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Rice Culture in the Madras Presidency

Its Varieties in relation to its varied Seasons

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Introduction. Rice being a crop that adapts itself to a variety of conditions is most extensively cultivated and is also the staple food for the largest population in the world. It thrives well in the tropics and temperate zones, from the seacoast to an altitude of 5,000 ft. as in Coorg and Mysore Plateaux, the Wayanad and Gudalur taluks of the Madras Presidency as well as on the hills of Assam, Kashmir, and Burma. But in higher altitudes and in temperate zones, the duration of the rice varieties gets a bit prolonged. Rice is cultivated in areas with low rainfall with irrigation, as in the case of Sind, and under heavy rainfall amounting to over 150 inches as in Assam and the West Coast districts of Malabar and South Kanara. It is grown in almost all types of soils varying from the shallow laterite soils of the West Coast and the Coastal sandy areas where the hoofs of animals and fingers and legs of coolies working in the puddles get soft and pitted, to the heavy and deep soils of the delta areas where the soils crack deeply in summer and animals and coolies working there sink knee-deep. Lastly, rice is also grown under a wide range of agricultural seasons. Therefore it is no wonder that in rice which is cultivated under such wide ranges of rainfall, soil, altitude, seasons etc., the number of varieties is so numerous that one gets bewildered at the large number of collections totalling about 2,000 annually grown at the Paddy Breeding Station, Coimbatore, comprising not only the varieties of our Province but also of the other parts of India and types got from foreign countries, besides new types extracted from artificial crosses in the course of the study of the mode of inheritance of various characters in the rice plant. The collection is in fact a rich mine affording one, a wide scope for choice of a variety suited to his conditions. Naturally it will be interesting to know in detail the varying conditions in which the cultivation of the rice crop is carried on in the Madras Presidency.

2. The cultivation of the rice crop in any country is always associated with plenty of water supply either by well distributed rainfall of 30 to 40 inches during the growing period as in the East Coast or by the 100 to 150 inches of heavy rains as in the West Coast or by irrigation from river channels as in the great delta irrigation systems of the Godavary, Kistna and Cauvery or from the huge reservoirs of Periyar and Tambaraparani systems, not to speak of many tanks of varying capacities dotted all over the Presidency and by lift irrigation from wells by means of mhots, picottahs and power pumps, as in the Districts of Chingleput, North Arcot, South Arcot, Chittoor, Salem etc. In the Madras Presidency, out of 10.5 million acres under rice, it may be roughly stated that 9.75 million acres are cultivated under swamp conditions either directly dependent on rainfall or commanded by the different sources of irrigation mentioned above. The river channels account for 5.25 million acres and three million acres depend for their supply on tanks. The two West Coast districts comprise 1.5

million acres that have no definite sources of irrigation but mainly depend on the rainfall amounting to 100-150 inches received during the growth period of the crop. For all practical purposes 9.75 million acres of paddy should therefore be considered as growing under 'swamp' conditions. Thus there is just 0.75 million acres of rice, cultivated under purely rainfed conditions of 30-40 inches during their growing period and this area is mostly confined to the East Coast districts of the Presidency. In this Presidency, again, there are 32,870 tanks of varying capacities and irrigating areas ranging from ten acres to over 1,000 acres. The number of tanks serving an *ayacut* of less than ten acres is about ten thousands; of those commanding less than 200 acres is 20,500 and of those exceeding 200 acres is 2,370. Most of the tanks can hardly hold supplies sufficient to last two to three months and unless they are replenished once or twice in the rainy season, the yield of the rice crop under tank *ayacuts* suffers considerably. To prevent a failure water has to be supplemented with spring channel or lift irrigation at critical periods, whenever the tank supply runs short. The cultivation of rice with tank water alone right from the beginning to the end of the season, in most cases is more or less a gamble. Similarly, in the West Coast districts the distribution of rainfall is more important than the total rainfall received in a year. There are no irrigation systems and the crop has to depend on the rains received day to day from the sowing to ripe stage. In the well drained soils of the West Coast, the rainfall is very often not timely and is ill-distributed during the growing period of the crop. Therefore in both the tank and rained areas the yield of the rice crop is bound to be affected more often and varying widely from year to year. For this reason a programme of sinking wells should be taken up in earnest under tank *ayacuts* so as to start the sowing of nurseries in time and also to save the crop at critical periods of growth when a supply for a week or two would save the crop from total failure. In the case of the West Coast districts provision of small reservoirs at the head of each valley where springs usually start and the training of the course of the irrigation and drainage channels that run all along the valleys at their sides and in the centre, will go a long way to save the crops at critical periods. The Government have now provided facilities by giving loans for sinking of wells. These facilities should be availed of in a great measure so that the yields of the rice crop of the tank fed areas become more assured than that at present.

3. **The Rice Zones of the Madras Presidency** The rice area in the Madras Presidency may be conveniently divided into six zones according to the nature of the rainfall, seasons and the cropping systems adopted. They are:

- (i) the Northern Circars covering the districts of Vizagapatam, Godavary, Kistna and Guntur and parts of Kurnool and Bellary;
- (ii) Nellore and parts of Cuddapah and Chittoor;
- (iii) Chingleput, North Arcot, parts of Chittoor, Salem, South Arcot and Coimbatore;
- (iv) the Cauvery delta including Tanjore, parts of South Arcot and Trichinopoly;
- (v) the Southern group comprising the districts of Madura, Ramnad, and Tinnevely;
- (vi) the West Coast districts of Malabar and South Kanara.

The cropping seasons, systems and their relationship to the varieties of paddy cultivated in each of these zones will be dealt with separately.

4. **The Northern Circars.** In the area covered by the Northern Circars, the rainfall during the hot weather period from February to the first week of June varies on the average from three to four inches while that of the South-West monsoon (June to September) is about 25 inches, closely followed by the North-East monsoon rains amounting to about ten inches mostly in October-November. The hot West wind (*Paschima gali*) that prevails till the beginning

