by some writers. But the true *Bhotias* are Hindus by religion and claim themselves to be Kshatriyas by caste. They are one of the most interesting races of people which form a connecting link between India and Tibet through the medium of trade. Without entering into the details about these people, which I propose dealing in the course of another paper, I will confine my present paper to the celebration of one of their very interesting festivals.

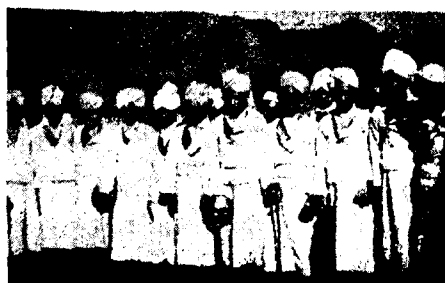
It is only the *Bhotias* of Chaudans that celebrate this Kangdali festival known as *the battle of the Kangdali*. There is no fixed date for this festival; but it is celebrated according to the convenience of the villagers concerned, in the country months of Bhadrapad, Aswin and Kartik. Different villages celebrate this

festival at different times so that people from other villages also might take part in the proceedings. The villages are small and so 3 to 6 hundred people, irrespective of age, sex, or status, actually take active part in the processions. This interesting festival is celebrated once in twelve years when a plant, called *Kangdali*, flowers. It is a shrub about 4 feet high which grows here and there on mountain slopes at heights ranging between 7 and 8 thousand feet above the sea-level. The plant has twelve knots and flowers once in 12 years. There is a common belief amongst the *Bhotias*, that if this plant is allowed to flower freely and not chopped off, that year, something untoward would happen to their womenfolk.

The *Kangdali* festival lasts for about a week, the first three days being spent for the necessary preliminary preparations, the fourth being the battle day proper, and the two or three days following the battle being spent solely for eating, drinking, and merry-making. On the first day of the festival, *putai-lipai*, plastering, white washing, and colour washing of the houses is done; and on the second day they prepare pancakes of wheat flour fried in oil. Large quantities of country liquor is brewed in every house, since there is no restriction on its production by the Government. This is one of the privileges which the *Bhotias* enjoy on the borderland. On the third day the village deity is worshipped and propitiated. This is situated under a tree outside the village, where several bells and flags are set up. Villagers assemble there carrying with them tumblers full of country beer called *dāru*. Flowers are put in the vessels containing beer, and rice is thrown on the people with cries of *Parameshvara*. Then the beer is distributed to all that are present and then they all go back to the village with the beatings of drums, etc. On returning from the deity, pancakes (*Mal-pua*) are distributed to the relatives in their own villages and those in the neighbouring villages.

The Battle:—The actual battle of the Kangdali takes place on the fourth day. Men wear long home-made woollen gowns and big turbans of white colour. Over the gown they wear a long *dhoti* as *kamar-band* or waist-cloth. Women are gaily dressed in colourful silks, woollens, and heavy silver ornaments weighing sometimes 15 or 16 lbs. They wear necklaces of silver coins as rupees, half-rupees, and quarter-rupees. Ladies wear Tibetan boots made of wool coming up to the knees. Between 10 and 12

*Paper read before the Geography and Geodesy Section of the Indian Science Congress, Baroda, January 1942.



A.M. all villagers assemble in front of a prominent villager's house and a regular *Sabha* is conducted. None is allowed to do any sort of business in the village and all work is suspended during these days. One tumblerful of country beer from each house is brought to the *Sabha*. Flowers are put in them. Rice is thrown on the audience and wine distributed in small cups. At about 1 P.M. the procession starts with sounding of drums and cymbals. They conduct the march in single file, the men with swords and shields or lathis and bunches of green leaves in their hands, being followed by the women holding long wooden lease-rods, called *rel* in one hand and coloured silk cloths in the other. Dancing right to left and left to right and swinging their swords and *rel* in graceful sweeps and with dexterous wrist and hand movements, they advance until they reach a mountain spur about a mile or two outside the village. They then halt, break the file and assemble. Shots are fired, the drumming becomes more frenzied, then down the mountain slopes spotted with Kangdali plants in bud and blossom rush two men, shouting war cries and brandishing their swords and shields. After chopping off the flowers of this ominous shrub—the psychic enemy—they turn back bringing with them the trophies amidst deafening shouts of triumph. This is called *Kangdali-ka-ladai* or the "Battle of Kangdali."

Now the trophies—the stems of the Kangdali plant with buds and flowers—displace the coloured silk cloths in the left hands of the ladies. All reassemble in an open maidan on the spur of the mountain and dance for a while. All men dance first, then aged veteran ladies shall have to dance, followed by other youngsters. Dance and drink are the part and parcel of the social life of the Bhotias. They dance both on festive occasions and in death ceremonies like the Spanish Gypsies and the inhabitants of any other part of the Himalayas. After the dance, they proceed into the village in a procession dancing as before.

