

- (5) The diseases of rice.
- (6) The world's commerce in rice.
- (7) Co-operative Societies of Production and Consumption as applied to rice.
- (8) The effect of increase of rice cultivation on public health.

Important conclusions were arrived at with respect to each of the 8 subheads mentioned, most of which have a direct application to Indian conditions and we are sorry that, for want of space, we are unable to give a larger abstract in our Journal and have to refer our readers to the original article for a detailed information.

Practice Better Than Precept.

Mr. C. K. Ramaswamy Goundar, landlord, Kallapatti writes:—

I sowed thin seed bed of Samba paddy on the 25th August 1913 at the rate of 7 Madras Measures of paddy in 7 cents for transplanting an acre.

Doubts were expressed at first, when transplanting was done after 42 days, whether the crop would come up well.

The crop suffered at the outset for want of water but subsequently regained its vigour when freshes were received in the channel. About a month and half after transplanting, the crops had an attack of worms, specimens of which were sent to the Government Entomologist for identification and advice. He advised me to drain the water off the fields which is also our local practice. The crop recovered from the disease later and tillered freely.

At the harvest time from the $3\frac{1}{2}$ acres of single seedling plots, I obtained 48 salagais of paddy which come to about 14 salagais per acre, the ordinary yield being about 10 salagais.

I am perfectly satisfied with this method and, for the Kar crop of this season, I have raised single seedlings sufficient to transplant 30 acres, and in future all my fields will be transplanted singly and my neighbours who have watched these results carefully, intend doing this for the next Samba crop.

Mr. K. P. Karuthiruma Goundan, Village Munsiff, Nanjaipuliyampatti, Gobichettipalayam Taluk, writes:—

In leaflet No. 9 of 1913, full details as regards the profit obtained by me by adopting single seedling method last year are given. This year in S. No. 193 a quantity of 28 Madras Measures of Samba paddy seed was sown on an area of 28 cents. In S. No. 173 A, 7 Madras Measures of Anaikomban seed were sown in 7 cents. Seedlings from 18 cents were found sufficient for transplanting 4 acres in the case of samba, while 5 cents Anaikomban nursery was sufficient for transplanting an acre. The paddy crops ordinarily transplanted had an attack of "Sembam" disease occurred to the single seedling crops. The single seedling crop was stout, darker in colour and tillered freely to the extent of 16 to 22, and also put forth longer earheads which had grains closely set. Like the ordinary fields, the single seedling plots also received cattle manure. At my instance and after seeing my single seedling crop of last year, K. Karuthiruma Goundan and M. C. Rungiah Goundan raised single seedlings in 1 acre and 36 cents respectively and obtained profit as noted below. Owing to the scarcity of water, there is slightly reduced yield. Several ryots in Nanjaipuliyampatti and in adjoining villages, after seeing my single seedling crop and on my inducement, are desirous of growing single seedling crop during next year. I also intend raising single seedlings on 10 acres during the coming season.

PARTICULARS OF YIELD.

No.	Names of ryots who raised single seedlings.	S. No.	Area of single seedlings planted.		Yield of ordinary crops this year.	Yield of single seedling crops.
			Ac.	Cets.	Salagais.	Salagais.
* 1	K. P. Karuthiruma Goundan.	192A	4	00	11½	14¼
	Do	193	1	00	17	17
		173A				
2	M. C. Rungiah Goundan	389A	-	36	13	13
3	K. Karuthiruma Goundan,	75	1	00	7½	10¼

* NOTE:—Savings of surplus seed in transplanting 5 acres. ... 70 — 11½ = 58½

VALLAMS. VALLAMS.

SALAGAIS. SALAGAIS.

Increased yield for 5 acres. 75 — 61 = 14

The crop was sold at Rs. 9/- per Salagai.

Savings in seed per acre about 11¼ Vallams.

Increased yield per acre about 2¾ Salagais.

The Munagala Prize Eassay 1914.

Paddy Cultivation in the Madras Presidency and the Lines of improving it, with Special Reference to the Pithapuram Estate.

Paddy ranks first among the crops cultivated in this Presidency and affords its people a most esteemed food grain. Being easy to grow and a much surer and more profitable crop than most others, ryots take to it with a fondness and are always anxious to bring as much of their land as possible under its cultivation.

The crop occupies about 10 out of the 36 million acres of the annual cultivated area of this Presidency. Its cultivation is most

tensive in the highly irrigated deltaic tracts of the East Coast and the districts of Malabar and South Canara where the rainfall is so abundant as to render artificial irrigation almost unnecessary. In other parts of the Presidency too, there are considerable areas under it, depending as they do, on more or less precarious sources of irrigation.