of June gradually turns South-West between June—September and then deflects as an Easterly wind (Turpu gali) and continues to prevail up to the end of January when the beneficial 'Pyruga' (Corn Wind or South Wind—Thenral, Kathu in Tamil) sets in. The South Wind continues throughout the month of April. It will thus be seen that the soils in this zone get sufficient interval to dry up well with the beneficial sun's rays. During the hot weather months, the heavy delta soils crack deeply, so much so that in some of these areas, when canal water is allowed into the fields in June, cattle and men sink so deep that no regular ploughing is possible. In the Northern Circars, the nature of rainfall is such that the first crop cultivation can only commence with the break of the South-West monsoon rains and has to mature with the receding rains of the North-East monsoon at the end of November or early in December at the latest. Though the harvest of the first crop is commenced in November and completed in early December, yet the planting of the second crop or what is locally known as 'Dalwa', does not commence in the Godavary delta till late in January or early in February, even though there would be plenty of continuous water supply during December to March. The reason for this is not far to seek. The months of December-January are very chill and the East Wind prevailing during this period is very favourable for the incidence of the stem-borer pest which attacks any rice crop just planted and wipes out the crop within two weeks of planting before the seedlings get established. Further, in the cold weather a low soil temperature persists which is also not helpful to an early establishment of seedlings. However, with the setting in of the 'Pyruga', in February, the parasites on the egg masses of the stem-borer suddenly get the upper hand and completely keep the pest under control so that the second crop planted in February, is almost free from the pest. The period from December to February, though unfavourable for the paddy crop is eminently suited to take a catch crop of sunhemp or pillipesara for fodder or green manure and a pulse crop of green gram or black gram for seed, in the delta areas where the soil is not alkali e. It must be noted that these crops are not irrigated. They germinate with the residual moisture that is available in the paddy lands, that has been under a film of water for the previous six months and mature with the thick dew and mist that are common during the months of January—February. The seeds are sown in the standing crop of paddy a week before its harvest and the final draining of the surplus water in the field. In the case of the alkaline soils, the practice during this period of December—March when water supply in the canal is plentiful, is to keep it under water continuously so that the soil may be periodically washed off the soluble harmful salts. This is one method of reclaiming coastal saline lands in the Godavary delta. The first crop locally known as 'Sarva' in the deltas commences in June with the arrival of freshes in the two great rivers, the Kistna and the Godavary. In the Godavary delta areas, the growing of the 'Dalwa' crop and the cultivation of plantain and sugarcane to a larger extent has necessitated the keeping of the canals open up to the last week of April. Hence there has developed a system of maintaining small seed-bed tanks which are filled up in the final turn. The water thus stored up is made use of, for raising nurseries in advance, during the month of May when the canals are closed for repairs.

5. In the Kistna delta on the other hand, there is no such practice of digging such small seed-bed tanks, because, the canals are closed much earlier than in the Godavary delta and water, even if stored in March, will not be retained till May for supporting even dry nurseries. In its stead, there is the system of digging 'Doruvus' or small pits then and there in areas where spring water is obtainable for the season. Nurseries are raised under these small temporary wells or 'Doruvus'. In some of the areas, where facilities of this kind are lacking, nurseries are raised only after the receipt of water in canals in June. It is a

common experience in the delta areas, that seedlings raised under dry conditions and in advance of the season, establish quickly and grow well; free from pests or diseases. Hence the 'Muduraku' or early seedlings are valued very much and ryots who have no facilities to grow seedlings in advance of the season, pay fancy prices for these seedlings. There is therefore a well developed industry in some parts of the Guntur and Kistna districts, of raising paddy seedlings merely for sale. Considering the difficulty under which the seedlings are raised in these delta areas in summer months with the limited supply of stored-up water, the seed rate used is the lowest in the Presidency and transplanting is also done most economically. They have to plant the maximum area with the seedlings grown in the minimum area.

6. In the Vizagapatam district as a whole and in the upland taluks of the Godavary, Kistna and Guntur districts there are no large irrigation systems except for some minor river systems that provide but an erratic supply. The rice crop depends mostly on the supply from tanks that store up the water during rains. In the Vizagapatam district in particular the area under tanks is nearly five lakhs of acres which is double the area irrigated from river channels in the same district. Rice cultivation in these areas depends on the actual time of the break of the monsoon and its initial strength to start cultivation. Hence sowings in the nurseries have to be done only at the end of June or early in July and planting would be taken up in August and September, when the supply in the tanks would normally become assured. It is in these cases, that the raising of seedlings under dry condition with the help of wells, will hasten the planting operations. At the Agricultural Research Station, Anakapalle, seedlings raised under dry condition have been kept for over sixty days in the nursery and yet the crops grown out of those seedlings have always been much healthier than would be expected. In the Northern Circars, as a whole whether in the delta or in the uplands, the planting operations should be completed and the crop well advanced before the commencement of the 'Turpu Gali' or the adverse 'Easterly Wind'. Any crop that is planted after the setting in of the East Wind sooner or later, succumbs to the stem-borer and 'Kodu' pest. Further it has been observed that the yield of the crop planted from June to September is progressively reduced with every fortnightly delay in the planting of the crop. Hence it is of the utmost importance to catch the season by the fore-lock and finish the planting as expeditiously as possible. In this connection, the time honoured Tamil proverb 'Kalathu Payaru Karumbilae' meaning 'you can sow the seed even in the unploughed land provided sowing is done at the right season' is noteworthy. Again, crops raised with late sown seedlings and planted after the tank gets its supply run the serious risk of water scarcity at the time of maturity by the end of November or early in December, if the North-East monsoon should be disappointing. It is therefore, advisable that the cultivators under the tanks should think over the problem of raising seedlings under dry condition in the proper 'Karthi' or season, by providing themselves with suitable facilities by way of wells or 'Doruvus', so that seedlings may be ready for planting when the tank gets its supply.

7. Considering that the bulk of the rains is received between June-October, the varieties chosen for cultivation in the Circars should be those that come to ears in October and mature in November or early in December at the latest. In the case of the upland areas, the varieties should be somewhat shorter in duration than those cultivated in the coastal areas of the delta taluks. In the case of the upland areas, the commencement of cropping is uncertain and the supply of water in the tank will be scarce in December. Besides the East Wind contributes its own share to pull down the yield. Hence the varieties cultivated are such that they are not as early as 'Kar' or 'Dalwa' varieties, but not as long as those that are cultivated in low-lying delta areas. They belong to the class

of medium or what is locally known as 'Punasa' varieties like 'Basangi', 'Bobbiganti', 'Punasakonakani', 'Mypali', 'Boroponko', 'Akkullu', 'Sunkisaanam' etc., while in areas of better water supply, varieties like GEB. 24, 'Bayyahunda', 'Ratnachudi', 'Pedha Konamani', 'Navakotisannam', 'Maharajabbogam' etc. are grown as in the Vizagapatam district. In the Godavary delta area, varieties like 'Punasakonamani', 'Pedha Konamani', 'Punasa Akkullu', 'Krishnakatukulu', 'Atragada' are grown while in the Kistna and Guntur deltas, 'Pala Akkullu', 'Kusuma', 'Konamani', 'Vankisannam', 'Pedha Atragada', 'Pedha Kusuma' which are only a week later than the Godavary varieties are commonly cultivated.

8. In this connection it is pertinent to ask why in the Kistna and Godavary deltas where the water supply is regular and well regulated from June to March and June to April respectively, the systems of taking a short 'Kuruvai', or 'Kar' followed by long duration as in the case of the Cauvery irrigation is not followed even on a small scale. The reason is simple. 'Kuruvai' varieties thrive well only when there is plenty of water supply with little of rainfall. In the Godavary and Kistna deltas twenty-five inches of rain are received during June-September. Secondly as already pointed out, planting done in October-November succumbs to pests and diseases on account of the East Wind. 'Thaladi' planting as practised in the South in October-November is therefore out of question. Hence the second crop can be planted at the earliest, only by the last week of January. The supply in the Kistna is not adequate to support a second crop over a large area, while in the Godavary delta where the water supply is more plentiful, a third of the area is under the second crop from January-April.