It is evening by now and they gather in a courtyard of some prominent person's house and begin the popular circle-dance, called *Golnakh*, which invariably lasts till mid-night and not infrequently the whole night. Upto this time there is no singing in the dance. Beginning from this circle-dance they sing. During this dance, they all form a ring or circle catching hands and move from left to right counter-clock-wise, singing love-songs in a monotonous yet impressive mountain tune—*pahadi rag*—

which certainly appears to befit those lofty surroundings. During the dance they move by treading left foot towards the right and right foot to left. During intervals they are entertained with liquor by the villagers. Young men and maids from far off villages go here as if to a fair and many a match is made. Men and women mix freely without any sign of shyness.

During the three days following the battle, there are dinners in the morning in individual houses to their near relatives; and in the evening all villagers gather together and enjoy a general dinner consisting of rice, dal, pancakes, vegetables and meat. These common dinners are conducted at the expense of the whole village divided into two or three wards. Dance and drink constitute the main items of the festivity of the last three days. Sometimes dance is conducted by people forming two rows facing each other and moving round and round without completing the circle. This kind of care-free feasting and revelry is most probably a sort of recreation after their long and monotonous stay in the Tibetan markets, or in the down country.

Besides this twelve-yearly Kangdali festival they have an annual "Tyohar" or "Shangthang" or festival during Desehra which closely resembles the Kangdali festival excepting that there is no battle of the Kangdalis.

Physiographic Divisions of India

A DISCUSSION

IN THE INDIAN SCIENCE CONGRESS SESSION AT BENARES, JAN. 41

(Section of Geography and Geodesy.)

Dr. S. M. Tahir Rizvi, Aligarh, presided.

1. Dr. Kazi S. Ahmad, Aligarh.

Dr. Pithawalla has divided India into three major physiographic divisions, forty-four physiographic provinces with twenty-nine sub-sections. The chief criterion claimed to be adopted is that the principal divisions are made according to geology and topography (rocks, drainage, etc.) as controlled by the internal and external agencies working on them. The findings of the allied sciences, such as Botany, Zoology, Meteorology, are considered while making sections and sub-sections of major divisions.

Actually in his scheme of the physiographic provinces this basis has not been consistently followed and physiographic homogeneity often overlooked, for example the physiographic province (1) V, the Eastern highlands, covers a huge area to include the old plateau and the newly folded ranges of Assam and the whole of Burma, large areas so much diversified in structure and land-forms. If such areas can fall under one province, the whole of India can as well make one physiographic region. The criterion for the physiographic province (2) IV, Upper-Ganges Valley, and (2) V, Middle-Ganges Valley, is climate, irrigation, and cultivation. The regions have not been properly differentiated, located, and defined. The middle Himalayas province (1) II swings round to the north-west of India to include N.W.F.P. and Upper-Ganges Valley province is mostly located over the Ghaggar plain. Even some terms are not properly used. Kashmir Valley has been called a Dun Valley.

When the physiographic regions are carefully examined one fails to note much uniformity in their classifications except in a few cases. What is striking is a lack of unity in their individual entity. To be exact the scheme is examined below, division by division and province by province:—

The fundamental division of India into three parts, (1) Extra-Peninsular, (2) Indo-Gangetic Plain, and (3) the Peninsular area

may be geologically correct but is not desirable from the physiographic point of view as the peninsular area includes two quite different regions, Coastal lowlands and Deccan plateau.

Division (1), Extra-Peninsular

Province I. The sections A and B are not clearly and correctly defined.

What is meant by anticlinorium valley?

The classification of the Himalayas is not correct. The name 'Southern Himalayas' is given to an area which, according to his own terminology, lies to the north of the 'middle Himalayas'.

Province II, sections A and B. By what he calls 'The Northern Himalayan Section' he means the axis of the great or main Himalayan Range, as shown by the peaks named. It is composed mostly of crystalline and metamorphic rock-granites and schists, of unfossiliferous sedimentary beds, believed to be principally of palaeozoic age. It does not consist of highly fossiliferous sedimentary rocks. This is characteristic of the Tibetan section lying to the north of the main Himalayan Range.

The area put under section B, the southern Himalayan section, is not clearly intelligible.

Province III, section B. Kashmir Valley is not a Dun Valley. The position of the Dehra Dun is not relatively the same as that of the Kashmir Valley.

Section C. The name 'Himalayas proper' is not a proper choice. Perhaps the author means the lesser or lower Himalayan ranges lying to the south of the main Himalayan Range, which seldom rise much above 12,000 ft. to 25,000 ft. An emphasis on snow-line at 16,000 ft. may give a wrong conception of their height.

Province IV. The Potwar region is not properly demarcated. It is shown to extend eastwards across the Salt Range.

It is mistake to group it with the Swaliks. As shown on the map it is not a continuation of the Swalik section further west. The Swaliks are continued up to Indus and even beyond it. The Potwar region lies to the south of them and is different in conformation. The Swalik hills are not flat and not so low as only 300 to 500 ft. high. Their average height is 3,000 to 4,000 ft.

