

# KOLE CULTIVATION OF RICE IN THE MALABAR COAST, WITH SPECIAL REFERENCE TO INSECT PESTS \*

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**Introduction.** The peculiar method of raising a crop of rice known locally as *Ko'e cultivation* appears to be a practice existing only along the Malabar coast, especially in the Southern parts of the British District of Malabar and the native state of Cochin; and as far as the writers are aware the practice has been in vogue in these tracts for several decades in the past. The choice of the land selected for this purpose and the special methods employed in that connection reveal a considerable amount of ingenuity and skill on the part of the inhabitants of these localities even in those early years to utilize all available possibilities to add to their income from mother earth.

**II The Physical Features and Topography of the Kole Land.** The lands utilized for the Kole crop are beds of two or three freshwater lakes which ordinarily contain water to a depth of three to six feet for over five months in the year from June onwards. It is reported by some of the old residents of the areas that these lake beds were primaevial forests which gradually became lakes, and that large logs of very old and partly burnt wood discovered now and then while digging testify to this. These lakes are bounded on the east by the submontane areas of picturesque fields and gardens extending to the foot of hills of the forest-clad Western Ghats, and on the west by the narrow belt of backwaters lying in close proximity and parallel to the Arabian sea coast with which these are also connected in one or two places. For more than half the year, *viz* from the time the southwest monsoon sets in with its heavy and continuous downpour of rain, these areas are full and appear as expansive sheets of water and quite deserted, and no stranger to the locality will be convinced if he is told that these tracts are cultivable areas. With the approach of early summer in January the whole area becomes gradually metamorphosed. Streams of labourers, fleets of boats and pumping machinery of various kinds appear on the scene, and the whole area throbs with human activity; and by April or May the quite water covered lake of the previous autumn is completely changed and presents a most beautiful amphitheatre of green smiling paddy fields enclosing a remarkable net work of large and small irrigation canals. The whole landscape at this time of the year presents a most interesting and charming scenery

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rarely met with elsewhere. One such Kole area is the Enamakal lake situated at the extreme south of the Malabar District with a part of it lying within the limits of the Cochin State. This lake covers an area of about 25 sq. miles and is the best and typical example of one of the Kole areas known. The whole area brought under Kole cultivation along the West coast every year roughly comes to not less than 7,000 acres.

**III System of Tenure and Preliminary Preparations.** These extensive Kole areas generally belong to a few wealthy landlords called *Jenmis* who lease out these areas to different lessees who may in their turn sublease their portion into smaller holdings so that one big area like Enamakal tract will generally be the property of about half a dozen wealthy landlords and actually cultivated by several tenants and subtenants. Each kole area is generally divided into what are known as '*Padivus*' and this partition into smaller pieces is facilitated by the net work of main and minor irrigation channels which also act as boundaries. By about the beginning of December when the water level, in the lake subsides, the remnants of the boundaries of the canals become visible and the work of repairing and strengthening their bunds is started in earnest all over the tract. At the same time the one or two openings (through the permanent embankments maintained by the state) by means of which these lakes open into the backwaters towards the west are closed in order to prevent the flow of salt water from the backwater into the Kole areas. The work of repairing, raising and strengthening the embankments and bunds of the various channels in the area forms one of the most important items of work, and obviously in most of these preliminary operations, a good deal of co-operation is and has to be displayed by the cultivators. Boat loads of gravel, bamboo skates, matting and straw are brought from the mainland for these purposes and the bunds are gradually raised to a height of 4 to 5 ft. and strengthened. As this work proceeds the water level in the cultivable area gently goes down and pumps of different kinds are employed to pump up the remaining water into the adjacent canals. In the old days wooden Persian wheels and other manual devices were employed to bail off the water from the low-level areas into the adjacent high level channels, but now-a-days with the advent of high power steam and motor engines, this work of pumping up the water is very much facilitated and done expeditiously. During the early summer months, numerous such pumps are installed at the main bunds and will be found at work, and for some days the murmur of these pumps and the noise of the pumped water can be heard continuously night and day. This work of pumping out water from these areas is often undertaken by contractors who own pumps and who get a good remuneration from the cultivators and now-a-days, of the two parties, the cultivator and the water-pumping contractor, while the former has to brave risks of



different kinds, the latter is sure of his income and has absolutely no risk to run since he is assured of his charges for pumping the water whatever happens to the crop. Incidentally we may add that in this way the Kole cultivation has substantially helped engineers and contractors to make large profits compared with those of the actual cultivator.