9. In the Northern Circars, high yielding strains in almost all the important varieties that had got acclimatised to the local condition have been released from the four Agricultural Research Stations viz. Berhampore for North Vizagapatam, Anakapalle for the South Vizagapatam, Samalkota for the Eastern delta of Godavary and Maruter for the Central and Western Godavary and Kistna and Guntur. Apart from yield considerations, selections of strains that possess other desirable characters are also receiving consideration. For example, 'Basangi', of Western Godavary delta is similar to the 'Rasangi' of Eastern Godavary and comes to harvest at the end of October. Usually this is the peak rainy period for the North-East monsoon. The crop would lodge badly and the grain used to germinate before harvest. Further the delta area being wet from June, its harvesting and threshing during rains are always a problem for the ryots who grow this variety. Thus its cultivation is always beset with risks of all kinds. All the same, ryots who have facilities to cultivate it, being close to a road site, pathway or canal bund persist in growing it, for the reason that it yields the highest and it gives some cash in advance to pay the land revenue and meet the expenses in connection with the main harvest. Twenty years ago, when the Rice Research Station, Maruter was opened, it was said that the area under 'Basangi' was rapidly going down for reasons just mentioned. Hence, work on 'Basangi' was taken up to isolate a type that combines non-lodging and high yield. It is pleasing to note that MTU. 3 (Potti Basangi) possessing the desirable characters evolved from Maruter is now the ruling strain for the early season in the three deltas of the Godavary. Since its release, the area under 'Basangi' has not only been on the increase in its original home, but has also gradually spread in the Kistna delta where it was not formerly cultivated. In the same variety, another type, MTU. 4 (Pedha Basangi) which is a week later has been found suitable to the upland conditions of Guntur. Similarly, 'Krishnakatukulu' cultivated on a large scale in the West Godavary delta was found to need topping of its vegetative growth in August once or twice in fertile areas that are planted early. Otherwise the crop would lodge flat in water even before flowering. In the search for a non-lodging type, it was possible to isolate MTU-10 (Sanna Krishnakatukulu) which combines fine rice with non-lodging habit.

This is now one of the recognised varieties in the markets of West Godavary. Another coarser grain strain, MTU. 5 (Bontha Kriahnakatukulu) for average type of soil has also been evolved. Both the strains are maintaining their merit in the respective areas for the past ten years. Similarly two strains MTU. 6 (Pati Atragada) and MTU. 14 (Bontha Atragada), the former a non-lodging short growing type, and the latter a coarser one for average type of land, have been evolved. Success has also been obtained through hybridisation in getting a systematic strain (MTU. 16—Badava Kusuma) for growing in low-lying lands subjected to occasional submersion. But in some years this variety is found to be comparatively more susceptible to stem-borer as the deep water condition primarily predisposes any crop to its attack. Another notable success in the matter of isolation of a suitable strain for the 'Dalwa' season by hybridisation, between two local 'Dalwa' varieties 'Nallarlu' and 'Garikasannavari' is MTU. 15 (Dalwa Sannam). This variety is found to combine the quality of drought resistance of 'Nallarlu' and the suitability for early planting of 'Garikasannavari'. It is also non-shedding and non-lodging compared to 'Garikasannavari'. It is also pleasing to record that it is found suitable for the 'Navara' season in the Southern districts of this Presidency.

10. In the matter of introduction, I may mention the case of GEB. 24. This strain, probably a mutant, was first isolated in a 'Konamani' crop at the Central Farm, Coimbatore. 'Konamani' is one of the varieties grown in the Northern Circars. Hence its duration was found suitable for cultivation in this zone. After trials for over ten years from as early as 1925, it was realised that it suited well to the coastal sandy areas and loamy soils of the higher delta where early planting is possible. It had a strong-hold in the coastal areas of Narasapur, Bhimavaram and Kaikalur taluks bordering the Collair Lake. These areas have always been subjected to inundation and excessive water would stand for long periods during the North-East monsoon rains. Consequently most of the local varieties cultivated, 'Akkullu', 'Atragada' and 'Kusuma' were always affected by stem-borer. When GEB. 24 was introduced it had a slow spread between 1925 and 1930, until ryots found its habit of resisting borer attack and adapting well to the sandy areas. This variety is said to have saved the ryots of Kaikalur taluk during the period of depression (1930—1939) when it was yielding 15 to 20 bags and fetching a premium for its quality rice as against 10 to 15 bags obtained from local 'Akkullu' of low quality and low price. As ill-luck would have it, GEB. 24 which is most resistant to borer is found to be susceptible to silver shoot (Kodu or Anaikombu) disease, which would ordinarily be seen in crops cultivated under uncongenial conditions. The variety lost ground, however, when in 1943 season, 'Kodu' appeared in the advanced stage of the crop in the Kaikalur taluk in an epidemic form. The appearance of the pest in such a severe form was noticed only once in 1925. Another interesting area is the Hospet taluk, irrigated by Tungabadra channel where GEB. 24 has found a condition most suitable to it. The soils are well drained. Heavy manuring is practised. Rice is rotated with sugarcane crop and is planted early. Therefore it is no wonder that GEB. 24 has completely replaced the local varieties in the Hospet area. In the Nandyal taluk, GEB. 24 for the same reason has established itself as the chief variety of the tract. Among the recent introductions, the case of S. R. 26-B and 'Kasipichodi' deserve mention. The strain S. R. 26-B was isolated in the Cuttack Farm, Orissa Province from the 'Patnai' types of Bengal. It was introduced for trial in the Divi taluks in areas where local 'Kusuma' used to perish after planting due to the influence of sea water. In about two years, this variety has won the confidence of the ryots in that area and has been named as 'Uppinetti vithanam' (salt water seed). It yields as much as any local variety of the delta and compares very favourably with 'Akkullu' (MTU. 1) of the delta. 'Kasipichodi', as an early 'Dalwa' variety has been for some years past, gradually gaining

ground on account of its earliness and the premium it was getting for its fine rice in the market. Its low yield was made up by the high price it fetched. However it required very heavy manuring and good drainage to maintain a high yield. In this Presidency as has already been mentioned, the seasonal factor plays such an important part that the yields of varieties vary within wide limits from year to year. In the Northern Circars, heavy North-East monsoon rains at the time when one or other of the varieties is in flower, affect the setting of the grain up to 25 per cent. It is therefore advisable for a farmer to grow two or more varieties so that an average yield may be maintained in one's holding.