Province V. As mentioned above, under province V have been included large areas much varied in structure and land-forms. It is difficult to find any basis of unity in this extensive area to be combined into one physiographic region.

Division (2), Indo-Gangetic Plain

Province I, section A. This section as shown on the map is too broad. A more or less similar type of region in the north-east of the Punjab has been neglected altogether. Drift soil is not characteristic of this section alone. The whole of the Indo-Gangetic Plain has drift soil. In what respects have the sand-belts or clay-belts been called rich?

Section C. 'Many and frequent hydrographical changes' are unnecessary repetition.

Province III, sections A and B. The boundaries of Pat and Thar section require further explanation.

Province IV, sections A and B. The boundaries are not correct.

Section A is supposed to be Ganges-Jumna Doab but on the map it includes a large portion of the Ghaggar plain and has not the proper orientation. Similarly Rohilkhand section (section B) is wrongly shown.

The difference between these two sections is just that of a few inches of rainfall which is not sufficient basis for division in such a generalized scheme as it is. Even much greater variations have been neglected. For example, the next region (2) V, middle Ganges Valley, extends across a much wider range of rainfall without its being further sub-divided.

Province V, middle Ganges Valley. It cannot be said for the whole of this region as demarcated that rice is more important than wheat.

Province VI, section C. The Damodar Valley is not in section C but in B. The boundary between section B, the old delta, and section C, the new delta, is not correct.

Division (3), the Peninsular area

Province I, section B. It is not proper to call this Aravalli region as plain.

Section C. This section is shown on the map to extend eastwards, south of U.P. up to Bihar. So it is not desirable to put it under the general heading of Rajputana and uplands.

Province II, section B. The Western Ghats should not be confined to the region of the Deccan Lavas.

Section C. It is not proper to make an absolute statement that 'Bombay Deccan is thinly populated.' It is only relatively true.

Section D. Gujarat does not largely consist of the shore foci of the Western Ghats.

Province III, north-east foreland. The choice of the name 'foreland' is not a happy one, as this region has not separately functioned as foreland. It includes coastland and his emphasis is on river basins which cannot be called forelands.

Section C. It is not correct to confine the Eastern Ghats to the small area shown on the map.

Province IV. This province is entitled 'the southern plateau' but includes coastal lowlands.

Section A. It is not correct to say of Malabar as an alluvial plain. It may be pointed out that under province II, section E, he has referred to Konkan as a plain of marine denudation.

It will be seen that the above criticism deals mostly with some mistakes of facts which have cropped up in the attempt to define the regions. It is difficult to improve on them as such.

The speaker then submitted an entirely new scheme.

2. Mr. George Kuriyan, Madras.

Prof. Pithawalla has in his paper suggested a division of India into physiographic regions and has added that these physiographic regions should form the basis for further regional study. Dr. Ahmed has given an elaborate destructive criticism of Prof. Pithawalla's divisions so that there is absolutely no need for me to take up any more time on that score and Dr. Ahmed has given us, according to himself, 'a very simple scheme instead.' I for myself am not quite prepared to agree that the scheme given by Dr. Ahmed is either simple or a distinct improvement on that of its predecessor. If Prof. Pithawalla is criticized for 44 sub regions, Dr. Ahmed's scheme, I wish to point out, does not fall far short of 35! And this is certainly not a distinct advance.

The main purpose of our discussions to-day is to find out the basis of a classification of India into natural regions. 'Man made divisions for political and administrative purposes must occupy a most important place, but they can only be appraised in relation to entities, which, while they represent real distinctions, have not been deliberately created by man. The term natural is notoriously difficult to define, but is clearly opposed to political.' In our study of regions, we are concerned with the interaction between the physical and biological conditions on the one hand and the nature of the human response on the other and an attempt must be made to facilitate such studies in Indian geography.

Several factors have necessarily got to be chosen in effecting a division of India. Physiographic regions are admittedly important in that they are more or less permanent, but nevertheless they cannot in themselves be complete.

A major region like India is necessarily constituted by a harmonious but complex combination of many different elements, but the smaller regions within it are generally distinguished by the prevalence of some particular characters, revealing thus a concept of variety within unity. In a large country like India, it would perhaps be impossible to choose factors which have a universal application, but understanding is more important than classification.

I would like to suggest that geographic entities should be used as political provinces and our criteria then should be such that their location on the ground is not rendered particularly difficult. At the same time, such factors as languages, are fundamental. Linguistic affinities are more important than communal and I am availing myself of this opportunity to appeal to the members to construct detailed linguistic maps of India. Almost similar is the question of racial affinities, but the results could not be mapped so easily.

3. Mr. Nafis Ahmad, Calcutta.

The scheme of the physiographic divisions of India as suggested by Mr. Pithawalla seems far from satisfactory. Firstly, a division of India on merely physiographic basis seems to lead the geographer towards a multiplicity of subdivisions largely based upon structure, and secondly, such potent influences as climatic, human, and cultural occupy a minor place in determining the geographical values of areas.