Varieties.

The paddy plant varies greatly in habit of growth as well as in the size, form, colour, weight and composition of the grain, thus giving rise to numberless varieties, which, for practical purposes, may be classified in a number of ways.

Primarily, the different varieties of paddy may be grouped into two main classes viz., the dry and the wet, though intermediate forms also occur. Paddies of the former class are usually grown without irrigation and need no more moisture than the ordinary cereals. These are met with in the dry lands of various districts in the Presidency and on the hill slopes of the West Coast. Those of the latter class, also termed 'swamp paddies' are semi-aquatic in nature, and require for their successful cultivation plenty of rain or copious irrigation. The majority of the cultivated varieties of paddy belong to this class and are usually first sown in a seed bed and then transplanted into the field.

The classification of varieties into early and late kinds, based on the time taken by them to mature is also a common one. Those which take about $4\frac{1}{2}$ months or less are generally considered to be early or 'punasa' and those which take a longer time, late or 'pedda.'

The slenderness or robustness of growth, the drought or flood resisting capacity and the tillering power of the plant as well as the size of the ear and the closeness of the grain in it are other characteristics in which the several varieties differ and from which their suitability for cultivation is usually judged.

According to variations in the size and shape of the grain, paddies can be classed as coarse, medium and fine or as long, medium and

short. These and other various characteristics of the grain, such as the absence of awns, the weight and boldness of the grain and the colour, composition, and percentage of the rice yielded, determine the merits of the different varieties.

Soil.

Loams and clay loams, free from weeds, are generally the soils most suitable for dry paddies though lighter soils are also sometimes cultivated with them in several localities. The alluvial clay loams around Nidadavol in the Kistna District have been known to give very high yields.

Wet paddies have also been found to thrive best on alluvial clay loams but, where there are good facilities for irrigation, fairly heavy crops are being obtained from almost all kinds of soil.

Seasons.

Dry paddies are generally sown at the beginning of the S. W. monsoon but the time at which the cultivation of wet paddies begins varies to some extent in the different parts of the Presidency.

In the Northern Circars the first crop (Saruva) which, in most places is the only one in the year, is usually sown in June or July and transplanted in July and August, both early and late varieties being cultivated. The 2nd crop (Dalwa), possible only in the deltaic tracts, is sown at the end of December or beginning of January and planted out a month later, only early varieties being cultivated at this season.

In the Tanjore district the first crop is sown in the nurseries in June and harvested in August or September if early varieties (here termed 'Kar') are cultivated, the late (Samba or Pishanum) varieties being usually sown in July and August and harvested in January. On double-cropped lands the second crop usually succeeds an early first crop in October or November and is harvested in January or February. A third crop is sometimes grown after this.

In most other districts in the South the times at which the different wet paddy crops are cultivated more or less correspond to the above.

On the West Coast wet paddy lands are of three classes high, middling and low, the first generally carrying two, and the others only one crop in the year.

In the cultivation of paddy the season at which it is sown and planted out is of great importance. In the Northern Circars especially, any delay in sowing or transplanting is attended with very serious reduction in the yield, the growth of the crop being poor and often checked by insect pests. Varieties usually grown at one season do not generally suit another season but there are a few exceptions. *Garika Sannavari*, for instance, suits both the *Samva* and *Dalva* crops in the Godavari delta.

Rotations and Mixtures.

Wet paddies are generally grown year after year on the same land, but in some parts of the Coimbatore and other districts, where the land is well drained, it is sometimes rotated with garden crops, such as turmeric, betel-vine, sugarcane and plantains. Within the same year the paddy crop is usually succeeded by pulse or where irrigation facilities exist, by gingelly, ragi or a 2nd crop of paddy.

Dry paddies, though generally sown alone on the hill-slopes of the West Coast and sometimes in other districts also, are most commonly grown as a mixed crop with red gram and cotton or red gram alone. This mixture is usually cultivated year after year on the same land but occasionally a change to chillies or cholam is effected.

When grown alone, as in some parts of the Kistna District, dry paddy is followed by Bengal gram or blackgram as dry crops, or by garlic or gingelly under irrigation. A noteworthy rotation in which the dry paddy crop is successively followed in the same year (under irrigation) by garlic, gingelly, and greengram (*teegapasara*), the last as a green manure crop, is sometimes practised in the Tanuku Taluk of the above district.

Cultivation :—Dry Paddies.