11. **The Nellore Area** In this area, as in the Circars, the hot weather rains are too meagre (two to three inches). The South-West monsoon rains contribute about eleven inches on the average. The bulk of the rainfall in this area is received in the North-East monsoon, spread over the months of October, November and December. In the Nellore district, fifty per cent of the rice area is commanded by reservoirs getting the supply from the Pennar river and fifty per cent are under tanks that get their supply only during the North-East monsoon rains. Freshes in the Pennar river, which has its source in the Mysore plateau, are invariably received between July—August. Hence the cultivation of the channel-fed areas usually commences from July onwards. As the season for the paddy crop in the district commences late in the South-West monsoon months and as the crop has to mature at the end of the North-East monsoon, the varieties cultivated are naturally of a longer duration than those of the Northern Circars. Any initial set back in the growth of the crop is therefore made up by rains received during October, November and December. Where the soil is retentive and where water supply is not received in the tanks during the South-West monsoon months for cultivation, the crop is started under dry conditions with the rains received during August-September and later treated as a wet crop. In the regulated river systems, the crop is transplanted from a nursery raised under wet conditions. In the case of areas where a crop could not be started during the South-West monsoon rains on account of the non-retentive or alkaline nature of the soils, the crop has to start in October and November. In the Nellore district, 'Molagolukulu' (six months' duration) is the chief variety and ryots invariably prefer it save for other reasons beyond their control. But this variety which has built up a market of its own, thrives well only when planted in July-August or early in September. Any planting later with the break of the North-East monsoon rains, succumbs to the deadly 'Blast' disease (known as 'Aggitheegalu' or 'Medavirupu theegalu' in Telugu) and stem borer. This district also is said to be influenced by the adverse 'Turpu Gali' prevailing in the months of October-November in the Circars. There is plenty of water supply in all the tanks from October to March and so a variety known as 'Iswarakora', a coarse red rice variety with poor quality of rice is cultivated, because it is able to resist pests and diseases and withstands alkalinity as well. This season is therefore locally known as 'Iswarakora' season. The harvest of 'Molagolukulu', 'Pishanam' and 'Vadansamba' (a semi-dry crop) comes off in January while 'Iswarakora' is harvested at the end of February or in March. In a small area, a second crop akin to 'Dalwa' is taken between February-May. Red 'Kesari' (four months' duration) is usually grown in this period.

12. The prevalence of the blast disease in 'Molagolukulu' in an endemic form in the Nellore district and the poor rainfall during South-West monsoon months called our attention to breed a strain of 'Molagolukulu', resistant to disease as well as drought and a Rice Research Station was opened in Buchireddipalem in 1937. As a result of the work done in the said Research Station, a few high yielding strains resistant to blast and drought with good quality rice have been selected. They are under extensive trials in the districts. It is happy to note that cultures 2502, 2552 and 2555 have already won the confidence of the

cultivators for their resistance to blast. 'Pishanam', the variety once favoured for its quality rice, is almost extinct on account of its susceptibility to the blast disease. A culture 1283, in 'Pishanam', has been isolated and is in the course of multiplication. It is hoped that this 'Pishanam' strain will ere long restore the variety to its lost glory. In the Southern taluks of the district, where sandy soils predominate, more akin to Chingleput district ADT. 22. (Vadansamba) is best suited for cultivation.

13. **The Chingleput Zone.** Chingleput, North Arcot, South Arcot, Chittoor and parts of the Salem district form a group by themselves. In these districts one can see, all through the year, some crop of paddy or short-term garden crop like ragi, cholam, cumbu, groundnut, gingelly and indigo, grown with irrigation in wet-lands. They are situated in the valleys amidst hills in the interior of the districts of Salem, North Arcot and Chittoor. By the high water table in the two coastal districts of Chingleput and South Arcot, and also by the nature of the rainfall received in the tract rice is grown under wells. In addition to the innumerable tanks that are dotted all over the valleys, the lands in most of the ayacuts command supplementary sources of irrigation from wells lifted by means of mhotes, picottahs, power pumps and from spring channels from rivers. In the South-West monsoon months of June-September, a rainfall of 15 to 18 inches is received while in the North-East monsoon months the amount of rainfall received is about 25 to 30 inches in the coastal districts and about 15 to 20 inches in the central districts. The hot weather rains from February to June are scanty and rarely exceed three to four inches. The South-West monsoon rains are fairly well distributed from June onwards and help either to prepare the land for sowing paddy in dry or to maintain short term garden crops like ragi, gingelly etc. supplemented by lift irrigation when the supply in the well is not sufficient to support the short term paddy crop 'Swarnawari' generally grown in the season. The North-East monsoon rains bring sufficient water supply to the tanks to mature the semi-dry crop, sown in August-September and leave a surplus in some of the tanks to take a 'Navarai' crop of paddy from January-May.

14. In this zone, the rice is cultivated in three seasons, locally known as 'Kar' or 'Swarnawari' (June-September), 'Samba' extending from July-January or 'Thaladi' (October-March) and 'Navarai' (January-May). Though there are three seasons, it does not mean that the same land even in favourably situated areas is continuously cropped in all the three seasons. Under favourable conditions of water supply two crops of paddy are taken in a year, either 'Swarnawari' (June-September) followed by 'Thaladi' (October-March) or 'Samba' (July-January) followed by 'Navarai' (February-May), or short term garden crops in June-September and a long term paddy (October-March). The bulk of the area in these districts generally supports a single crop of paddy in the 'Samba' season. The crop is invariably started with the South-West monsoon rains in July-September and it matures with the North-East monsoon rains in January. 'Vadansamba' is the chief variety cultivated under the semidry conditions. In the Chittoor and North Arcot areas under similar conditions, a variety known as 'Bairiyadlu' which is specially used for puffed rice is most common. In fairly high level areas where the retention of standing water is poor even under the high rainfall of the North-East monsoon months, a variety known as 'Sembalai' is cultivated. In some of the coastal taluks like Madurantakam and Tindiyanam where the soil is more loamy, varieties like 'Bayyahunda' (BAM. 3 and BAM. 4), 'Chinnasamba' (CO. 5), 'Sadaisamba' (CO. 7) also thrive well when sown under semi-dry condition. Another variety called 'Kappasamba' with a duration between 'Kar' and 'Vadansamba' is largely cultivated in the Conjeevaram and Sriperumbudur taluks of the Chingleput district.