Dr. K. S. Ahmed's scheme as discussed by him is definitely an improvement on Mr. Pithawalla's attempt, but as he himself confessed it falls short of meeting a geographer's demand for describing the essential geographical potentiality of regions.

Mr. Kuriyan suggested to stick to a scheme of natural regions. And in addition he made a plea for further fragmentation on linguistic and racial basis. Such a suggestion, to my mind, makes confusion worse confounded. The development of India in future will conform, and must, to a pattern of unity rather than isolation. The natural resources of areas according to their worth based upon structure, physiography, climate and human values will play their

part towards common progress. If at all, a scheme of geographical regions sounds better. Why choose unhappy terms which lead to unnecessary controversy?

4. Mr. K. Kularatnam, Ceylon.

After the learned criticisms and remarks I have heard to-day of Prof. Pithawalla's pioneer attempt at a division of India into Physiographic Divisions, I feel that Dr. Pithawalla should be congratulated for attempting a very difficult task, particularly as he has to deal with a region of continental dimensions like India, with a complexity and variety of geographic factors. However much we may differ from Dr. Pithawalla, our difference I should think is only with regard to details, and in this we may well agree to disagree. I incline to his fundamental basis of division, viz., a division based on geomorphological considerations. Physiographic Division has in the ultimate to rest on geomorphology, for the physiography of a region is the result of the mutual interaction of geological history, composition, structure and climate. But it is unfortunate that after starting from this scientific standpoint he has shown a tendency to deviate from it in his further subdivision of the Major Divisions into Provinces and Sections, as when he introduces questions of soil fertility and crop variety as criteria. However, I feel confident that Prof. Pithawalla will deem it fit to revise his scheme in the light of these criticisms and give to geographers a much-needed division of India into Physiographic Units. I shall conclude by thanking Prof. Pithawalla for initiating this valuable discussion.

CORRESPONDENCE

Karachi, 1st November, 1941

To

The Editor,

"Indian Geographical Journal."

Sir,

While the discussions held on my scheme of "Physiographic Divisions of India", under the auspices of the Indian Science Congress for the past three years, have unfortunately not produced any tangible result for several reasons, and while I have been all along welcoming any constructive and sympathetic suggestions from Indian as well as foreign geographers for its improvement, my attention has been drawn to an article on the subject by Dr. Kazi Ahmed of Aligarh in your latest issue, in which the author claims to have "severely criticised" my work as "altogether unacceptable"

and have submitted "an entirely new scheme" of division. What those adverse criticisms are I am not aware, nor have the Proceedings of the Congress for 1941 (Discussions) been as yet published for our use. In justice to me, therefore, I crave your indulgence for giving me an opportunity to make a brief reply to the Doctor.

In the first place, I hope to be excused for deprecating any tendency among our Indian scholars to run down one another, to set aside the work done by other specialists in their line, and to propose "new schemes," which cause endless worries and delays in solving our urgent Indian problems. My idea of the Physiographic Divisions of India has been to solve the most urgent problem of producing some homogeneous physical regions of India with suitable background for all kinds of surveys, economic, historical, cultural etc. Such divisions should be scientific and should be based on the real physiography of the land, which should be prepared by us Indian geographers, without depending entirely upon foreigners but by utilising the precious material so far collected by the Geological Survey of India and by making fresh aerial surveys locally wherever possible, in the absence of an All-India Geographical Survey or Association. Such divisions or regions of our country should not be vaguely termed 'Natural Regions' in these days of loose thinking but *physiographic* in the real and broad sense of the word taking into account not only the land forms and their erosional history but also the economic resources, water supply, soil distribution, climatic conditions etc. within those regions and under their *proper* physiography.

Now, Dr. Ahmed's divisions are neither physiographic nor morphological. He has divided India into 24 uniform parts, with no difference between major and minor ones, with no system of classification or nomenclature, no proper physiographic boundaries shown (his map is so small and defective, without any latitudes or longitudes etc.). Only a few more descriptive notes on the divisions are added by him. He does not accept even the three fundamental divisions viz., (1) Extra-Peninsular Mountains, (2) Indo-Gangetic Plain and (3) Peninsular India, already accepted by the Geological Survey and others, but he coins a 4th major division of Coastal Lowlands, which I have already shown to be mere shore facies belonging to the different Provinces into which Peninsular India is divided by me. (Vide Journal of Madras Geographical Association, Vol. XV No. 4) He is not sure whether these coastal plains are submarine or of marine denudation and yet he calls Gujarat (a distinct part of them) a peneplain. He says he has presented

quite a new scheme, and yet out of the 24 divisions given by him, he has himself repeated no less than 18 of our old ones with slightly different names, *e.g.*, Central Indian Ranges and Intervening valleys. He shows no distinction for instance, between his first major province, the Himalaya Mountains and his 10th (a minor sub-section merely) the Chos Region of 'perennial hill torrents.' The Himalayas are a veritable physiographic world, but there is no sub-division of them indicated by the Doctor, except their usual western and eastern offshoots. Though the Eastern Ghats are no great mountains, being a degraded series of hills of the Inselberg type, yet an enormous space on his map is occupied by them, covering several South Indian physiographic regions. In Dr. Ahmed's scheme, again, the Ganges delta must form a division by itself, but not so the Indus delta. The Indus Valley is divided into Upper and Lower but not the much larger Ganges Valley.