Next in importance to the pumping up of the water and exposing the lake bed is the problem of clearing the rank growth of weeds. This is a fairly tedious operation and numerous coolies are employed in their removal and collecting them into heaps. One can get an idea of the magnitude of this weeding operation if one is told that there are generally from 8-10 such heaps of weed, to each acre, each of these from 6-7 feet in height and about 6 feet across the heap! It is almost an impossible task to completely clear the weeds. These heaps when dry are burnt and turned to ashes to be used as manure later on. There is hardly any ploughing done, the only cultural operation being the drawing of a wooden harrow-like implement (a horizontal stout piece with numerous short spikes) over the surface of the smooth miry surface and then levelling the same with a long flat piece. Excepting the high channel bunds and the important embankments which still retain their framework, all the small narrow field bunds are almost completely erased by the floods of the previous year and have to be remade; this is usually done by erecting a line of weeds covering them with wet soil and fixing strong bamboo skates along the canal banks. These bunds being new appear clean and absolutely without any growing weeds to start with. In each *Padavu* or block all the preliminary operations occupy a fortnight's time and it is during this period hundreds of coolies from far off villages find occupation in the area.

**IV Sowing Seeds and Irrigation.** Soon after the land is prepared as before and the necessary arrangements made to get rid of the extra water and preserve the water necessary for future irrigation the seed is sown broadcast in the puddled lake-bed. It is needless to add that the area thus utilized is extraordinarily fertile; the soil is a sort of blackish soft mire mostly composed of large quantity of silt and organic debris deposited by the huge mass of water. The variety of seed used for the major portion of the area is a short-duration variety known locally as '*Cheera*', though occasionally other varieties like '*Ponnaryan*' and '*Champa*' are also used. The seeds are soaked in water in bags or baskets for 12 hours and kept wet for about 30-40 hours and the half sprouted paddy is sown on the 3rd day. The seeds remain exposed on the soil surface or a little below. In 3 to 4 days they give rise to white sprouts and green leaves open out. The sown plots are allowed to dry and crack for about 10-20 days before water is again



let in from the high level channels. In some portions where swampy conditions always prevail transplanting is done, and, for this nurseries are raised in high level areas at the outskirts of the lake. The major portion of the sowing is completed in the course of about 15—20 days. The baled off water which is held in the canals at a much higher level, as stated before, serves as a reservoir for supply whenever needed. The whole area in about 10 days after sowing presents a picturesque show with a vast area of green verdure enclosing and surrounded by numerous channels of different sizes full of water, much above the level of the crop in the fields. A close watch is made, day and night by respective lessees to prevent any leak in the bunds; for, a breach at this stage will undo the whole work over large areas. In borders and outskirts away from channels, if the plots dry up too soon, before the seeds are fully germinated irrigation by splashing or by means of Persian wheel is given. By the time the plants are 6 inches high, the plots are fairly dry and water is let into the fields from the main and sub-channels. Sometimes necessity to refill the feeder channels by pumping back water from the main channels also arises for fields sown in somewhat higher levels. In later stages when the channel water supply is exhausted, the crop has to stand the chance of a rain or two. Occasionally a 'Padavu' or two lying uncultivated in swampy situations in the middle, may also serve to supply water as necessity arises. Thus the crop grows and comes to harvest by the end of April or early in May without much by way of further operations on the part of the cultivator.

Transplanted crops of Ponnaryan or Champa are also found occasionally in detached areas. Though transplanting gives a comparatively higher yield it is seldom practised due to the additional labour involved, want of suitable plots for raising nursery in the near vicinity, and the inordinate delay necessitated in the actual process of planting such vast areas as compared with broadcasting. In fact transplanting is resorted to only in such plots 'where the soil condition is such that it cannot be brought to a suitable condition to broadcast the seeds, due to the persisting damp conditions or the existence of natural springs.

**V Harvest and Yield.** Under normal conditions in the locality, a heavy yield of paddy results. On an average, an acre yields 200—250 'parahs' (1 para=about 7 m. m.) of paddy i.e. 20—25 times the seed used. From local inquiries made by the writers the cost of cultivation appears to come to approximately Rs. 30—35 per acre, as follows:—

1. Bailing water Rs. 10—12—0.
3. Cost of seed Rs. 5—0—0.
5. Sundries Rs. 2—8—0.

2. Trimming bunds Rs. 10—0—0.
4. Weeding Rs. 2—8—0.



The yield after paying dues in kind for harvesting, threshing etc., comes to Rs. 100—125 (if the price of paddy rises, the income is more). The cost incurred in connection with combating insect pests or in connection with unexpected early floods before harvest is sometimes considerable.