15. Prior to the opening of the Rice Research Station, for the Chingleput area at Tirurkuppam, Sevvapet Road R. S. (M. S. M. Ry.), six miles from Trivellore, some work was done on 'Vadansamba' at Coimbatore and Aduturai. Two strains CO. 17 (Chinnavadansamba) and ADT. 22 ('Vadansamba', North Arcot) yielding better than the local unselected bulks were isolated. They are now under distribution in this area for the past two seasons. Of the two strains, it is noticed that ADT. 22 (Vadansamba) is able to revive better after a drought than CO. 17 (Chinnavadansamba) and it is expected that ADT. 22 (Vadansamba) will continue to be grown largely. Further work in this important variety, 'Vadansamba' and other varieties sown under semi-dry conditions is in progress, in the new research station, since strains selected in their own natural habitat will prove better yielding than those isolated elsewhere, and will possess the requisite characters to withstand the peculiar seasonal conditions that prevail in the tract. In the 'Samba' season, GEB. 24 as an early 'Samba' variety under wet conditions and CO. 2 (Poombalai or Karthigaisamba), CO. 5 (Chinnasamba), CO. 14 (Perumthandu vellisamba) for late planted 'Samba' areas and the long duration strain CO. 19 (Chingleput sirumanian) of the 'Nellore samba' group either as a main crop in the single crop lands or as a 'Thaladi' crop, are popular in these areas. The 'Swarnawari' or 'Kar' season being short, the varieties cultivated are of 100 to 120 days' duration. The important local varieties grown are 'Swarnawari', 'Chitrakali', 'Vellaikodai', 'Vellai kuruvai' and 'Vellaikar'. In each of the varieties a Departmental Strain is now available for distribution. They are PLR. 7 (Swarnawari), PLR. 2 (Chitrakali), CO. 18 (Vellaikar), CO. 13 (Arupathamkodai), CO. 10 (Gobi, Kar), and ADT. 18 (Vellaikuruvai). Recent trials conducted at the new station show the suitability of 'Karsamba white' of Tinnevely for the 'Swarnawari' season. Among the introduced varieties, 'Khasipichodi' is as good as 'Swarnawari' in yield. In the Chittoor district, 'Sannavadlu' varieties are grown both in the 'Karthigam' (July-November) and again in the 'Vaisakam' (January-April) seasons. CO. 20 (Tella sannavadlu) a strain selected from that variety has become quite popular in that district. Work on 'Pallasannavadlu' and Yerra sannavadlu' which are of lesser importance than 'Tellasannavadlu' is in progress. CO. 20 (Tellasannavadlu) is found suitable also to the Anantapur district and parts of Cuddapah bordering the Chittoor area. In this connection, it is noteworthy that the yield of the 'Sannavadlu' types in the Chittoor district cultivated in the 'Vaisakam' season, goes up to 5,000 lb. per acre. It is mainly due to the very high manuring by way of cattle manure, and green leaf besides the top dressing of oil-cakes not to speak of the very close planting.

16. As already mentioned, the 'Navarai' season extends from January-May and this crop has to mainly depend for its water supply on the surplus water available in the tank after meeting the needs of the 'Samba' crop. The area under the 'Navarai' crop in any year will therefore depend on the said surplus water which again is governed by the strength of the North-East monsoon rains and their distribution particularly during the months of December-January. To take a crop in the 'Navarai' season the distribution interval between the harvest of 'Samba' and planting of 'Navarai' is generally shortened and the resultant crop is very poor. But, if sufficient time is allowed for the preparation of the 'Navarai' crop it not only runs the risk of scarcity of water supply at maturity but also the setting of the crop is affected by the high temperature prevailing in May. Thus the yield of the 'Navarai' crop will vary with the time of planting. The varieties grown in this season are generally of the 'Kar' group and go by different names.—'Vellaikar', 'Gidakar', 'Tellaikar' etc., and 'Mankattai', 'Manuvai' etc. They are all of four to 4½ months' duration according to the time of planting. Owing to the set-back in the establishment of the crop planted in December or early in January, the duration is of 125 days while the same variety

planted late in January or early in February matures in 110 days. The 'Kar' and 'Kuruvai' varieties generally do not thrive well when planted in December or early in January. They are at their best only when planted late in January or early in February. Varieties of medium duration—GEB. 24 (Kichilisamba), CO. 2 (Poombalai or Karthigai samba), CO. 3 (Vellaisamba), CO. 7 (Sadaisamba) and 'Rangoonsamba'—stand well, if planted in the very early 'Navarai' season (December). Recent trials at Tirurkuppam, indicate the suitability of CO. 10 (Gobi Kar) and ADT. 18 (Vellai kuruvai) for the regular 'Navarai' season i. e., late in January and early in February and that 'Kuruvai' duration varieties like ADT. 3 (Kuruvai), ADT. 4 (Kuruvai), ADT. 19 (Sarapalli) and P.L.R. 7 (Swarnavari) do not compare favourably with the 'Kar' and red riced varieties like 'Mankattai' or 'Manavari' varieties mentioned above. In this connection it must be mentioned that the effect of 'Turpu Guli' or 'East Wind' is not felt in this zone or in the Southern districts and therefore it will be noticed that 'Samba' varieties thrive well even when planted from October-December in districts South of Nellore. However, short duration varieties of 'Kur' and 'Kuruvai' that require more of high temperature conditions do not thrive in the North-East monsoon rains of October-December. This is the reason why their cultivation is confined to the autumn and spring seasons, when the day temperatures are fairly high and rains are not heavy and are only sporadic. In the Coimbatore district, under the Kalingarayan channel, the practice is to take an early medium duration 'Samba' variety known as 'Rangoonsamba' of 4½ months' duration between July 15th to November and again a second crop of the same variety from December to April. This is a unique case in which the same variety is grown in both the seasons. As a result of this practice, of cultivating the same variety in both the seasons in the same land, the yield of the crop is said to have considerably declined when compared to the yields obtained when it was first introduced some years ago. Trials were made with varieties of the same duration in this area, a few years back and T. 672 ('Patnai' type introduced from Bengal) has been found suitable for the first crop. It is happy to learn that it is spreading in the area.

17. **The Cauvery Delta area.** In this area one-and-a-half million acres are annually cropped with rice. With the construction of the Mettur Dam, it has now been made possible to supply an unfailing and regulated amount of water for irrigation from the 15th of May to February. Before the construction of the Dam, the rice cultivation in the Tanjore district was beset with a number of adverse conditions. Firstly, the time of arrival of freshes in the rivers was indefinite with the result that the seedlings of the 'Kuruvai' crop would either become over-aged or seed-beds would be sown late after the receipt of water resulting in delayed planting. In turn, the crop will have to meet with the inconvenience of a wet harvest, not to speak of the low yields that would result from a late planted crop. Again the supply in the river during the South-West monsoon season would be quite unreliable. Very often, the 'Samba' planting operations would come to a stand-still during August-September when, fields that were planted and those to be planted would commence to dry up. Further the heavy North-East monsoon rains of November-December coupled with unregulated freshes in the river would inundate the crop, then in shot blade or in flower. After the construction of the Mettur Dam, all these disadvantages have almost disappeared. The supply for irrigation in the river is let in at regulated depths to the needs of the agriculture in the delta as and when required instead of the agricultural operations being adjusted to the supplies that were being received formerly. The early and assured supply of water available now, has not only given a strong impetus to increase the area under two crops but has also helped to finish the harvest of the 'Kuruvai' crop in bright weather before the onset of the North-East monsoon. The 'Samba' crops are planted in time with assured supply without any break. Apart from these advantages, enjoyed by the

old delta area, the storage of the water received in the Cauvery river at Mettur has now enabled the ryots of the Pattukottai and Tanjore taluks to convert their dry lands into wet to the extent of three lakhs of acres.