The 6 new divisions shown in the map drawn by Dr. Ahmed are:

1. The Salt Range—(But this is only a Sub-Section of the Potwar Plateau Section).
2. The Patkai Lushai Hills (Really belonging to the Yoma Section of the Eastern Highlands, not shown in the map).
3. and 4. The Tarai and the Chos Regions—(But they can be taken as only sub-sections of the river valleys in which they actually fall).
5. East Central Plateau (Better taken as the Godavari Basin by me).
6. The Gaggar Plain (But does this valley of the Lost River of the Desert not form part of the Upper and Lower Indus Basins which he has himself differentiated?)

In conclusion, any attempt to improve upon the system of physiographic divisions of India proposed by me three years ago and twice subsequently revised, (See, 'Science and Culture' Vol. VII), will be very welcome, if it is *constructive*. It will further the cause of Indian Geography and will be a credit to those who willingly help in collecting further material locally and in fixing the boundaries of the various Sections and Sub-Sections once for all, as the American and European geographers have done for their own home lands.

MANECK B. PITHAWALLA.

Geographical News and Notes

We are glad to acknowledge with thanks the fresh support that we have received for the Journal during the last year. That is due largely to its becoming an All-India Journal. Continued and increased support of this kind will enable us to improve further the size and quality of the Journal, with the return of normal times. Under the stress of war conditions we have regretfully to cut down the number of pages and illustrations.

* * * * *

The conversion of the Journal as an All-India one is but the first step in a comprehensive plan of forming an Indian Geographical Society, from out of the nucleus of the Madras Geographical Association, which has been fully functioning for the last sixteen years.

* * * * *

It may not be out of place to recall in this connection certain relevant facts, detailed from time to time in the back issues of the Journal during the last five years. It was the Indian Science Congress that first provided a common platform for the Geographers in India to come together by expanding its Geology Section into the Geology and Geography Section in the Indore and Hyderabad Sessions in 1936 and 1937. But the response was rather poor on the part of the Geographers, due probably to insufficient notice.

* * * * *

Next year (1938) at the Silver Jubilee Session of the Congress at Calcutta, Geography was separated from Geology, temporarily for that year, as a distinct Section. And in a business meeting of the new Geography Section, at the instance of British Geographers—Professors Fleure, Fawcett, Stamp and others who attended the Session—the need was discussed for an All-India Geographical Organisation to co-ordinate the geographical work done in the several Provinces and States. A committee of five members was appointed with Mr. N. Subrahmanyam as Convener to carry on correspondence with geographers and geographical associations and societies in India, and going into the question fully to work out a scheme for adoption at the time of the next Congress Session at Lahore in January 1939.

* * * * *

Accordingly, a circular letter enclosing a Questionnaire was sent widely to persons known to be interested in the cause of Geography in the several Provinces and States to elicit and gather information. But the response was most disappointing. When the matter was actually discussed at the Lahore Session, there was little enthusiasm or support for starting an All-India Geographical Organization. The chief reason for this appears to be the lack of general interest in Geography even among educated people and the indifference of Universities to Geographical Studies.

Under circumstances detailed at P. 105 of Vol. XVI No. 1 of the Journal, the Journal of the Madras Geographical Association was converted into the Indian Geographical Journal, as a first and preparatory step in the formation and development of an Indian Geographical Society; and seeing that this step has justified itself by results, it has now been decided to make alterations in the title and scope of the Association itself so as to suit the coming into being of an All-India Geographical Institution. This step had to be hastened as a result of the practical scrapping of the Geography Section of the Indian Science Congress from next year by re-amalgamating it with the Geology Section. After long deliberation and discussion, the title of the new All-India Organization has been settled as the Indian Geographical Society, with membership thrown open to all interested in Geography.

A Committee of the Council prepared draft Rules by adapting the existing Rules to suit the requirements of an All-India Society; and the Council and the General Body adopted them in their last meeting. The Rules concerning the formation and working of the branches have been carefully revised; and it is hoped that several of these would be formed in different localities in India, where there are no Geographical Societies or Associations.

It will now be possible for an Indian Geographical Conference to meet annually in the several branch centres in turn, as a common platform for discussion of papers on geographical studies carried out by geographers in the country. If conditions and circumstances are favourable, it may even be possible to start with the first Indian Geographical Conference in Madras during the ensuing Christmas holidays, along with the All-India Educational Conference which is expected to take place at the time.