A long duration swampy variety of paddy is also grown in small scale in the flats near the borders of the lakes from March to December. This crop grows and with the rising floods the plants always keep above the level of water; harvesting is mostly done here in boats. Due to increased facilities for draining or irrigating the land by use of pumps, the typical summer crop is raised of late on an extensive scale.

In case the summer rains are late, cattle are allowed to graze in the fields which will be full of green grass after harvest. Ploughing is also done here and there if conditions permit.

**VI Insects of the Kole Areas.** The Kole cultivator is at once familiar with two important pests viz. the swarming caterpillar of paddy (*Spodoptera mauritia* Boisd) locally known as 'Karakotti' and the ricebug (*Leptocorisa acuta*) known as 'Chayi.' Next in importance are the Rice hispa (*Hispa armigera*), the stem-borer (*Sehobius incertellus*), the climbing cut worm (*Cirphis albistigma*), the case worm (*Nymphula depunctalis*) and the leaf roller (*Cnaphalocrocis medinalis*). Other insects of minor importance, are the green and white Jassids (*Nephotettix bipunctatus*, and *Tettigoniella spectra*), the rice thrips *Thrips oryzae*, *Leptispa pygmae*, *Dasychira securis*, *Oxya velox*, *Parnara mathias* and *Prodenia* sp., which appear at several stages of the growth of the crop.

**Spodopetra mauritia, (Boisd)** This pest occurs on a large scale and does considerable damage to the crop almost every year. The caterpillars are first noticed by cultivators when they are about two weeks old in crops of 3 to 4 weeks' growth especially when they cut leaves and do appreciable damage to the crop. But the actual infestation starts quite earlier and is little noticed. Usually the ryots' practice of keeping the plots dry for a period of a fortnight and then suddenly flooding the crop, reduces to some extent the severity of attack. More sensible ryots if they happen to see the small caterpillars keep the crop wholly submerged for 2 or 3 days, and then sweep the floating caterpillars with brooms and destroy them. Often a floating raft made of brambles and green twigs is made and dragged over the submerged crop and by this means a large number of the larvae are collected out of the crop, and water let out to the desired level. In the absence of sufficient water supply, the ryot is practically helpless. Fortunately the pest is never found to occur a second time in the same crop. The grown up caterpillars are eagerly singled out and greedily devoured by ducks which are reared in thousands around these localities.



2. The notorious rice bug (*Leptocorisa acuta*) is another injurious pest causing very serious damage at the flowering stage of the crop. The bug quickly multiplies in numbers in the numerous grasses and in the swamp paddy at the outskirts of the lake, almost all through the year. In the vast area of paddy the ryots' attempts to capture them are of no avail, and this bug is in some seasons known to cause more damage than any other pest.

3. The rice hispa, the case worm and the leaf-roller appear in stray plots in such large numbers as to disfigure the foliage, and cause a sickly appearance to the early stage of crop which however, recover later on automatically with advance of growth. The egg-masses of the paddy stem borer are found in plenty, as soon as the water is let in, but the later vigorous growth of the crop and with the advance of hot weather, it becomes scarce. Climbing out worms (*Cirphis spp.*) appear during certain years and cause some appreciable damage to earheads. Isolated caterpillars of *Prodenia* start along with *Spodoptera*, but they prefer to grow on the weeds in later stages. Thrips *Oryzae*, *Leptispa* and the Jassids are not known to do any serious damage though visible in early stages. *Dasychira*, *Parnara* and *Oxya* are found in small numbers almost to the time for flowering.

It will be seen that almost all important paddy pests are found on Kole paddy, but the more important and serious ones during most years appear to be the swarming caterpillar and the ricebug.

**VII Conclusion.** It will thus be seen that Kole cultivation presents a unique method of crop growing and offer multifarious opportunities for studies in different directions to all interested in the various aspects of agriculture and allied sciences. To the entomologist it affords exceptional opportunities to study the bionomics of insects under unique conditions. No less important is the field for the zoologist who can get a varied collection not only of fresh water fauna, but also other animal associations such as birds, reptiles etc. The avifauna of this region is extremely remarkable and the ornithologist will find here an ideal spot for game shooting. Of immense value, may be the study of the weeds and vegetation of the locality to the Botanist. The study of the changing conditions of the soil in this area will no doubt interest the chemist and bacteriologist as well. The sudden changes in the atmosphere brought about by the removal of water, drying of the fields, and concomitant rise of crop in a large scale together with the prevailing influence of hot weather also offer exceptional opportunities for the Agricultural meteorologist for the study of the microclimate of crops. The authors have only attempted to give a general out-line of this interesting practice and those who are interested in the details of this subject will find ample scope for further scientific investigations.