18. In addition to the regulated supply of water received from the Cauvery river, this zone gets four to six inches of rain in hot weather; ten to twelve inches in the South-West monsoon months of June-September, and twenty-eight inches in the North-East monsoon months. Further, these rains, unlike in the Northern Circars and West Coast, are spread over the months of October to December and sometimes to January as well. There is no such thing as the uncongenial East Wind that prevails in the Circars and hence the transplanting operation of the 'Samba' and 'Thaladi' in the Cauvery delta area extends from August to November. Among the prevailing winds in the tract, mention may be made of the high 'Westerly Wind' that is said to connote the arrival of freshes in the river during June-July. This is considered adverse to any standing paddy crop in ears as it affects setting and shatters the mature grain from the ears. Other prevailing winds are not considered harmful to the paddy crop in the Tanjore delta.

19. About twenty per cent of this area is cropped twice in the year, either 'Kuruvai' (June-September) followed by 'Thaladi' (October-January) as in the Tanjore district or 'Samba' (July to January) followed by 'Navarai' (February-June) as in the two taluks of Kulittalai and Musiri areas situated in a narrow stretch of land along either banks of the main Cauvery river. In the upland taluks of the Trichinopoly district which have their sources of irrigation from tanks and minor river systems the practices are more or less similar to those adopted in the Central districts.

20. In the programme of work, for the improvement of the rice crop in the Madras Presidency, the area irrigated by the Cauvery river received the first attention of the Government as early as 1922, when a research station to improve the varieties of this large irrigated area of the Presidency was opened at Aduturai in the Tanjore district. Since then, high yielding strains have been isolated in all the local varieties of the tract and suitable varieties by hybridisation are now being worked out. There are already three strains extracted from crosses now in distribution. Work in other directions, as well, has given a fillip to the progress of the practice of green manuring in the delta and made the 'Mirasdars' manure-minded. The chief varieties cultivated in the 'Kuruvai' season are ADT. 3 (Kuruvai), ADT. 4 (Kuruvai) of 90 to 100 days' duration; ADT. 12 (Chitrakali); ADT. 14 (Vellai kuruvai); ADT. 16 (Konakuruvai); ADT. 19 (Sarapalli) of Lalgudi taluk, belonging to the class of 105-115 days' duration. Among the 'Kar' group of 120-125 days' duration, ADT. 9 (Poonkar) and ADT. 18 (Vellai) are in distribution. Among these three groups of short duration varieties grown in the first crop season, it is generally noticed that proportionate increase in the yield is obtained with every period of increase in the duration of the varieties. Thus 'Kar' strains of 120 days' duration yield higher than the 'Sarapalli' group of 105 to 110 days' duration and this in turn yields better than the 'Kuruvai' group under identical conditions of cultivation. At the Agricultural Research Station, Aduturai, it may be mentioned that with good cultivation and high manuring, 'Kuruvai' strains maintain an average yield of 2,800 to 3,200 lb. per acre, while the 'Sarapalli' and 'Kar' strains record an average of 3,000 lb. to 3,500 lb. and 3,500 lb. to 4,000 lb. per acre respectively. In one of the favourable years, ADT. 9 (Poonkar) has reached the maximum yield of 5,000 lb. per acre. Though it is known that 'Kar' varieties yield the highest, yet 'Kuruvai' strains alone are extensively cultivated in the Tanjore district. Formerly this preference was necessary for two reasons viz., (i) the 'Kar' varieties in the first crop would definitely meet with a wet harvest and the 'Thaladi' (second crop planting) would get delayed considerably; (ii) the stubbles of 'Kar' varieties, being thicker than 'Kuruvai' types,

would require a long time to decompose. Further, there is a belief among the 'Mirasdars' of Tanjore district, that early planted 'Kuruvai' crops get a set-back in its growth due to high winds and hence there is distinct prejudice against commencing 'Kuruvai' cultivation earlier than June. In the case of the first crop cultivation, these aspects might be true because 'Kuruvai' wants unchecked and uniform growth conditions right from planting to blooming for good yields. But 'Kar' varieties are able to make up any slight set-back in their vegetative growth and hence it is worth a trial to cultivate 'Kar' varieties especially when water is now supplied as early as May 15th. 'Kar' varieties even if sown on May 20th, will mature by the middle of September. In addition, expediciencies, such as close planting or planting with two to three seedlings per hole, high manuring etc., hasten the maturity of the crop by about a week. This aspect is for the consideration of the 'Mirasdars' of Tanjore as to why they should not utilise the offer of early supply of water in the channels for cultivation of 'Kar' varieties in a larger measure than at present, and thereby increase the yield of the first crop to their own benefit and to the benefit of their less fortunate people of deficit districts. It may also be mentioned that in response to a demand for 'Sirumani' type of strain for cultivation in the 'Kuruvai' season, ADT. 20 (Kuruvai sirumani) extracted from a cross yielding 20 per cent. better than 'Kuruvai' is now distributed in the Tanjore delta. If war had not intervened, this strain would have taken a prominent part in the export trade with Ceylon. In the Tanjore delta, about 80 per cent of the area is cropped only once with long duration strain, because the monsoon period extends from June to December. Usually, the long duration varieties of six months' duration, cultivated in the single crop areas during the 'Samba' season are also cultivated in the 'Thaladi' season following the short duration 'Kuruvai' or 'Kar'. In the Tanjore district, 'Sirumani' varieties, ADT. 1 (Red Sirumani) and ADT. 2 (White Sirumani) predominate in the Chidambaram, Shiyali and Mayavaram taluks. In the coastal taluks of Nannilam, Negapatam, Tiruthuraiipundi, ADT. 10 (Korungusamba) is largely cultivated and in the upper delta area, Papanasam, and Kumbakonam, ADT. 11 (Nellore Samba) and ADT. 8 (Early white sirumani) are the most favoured. ADT. 11 (Nellore Samba) is the chief variety cultivated for the 'Samba' crop (August-January) in the Trichinopoly district. As ADT. 10 (Korungusamba) and ADT. 11 (Nellore Samba) were noticed to be liable to the attack of blast disease occasionally, two synthetic strains CO. 15 (Jada Molagolukulu) and CO. 16 (Bontha Molagolukulu) resistant to the disease and yielding as much as ADT. 10 (Korungusamba) are being distributed. Trials with CO. 19 (Chingleput sirumani) belonging to the 'Nellore Samba' group are now being conducted. It is found to lead in all the trials over ADT. 11 (Nellore Samba) and is soon expected to come to the fore-front in the Southern district where ADT. 11 is being cultivated.

21. In the upland areas of the Trichinopoly district, depending upon minor river systems and tanks supplemented with wells, CO. 1 (Peria kichili), CO. 2 (Poombalai or Karthigaisamba), CO. 3 (Vellai samba), CO. 7 (Sadai samba) and GEB. 24 (Kichili samba) are popular for cultivation after a summer crop of short term garden crops like groundnut ragi and cumbu. In the 'Navarai' season (February-June) 'Sarapalli' or 'Swarnawari' is sown broadcast. However, trials show that ADT. 9 (Poonkar), ADT. 12 (Chitrakali), CO. 18 (Vellai kar), MTU. 9 (Garika sannavari) and MTU. 15 (Dalwa sannam) of the 'Kar' group, if raised as transplanted crop yield higher than local 'Sarapalle', usually broadcast in the month of March. Such late sown crops suffer from unsetting, shattering of grain, being caught in the high winds and get affected by the rice bug (a common pest of the tract).