The 12th Madras Geographical Conference will be held at Vellore (North Arcot District) about the middle of May next, when papers on various aspects of the Geography of North Arcot District will be read and discussed. Mr. A. Swaminatha Ayyar, Retired Deputy Collector and former Editor, "Rural India" has been elected President of the Conference.

Owing to the present war conditions, the Summer School of Geography, usually conducted by the Madras Geographical Association at the Teachers' College, Saidapet in April, has been postponed to May and will be conducted in a mofussil centre. The exact time, place and other details will be duly notified as soon as they are settled.

Three meetings were held during the current quarter. On 24-1-42, Mr. N. Subrahmanyam read a paper on "Seasonal Control of Rural Life and Activities in the Conjeevaram Region." On 2-2-42 Mr. N. Sundarama Sastry spoke on "Localization of Crops in India." On 14-3-42, Mr. M. P. Rajagopal read a paper on "The Environment of the Tanjore Ryot in relation to Agriculture in Tanjore District."

The Sixteenth Annual Meeting of the Madras Geographical Association was held at the Meston Training College, Royapettah, at 5 P.M. on Saturday the 7th March 1942 with Mr. M. Subrahmanya Ayyar, B.A., B.L., in the Chair. The 16th Annual Report was presented by the Secretary on behalf of the Council, and was approved. The results of the Elections for 1942 (Vide below) were next announced. The change in the title of the Association to the Indian Geographical Society and the draft Rules as proposed by the Council were then accepted; and it was resolved that they come into force forthwith.

The following are the results of the Election for 1942:—

President: Rao Bahadur C. M. R. Chettiar, B.A., B.L., F.R.G.S.

Vice-Presidents: Mr. George Kuriyan, B.Sc. (Lond.), B.L.
Dr. A. S. Kalapesi, B.Sc., Ph.D., F.G.S.

Secretary: Mr. N. Subrahmanyam, M.A., L.T.,
F.R.G.S., (Editor of the Journal).

Asst. Secretary: Mr. V. Tyagarajan, M.A., L.T., Dip.,
Geog., Dip., Econ.

Treasurer: Mr. M. P. Rajagopal, B.A., L.T., Dip. Geog.

Ex. Committee Member from General Body: Mr. B. Clut-
terbuck, M.A.

Other Members of the Council:

Miss J. M. Gerrard, M.A.

Miss E. D. Birdseye, B.Sc., Dip., Geog.

Miss H. T. Scudder, M.A., Dip., Geog.

Mrs. P. S. Sundara Raj, M.R.S.T., F.R.G.S.
(Elected to Ex. Committee).

Rev. P. C. Kerslake, B.A.

Mr. K. Sundaresa Ayyar, B.A., L.T., Dip. Geog.

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The Geographical Journal: September, 1941.

Excursion into the Hajr Province of Hadhramaut—by Mrs.
Harold Ingrams.

The Tiger's Leap—By C. P. Fitzgerald.

Geography: September, 1941.

The position of Greece in the Eastern Mediterranean—By
J. L. Myres.

Islam and Mediterranean Lands—By H. J. Fleure.

An Investigation into Children's Ability to Interpret Con-
tour Lines—(Report by the Training College Group
Committee).

The use of the Barograph in Schools—By R. R. H. Rowe.

The Scottish Geographical Magazine: November, 1941.

Reconstruction in War-Time China—By Dr. V. K. Welling-
ton Koo.

The Sands of Libya—By Captain R. F. Peel.

Yugo-Slavia: Its People and its Resources—By Vladimir
Milanovitch.

Afghanistan—By G. Graham Brown.

Viipuri: Its Importance in the Political and Economic Geo-
graphy of Finland—By W. R. Mead.

Geographical Review: October, 1941.

Natural to Cultural Vegetation in New Zealand—By K. B.
Cumberland.

Stone Age Agriculture in New Guinea—By L. J. Brass.

Soil Erosion in China—By T. Min Tieh.

Dakar and Other Cape Verde Settlements—By Derwent Whit-
tlesey.

Physiographic Diagram of Tyosen (Korea)—By A. H. Robin-
son & Shannon McCune.

Discourse on Economic Geography—By Jan O. M. Broek.

R. G. S. of Australasia (South Australian Branch): Proceedings
for 1939-40.

The Construction of Relief Map—By K. R. Lamakraft.

The Place of Soil Science in Geography—By Ann Marshall.

- The South Indian Teacher:* December, 1941.
 Holiday Work in Geography: By Helen T. Scudder.
- The South Indian Teacher:* February, 1942.
 A Local Study: Vepery (Madras)—By Helen T. Scudder.
- The Teachers' College Magazine:* December, 1941.
 The New Approach to the Teaching of Regional Geography—
 By R. Subba Rao.
- Southern India Commerce:* November, 1941.
 Indian Glass Industry: Issued by the Commerce Department
 of the Government of India.
- Southern India Commerce:* December, 1941.
 Sugar Industry in India.

Approved by the Text-Book Committee.

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Lecturer in Geography, Teachers' College, Saidapet.

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Reviews

Pilgrim's Companion to the Holy Kailas and Manasarovar. By Swami Pranavananda of the Holy Kailas and Manasarovar. (Rai Sahib Ram Dayal Agarwala, Allahabad). Pp. 178, with 90 illustrations, and 5 maps. 1938. Price Rs. 2, art paper, bound; Re. 1 as 8 paper-bound.

This book is not a mere pilgrim's guide book which it professes to be; it abounds with rare geographical matter embodying the first-hand results of a great explorer in the Trans-Himalayan Region. Holy Kailas and Manasarovar Lake as the water-shed region of great Indian rivers have had a charming place in Indian Literature from ancient times; and pilgrim feet have trod those bleak snows and rocks in deep reverence from age to age. Swami Pranavananda is a Telugu Brahmin of Andhradesha who, entering the Holy Ashrama, moves about in saffron robes, staff in hand, with scrip and scrippage in which are stowed away a diary and a camera and some silver 'bullets,' too, to get food in poverty-stricken Tibet. His competency for the task is unique. He has the simplicity and bravery, the fortitude and endurance of the best *Sadhus*; he has the curiosity and fidelity to truth of the scientist; he is keenly observant; records his observations carefully; and gathers them up with a view to making them available to people at large. He knows Tibetan etc., and knows English, too; his papers have been published in the Geographical Journal, London; and his maps have been accepted by the Survey of India Office.

To quote from the full title of the book, it contains 'elaborate descriptions of 11 Routes to the Holy Kailas and Manasarovar and also to the "sources of the four great rivers" of this Region as well as the Pindari Glacier, with 90 illustrations and 5 maps and notes on important places with all particulars required by pilgrims and tourists'. The body of the book fully sustains the claims in the title page.

The Swamiji is the first of living Indian Explorers and has vindicated by his researches, the Indian claim to original work of the kind. This book should find its way into libraries that really prize such good work.

M. S.

Short Studies in Economic and Commercial Geography. By Manindra Nath Basu. Pp. viii and 532 (Book Land: 1, Shankar Ghose Lane, Calcutta). 1941. Price Rs. 3.

To students just beginning their Geography at the Intermediate or B. Com., this book will prove of help as a clear and compact first introduction to the subject. The opening chapters treat of regional concepts in the modern way, and are followed by chapters relating to commodities of exchange *seriatim*, and the factors of their production and exchange. In the second part, the subject is dealt with, once again, on the basis of countries and continents. The correlation between place and products is kept in view with due weight given to human causations and variations. The Indian view-point, it may be noted, is not suppressed but is mildly stated in a very subdued manner, e.g., *vide* Indian Unity, pp. 510 etc., jute (168); cotton (162).

The style is simple and clear and the matter is well illustrated with impressive sketches. The print is pleasant; the paper good; and the book well got-up. For a second edition, we would suggest more sketches and diagrams, so as not to suffer by comparison with similar books; and a fuller treatment of India and of the growing utilisation of its geographical opportunities so as to help the Indian student to a grip of realities and provide him with a rational basis of comparison with other countries.

M. S.

Namadu India நமது இந்தியா : (Our India) in Tamil. By Minoo Masani. (Translated into Tamil by 'Va. Ra.' Illustrated by C. H. J. Moorhouse, Pp. 194. Oxford University Press). 1942. Price Re. 1 As. 8.

This is not a text-book of Indian Geography for school and examination study, but an inspiring little volume for everybody to read whether in school or out of it, in order to understand the main problems of Indian Economic Life on its geographical basis. In 12 very interesting chapters, the author discusses, broadly, avoiding details, the main facts and problems connected with India's Population, Resources, Agriculture, Cultivator, Cotton Industry, Power, Iron and Steel Industry, and Factory and Cottage Industries,—bringing out the contrast between the backward and depressing conditions here with the better conditions prevalent in most western countries. The discussion in the last chapter on

Ideals of National-Planning and the Relative Value of Factory and Cottage Industries in the economy of Indian Life, is lucid, forceful, and presented from the national view-point.

Great credit is also due to the translator who has more than succeeded in bringing out the full spirit of the original. The style is simple and chatty, appealing to the man in the street.

No less credit is due to the artist whose speaking pictures interpret the living Indian scene in terms of the author's ideas, so that the reader is helped to carry an ineffaceable impression.

The get-up is in keeping with the excellence of the rest. It is an indispensable book to any library.

N. S.

The Face of Britain. By L. Dudley Stamp. No. 5 in British Life and Thought Series. Published for the British Council by Longmans, Green & Co., London. Pp. 68 with 11 illustrations and 4 maps. 1940. Price 1sh.