22. An account of the Tanjore rice cultivation will not be complete without the mention of the special cultivation of taking a mixed crop of a short

duration variety of 'Kuruvai' and 'Ottadan' (a variety of eight months' duration) In the Tanjore delta, there are isolated areas where this 'Udu' system of cultivation is practised for certain obvious difficulties experienced in the area. These are mostly situated in the Shiyali-Mayavaram areas. Seeds of both 'Kuruvai' and 'Ottadan' are mixed in the proportion of 3:1 and sown in the 'Kuruvai' season and planted when the seedlings are between 20-25 days in bunches so that each clump may contain a few seedlings of 'Kuruvai' and one or two of the 'Ottadan'. When the 'Kuruvai' crop is ripe in September, it is harvested end to end as though a fully ripe crop. After the sheaves are removed, water is let in to submerge the stubbles for a few days to facilitate early decomposition of the ripe stubbles of 'Kuruvai' and stimulate the shooting up of the 'Ottadan' stubbles. Soon the 'Ottadan' stubbles which are still on active growth put on fresh shoot. A weeding and a sort of combing up of the decomposed stubbles of 'Kuruvai' are given. In a month, the ground gets covered up with the 'Ottadan' crop. This system is adopted in areas where there are facilities to grow a 'Kuruvai' crop and yet the planting of a second crop would be difficult in October due to stagnation of water or inundation. Hence, both the short and the long duration varieties are started together when the season is favourable. The short duration varieties are harvested at the usual time and since the long duration varieties had already established well, they are able to revive even under adverse conditions under which a newly planted crop would not ordinarily thrive.

23. In the coastal taluk of the Tiruthuraipundi, low-lying alkaline depressions are subjected to inundation by the collection of drainage water of the surrounding areas. Hence such areas have to be planted as expeditiously as possible with the opening of the channels for the 'Kuruvai' season, so that the crop may get well established before the submersion. In fact, special precautions are taken to prevent early inundation by way of erecting high and thick bunds. Apart from those precautions, it is necessary to grow a variety that will withstand submersion and would not germinate when ripe. Locally a variety known as 'Kar' or 'Sandi kar' is grown. This comes to harvest in November and is said to satisfy all the conditions required. Recent trials indicate the suitability of MTU, 16 (Badava Kusuma) for this area. In the Shiyali taluk and in alkaline-coastal area, a variety known as 'Vadansamba' of five months' duration with red rice is grown. This should not be confused with the 'Vadansamba' of 5½ months' duration grown in the Chingleput district under semi-dry conditions. ✓

24. Southern group of Districts. This group comprises Madura, Ramanad and Tinnevely. The systems of cultivation and season may be said to be more or less similar to those of the Central and the Tanjore delta except that the total rainfall is about ten inches less. These districts on the average receive about 31 inches of rainfall. During the hot weather, a rainfall of five to six inches is received while the South-West monsoon and North-East monsoons register on the average four to nine inches, and sixteen to twenty inches respectively. It will thus be seen that the rainfall is fairly well distributed and is moderate in its precipitation and this factor among others may be one of the reasons for the high yields obtained in the irrigated areas of the Periyar and Tambaraparani systems. About 35 per cent of the area irrigated by the Periyar system and 60 to 70 per cent of the Tambaraparani system are cropped twice in the year, the first 'Kar' crop being taken from June to September and the 'Fishunam' or 'Thaladi' (second crop) grown from October to February. In the single crop area, a long duration variety chiefly ADT, 11 (Nellore samba) is raised. Under the tank-fed areas where the water supply is not available during the South-West monsoon months, to take a paddy crop, some short duration garden crops or 'Masipattam' Cambodia cotton (CO, 3) is cultivated from May to September. In any case, all the tank-fed areas are cultivated with crops of paddy in the 'Karthigai' or 'Manavari pattam' according to the availability of water.

25. Unlike the Tanjore delta, the first crop variety is of the 'Kar' group, viz. CO. 13 (Vellai kodai or Arupatham kodai) in the Madura district and CO. 9 (Karsomba red) in the Tinnevely and part of Ramnad district. The average yield of the first crop in these districts is therefore much higher than in the Tanjore district. In the 'Thaladi' season, the interval allowed between the first and second crops is fairly longer and the rainfall is comparatively less and consequently the 'Pishanam' crop also yields much higher than the 'Thaladi' of the Tanjore district even in areas where the same variety is cultivated.

26. In the 'Thaladi' season, ADT. 11 (Nellore samba) is largely cultivated in the Madura district. This variety being susceptible to the blast disease CO. 15 (Jada Molagolukulu), CO. 16 (Bontha Molagolukulu) and CO. 19 (Chingleput sirumanian) are now being introduced with very good results. In contrast, CO. 8 (Anaikomban), CO. 12 (Sendhinayagam), CO. 2 (Poombalai or Karthigaisamba) and ADT. 11 (Nellore samba) to some extent, are cultivated in the 'Pishanam' season of the Tinnevely district according to the length of the period in which the water from the various sources would be available for the crop. In the 'Manavari' season, another red-rice variety called 'Kalmanavari' is cultivated from December to March. In tank-fed areas, 'Karthigaisamba' or CO. 2 (Poombalai or Karthigaisamba) is the most popular variety in all the Southern districts. It is interesting to note that GEB. 24 under the name of 'Toppisamba' is grown in the Madura district both in the South-West monsoon and as a second crop in the months of November-December. In pursuance of the policy of opening rice research stations in each of the important rice tracts of the Madras Presidency, a small rice research station of ten acres was opened in 1937 at Ambasamudram in the Tinnevely district. Recently strains yielding higher than even the earlier releases, have been isolated in 'Karasamba' red, 'Karasamba' white, 'Veedhivadangan' of the Tinnevely district of the first crop varieties in 'Karthigaisamba' for the October-December season and in 'Kuruvikalayan' for tank-fed areas cultivated under semi-dry conditions. Similarly strains in 'Anaikomban', 'Arikarai' for the 'Pishanam' season are expected to be released in the next year. Among the varieties introduced, it is found that TB. 2 (Ponnaryan) promises to be a good substitute for 'Manavari' with regard to both yield and earliness. In the Ramnad district the cultivation of rice is largely dependent upon the supply of water received in the tanks during the North-East monsoon months. The soils are also alkaline. Consequently varieties of 4½ to six months' duration are cultivated according to seasonal rainfall. They are mostly red rice types. The improvement of the varieties cultivated in the Ramnad district was commenced in the year 1942-43 and is in progress at the Paddy Breeding Station, Coimbatore.

27. **The West Coast Districts** In the two districts of Malabar and South Kanara, rice is cultivated over 1½ million acres, an area equal to that fed by the Cauvery waters and yet the production is found to be insufficient to meet the food requirements of that area. In these two districts, there are no artificial sources of irrigation. The rice crop depends directly on the rainfall that is abundantly precipitated during the crop season, June-November and on the supply from springs that are developed in consequence. The precipitation in the West Coast increases from about 80 inches in the Southern taluk of Palgaat to about 150 inches in the Northern taluks of South Kanara. The bulk of the rains (88 inches in Malabar and 125 inches in South Kanara) is received during the South-West monsoon between June to September in the first crop season. In the North-East monsoon season, Malabar gets 17 inches and South Kanara, 12 inches spread over from October to the early part of November as in the Northern Circars. The first crop therefore starts with the hot weather rains (12 inches) and matures with the rainfall of 80-125 inches. The second crop cultivation and planting is completed with the North-East monsoon rains of October-November and depends largely on the springs that have developed after the high

rainfall and remain active till the end of December or middle of January. The hot weather rains in South Malabar (12 inches in all) are received from the middle of April-May. This facilitates the sowing of the first crop in a large measure under dry condition. Hence the first crop is harvested much earlier than in the South Kanara district where the hot weather rains do not exceed seven inches and where therefore, most of the area is transplanted after the break of the South-West monsoon in June. This naturally postpones the second crop in South Kanara with the result that, while the South Malabar ryots, a particular of the Palghat taluk, cultivate even longer duration strains as CO. 1 (Sendhinayagam), CO. 8 (Tinnevely Anaikomban) and ADT. 11 (Nellore Samba) for the second crop, even in favoured areas in the South Kanara district medium duration varieties alone like GEB. 24 (Kichilisamba), CO. 2 (Poombalai or Karthigaisamba) CO. 3 (Vellaisamba) and CO. 14 (Perumthanduvellaisamba) have to be cultivated. In Malabar, the first crop in the double crop area, is generally broadcasted, while in the South Kanara district, the first crop is transplanted. On the other hand the second crop in Malabar is invariably transplanted, while a great portion of the second crop in South Kanara is broadcasted to shorten its duration.

28. The number of varieties cultivated in the West Coast districts is far more numerous than in the delta areas having a regular supply of water for irrigation. As already pointed out the crop is dependent on the rainfall which varies from the sea coast to the Ghats and from North to South. Again, the situation in which the crop is raised varies so much that for each increase of level from the bottom of the valley along the sides of the hills, the duration has to get less and less so that the crop may mature before the spring that feeds it gets dried up. In the first crop season, the planting progresses from the bottom to the top of the valley while in the second crop, the crop has to mature in succession from the higher level to the lower. Hence both for the first and second crops, varieties of different duration that can stand irregular and inadequate water supply are needed. A research station was opened on the West Coast in 1927 at Pattambi (South Malabar) to improve the varieties of the West Coast. High yielding strains in a number of varieties cultivated in Malabar of durations varying from 100 to 145 days for the first and second crop have been selected and are now in distribution in the district. In this connection, mention may be made that unlike in other districts of the Presidency most of the varieties cultivated in the West Coast are red-riced varieties. The work with regard to the South Kanara varieties at Pattambi have not been as successful as with the Malabar varieties. In the face of the seasonal differences outlined above, the reason for this partial success is obvious. Hence, a separate Rice Research Station for the South Kanara district has been opened in 1944 at Kankanadi, Mangalore (South Kanara).

29. There is yet another season in the West Coast called 'Punja' (in Malabar) or 'Kolaki' (in South Kanara). This is analogous to the 'Navarai' season of the South and 'Dalwa' of the Northern Circars. This third crop is cultivated in February-May purely with lift irrigation in small patches where water supply is available, in wells to support a rice crop during the hot weather months. A fairly large area is also cultivated in what is known as 'Kole' area which gets inundated both in the first and second crop seasons. These basins are divided into big plots with huge bunds and wide channels. After the North-East monsoon recedes, the water from the plots is baled out, into the drains in instalments and a short-duration variety of 100 days' duration, like 'Thekkancheera (PTB. 10) or 'Manalvaluthan' is either broadcast or transplanted. During the growth period, the water stored in these wide channels is re-baled into the transplanted plots. There is yet another type of areas all along the river-sides where it gets frequently inundated and submerged for considerable periods during the high

rainfall months (June-August). Hence no first crop can be cultivated in these areas called 'Karinkora' in Malabar and 'Petla' in South Kanara. In September after the vigour of the South-West monsoon rains gets lessened they are planted with long duration varieties which are usually grown in the second crop season. The chief varieties cultivated under such conditions are PTB. 15 and PTB. 16 ('Kavunginpothala' strains—white riced variety fit for table purposes and a few red-riced varieties like 'Vellakoli', 'Kodian', 'Chamban' and 'Kuttadan' in Malabar and 'Punjakavama' or 'Kandrakutti' in South Kanara. Lastly the description of the systems of cultivation in Malabar would be incomplete without a mention about the 'Kaipad' cultivation of Malabar. This system is mostly confined to areas near river mouths where the sea-water frequently inundates the lands during the high tide. Even in areas where the inundation of sea-water is controlled the salinity that accumulates within the plots during summer is too high to start a crop of paddy straight away. Hence, a series of mounds of two to three feet diameter are made in the fields before the rains. During the heavy rains that fall in June, salt incrustations on the mounds get washed down to the sides and are drained through one way-outlets to the rivers. After two or three good showers, germinated seeds are sown on the mounds. In the meanwhile, the depressions unsown are dug and prepared to receive the seedlings with bits of sod attached. The mounds cut into a number of bits are spread out as such in the interspaces. By the time planting takes place, the whole area is fairly free from the effect of salts that had accumulated during the summer months. The varieties grown are known as 'Orkayama' and 'Bali'. They are harvested early in October before the South-West monsoon recedes.

30. In re-capitulating the analysis of the rice seasons of this Presidency with reference to rainfall received and the varieties cultivated, it is evident that the Northern Circars form a group by itself with a higher rainfall in the South-West monsoon months as contrasted with a similar high rainfall during the North-East monsoon months in the Southern districts. The Southern districts, Rampad, Tinnevely and Madura get ten inches less than in the Coastal districts. The Deccan plateaux (districts forming part of the Mysore plateaux) get comparatively poor rainfall. In the West Coast, South-West monsoon rains are five to ten times the rains received during the North-East monsoon. The rainfall condition and facilities for irrigation decide the number of crops to be taken in an area. In the Circars, the first crop varieties are longer than the second crop and extend from June to December, and January to April, respectively. In the Southern districts two crops one behind the other are taken in areas that have sufficient water supply,—either 'Kuruvai' or 'Kar' from June to September, followed by a second crop from October to February or a long duration one from July to January followed by a short crop from February to June. Most of the areas are cropped once in the year, mostly starting with the South-West monsoon and maturing after the North-East monsoon recedes i. e. from July-January in channel irrigated areas or from October-March in tank-fed areas. In the West Coast varieties of 3½ to 4½ months' duration are cultivated in both the seasons.

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