Dr. Dudley Stamp gives in this booklet a panoramic view of Britain, explaining the scenery and situations and settlements from their very origins down to their present position and importance.

Every town and tract falls pat into its place in this presentment and the causes of growth and decay are traced to the fundamental facts of British Social Life, Economics, History and Geography in their several interactions. It is a brilliant, fresh sketch in a short compass that is vividly informative and arresting.

Dr. Dudley Stamp has in recent years made a soil survey of Britain and with his close personal knowledge he has made new groupings and inter-relations by which the unity of underlying causes is fully brought out. This book is one of a series, 'British Life and Thought', intended to impart to the layman the main springs of British Life; and it completely sustains the claim, to the extent marked out for it, that for the foreign reader it would be the best substitute for a visit. It is a satisfying picture of Britain that is presented here.

M. S.

the teachers have been finding difficulties in understanding the full import and implications of it, as well as in the right methods to be followed in handling it. This guide book fills a gap, giving helpful hints and essential points of subject matter, and suggesting the proper methods to be followed. Valuable sketch diagrams illustrate each of the stories; and the location of the regions described in the lessons is indicated in a world map. The brochure is a cheap guide-book which should prove quite handy and helpful to the elementary school teacher in the schools of the Tamil country.

N. S.

Mysore Geological Department: Records—Vol. XXXIX—1940.
(Government Press, Bangalore). 1941. Price two rupees.

The volume shows that mining activities in copper, chrome, kaolin, manganese, and mica, have increased. Alluvial gold has been assayed, and the yield is 1 to 1½ grains per cubic yard. Gold-bearing quartz has also been found near Ganjiganhalli, and this find seems to be promising. Ways of utilisation are sought for the chromite, kaolin and kyanite of the State.

The Department has prepared a special scheme for the manufacture of sodium bichromate, aluminium sulphate and potassium permanganate (at a cheap rate) from the resources in the State.

Regarding the charnockite rocks of the Billirangan Hills in South-East, Mr. B. Rama Rao, the Director finds the acid variety of the rock preponderant, though intermediate, basic and ultra-basic types are also found, similiar to those described by Holland. The author concludes that they are composed of solid charnockites, consisting of a composite and complex series of acid and basic rocks of diverse characters. He believes that they are the products of extreme alterations of a composite series of rocks, both igneous and sedimentary.

The article on Earth Salt Deposits by Mr. Mallikarjunappa shows the salt as an efflorescent product, due to the decomposition of acid-bearing minerals of the rocks by chlorinated water. The efflorescence is seasonal in character. As salt is a very useful mineral, methods of salt manufacture are being constantly improved.

Re the petrology of the Felsite and Porphyry Dykes in Mysore, Mr. Raghunatha Rao concludes that with a few exceptions they are the youngest intrusives in Mysore, and that they bear genetic relationship with the Closepet granites. There are also notes on alluvial gold prospecting and a paper on the Conglomerates in Honnali Taluk of the Shimoga District both by Mr. B. P. Radhakrishna.

Industrialists should avail themselves of the information in the Records, which is a report of the activities of the Department in Mysore State during the year 1940.

K. S. C.

Books and Journals Received

- Short Studies in Economic and Commercial Geography:* By M. N. Basu.
- The Chhattisgarh Plain:* By B. G. Tamaskar.
- Pilgrim's Companion to the Holy Kailas and Manasarovar:* By Swami Pranavananda.
- The Face of Britain:* By L. Dudley Stamp.
- An Atlas of the War:* Oxford Pamphlets on World Affairs—
- Namadu India:* By Minoo Masani and Va. Ra.
- Guide to Geography Teaching in Elementary Schools for II and III Standards:* By N. S. Narasimha Ayyangar, B.A., L.T.
- National Planning and National Planners:* By Prof. M. B. Pithawalla.
- Geography:* September, 1941.
- Southern India Commerce:* October, November and December, 1941.
- Indian Information:* December 15, 1941, January 1, February 1 and February 15, 1942.
- Kalaimagal:* December, 1941, January and February, 1942.
- Adyar Library Bulletin:* ¹*Brahma Vidya:* December, 1941.
- Madras Christian College Magazine:* December, 1941.
- Indian Co-operative Review:* October-December, 1941.
- The Teachers' College Magazine:* December, 1941.
- Proceedings of the R.G.S. of Australia (South Australian Branch):* 1939-40.
- Journal of the Andhra Historical Research Society:* July, 1940
- South Indian Teacher:* January, February and March 1942.
- Nagari Pracharini Patrika:* Vol. XLVI-Part 3.
- The Geographical Journal:* September, 1941.
- The Educational Review:* January, 1942.
- The Indian Journal of Political Science:* January-March, 1942.
- Scottish Geographical Magazine:* November, 1941.
- Journal of Sri Venkatesvara Oriental Institute:* July-December, 1941.
- The Hindu High School Magazine:* February, 1941.
- Quarterly Journal of the Mythic Society:* July, 1941.