For dry paddies the land is usually prepared as for other dry crops and with the bursting of the monsoon, the * seed is sown broadcast, lightly phoughed and brushharrowed. One handhoeing is given about a month after sowing and another hoeing 3 or 4 weeks afterwards. The paddy is harvested in September or beginning of October; the red gram is cut in January; and the pickings of cotton last from February to May. An average yield may be said to be 1000 lbs of paddy, 600 to 800 lbs of red gram and 100 to 150 lbs of cotton in seed. Very high yields are sometimes obtained, a mixture of Budama paddy (a hardy dry variety) and redgram at the † Samalkota farm having yielded in 1908-09 produce valued at Rs. 153.

On the hill slopes of the West Coast dry paddy is grown once in several years, the jungle being cut down and burnt in the hot weather, and the seed sown broadcast after digging or ploughing at the commencement of the S.W. monsoon and harvested in August or September.

Wet Paddies.

Wet paddies, as already noted, are generally sown in a nursery and the seedlings thus reared are transplanted into the fields. In some tracts (Nellore, Trichinopoly etc.,) the seed is sown direct into puddled fields. In some places again (Nellore) it is drilled in the dry fields and the crop is grown at first as a dry one, irrigation commencing sometime afterwards.

Seedbeds.

For the transplanted paddy the cultivation operations commence with the preparation of the seedbeds. For these the best plots of the ryots' holding are usually selected. There are two systems of growing seedlings in nurseries viz., the dry and the wet. In the former they are generally grown without irrigation until the time of pulling them up except when, owing to drought, the seedlings threaten to wither

* usually 4 kunchams (28lb) of paddy, 1 seer (2½lb) of redgram and ¼ viss of cotton seed.

† Scientific report 1908-09 page 14.

away. In the wet system the seed (often previously sprouted) is sown in well manured and carefully puddled seed beds, and the seedlings grown under irrigation.

In both the dry and the wet systems of raising seedlings, 80 to 100 K-ms (560 to 700 lbs) of seed are generally sown in an acre of seedbed in the Pithapuram estate as well as in several other tracts, this area transplanting about 10 acres under the dry system and 15 to 20 acres under the wet system. In many parts of the southern districts the seed is often sown thicker in the nurseries and, even under this system, the seed rate often comes to about 100 lbs or more per acre transplanted. In some parts of the Kistna district, however, the ryots are able to manage with only 20 to 30 lbs.

Puddling.

While the seedlings grow in the nurseries, the preparation of the land to be transplanted is briskly attended to. Any manure that might have been carted previously is first spread over. Water is then let in and the land puddled. Usually this operation is repeated 2 or 3 times at intervals of a week but, when water cannot be got at will, it is finished at one stretch and the land transplanted. Sometimes the fields are ploughed dry before puddling. In some places where the soil cracks deeply and swells on water being let in, no puddling is at all done, the plots being merely troden over by cattle and planted.

Manuring.

Systematic manuring of paddy lands is rare in many parts of the Presidency, though, owing to the gradual impoverishment of the soil, its necessity has of late been keenly felt, especially in the continuously cropped deltaic tracts. Farm yard manure and village rubbish are the only manures generally available to the ryot for his paddy crop. Sheep and cattle are also often penned on paddy lands. In the Kistna and Godaveri deltas, patimannu is largely used as manure for paddy. Silt is also sometimes carted. Oil cakes (castor and margosa) are occasionally applied. In the Coimbatore, Tinnevely and a few other districts, wild indigo leaves are largely gathered from roadsides and

waste lands and used as green manure. In some parts this crop is especially grown for the purpose on paddy fields after the harvest of the 1st crop. Sunhemp is sometimes similarly grown in the Godavari and Kistna deltas for the same purpose.

Transplanting.

By the time the fields are thus prepared the seedlings also get ready for being planted out. Early varieties are generally kept in the seedbeds for 3 to 5 weeks and the late ones 2 or 3 weeks longer. As soon as the plots to be transplanted are ready, water is let into the nursery and the seedlings carefully pulled out and tied into bundles. These are then carried and distributed over the puddled field where the seedlings are separated and transplanted by women. To carry the seedlings from the nursery for distribution over the puddled fields, an implement called *Chalugudu*, literally a sledge, is often employed in the neighbourhood of Pithapuram and is a very convenient means for the purpose.

The number of seedlings planted in each place and the distance apart at which they are put in, varies greatly in different parts of the Presidency. The general rule in most places is to plant 2 to 6 seedlings about 6 inches apart. In some parts of the southern districts bunches of 10 to 20 or more seedlings are planted about 9" to 1 foot apart, an enormous wastage of seedlings occurring thereby. In some taluqs of Godavari and Kistna deltas, however, the practices of planting seedlings, one by one, obtains.

Broadcast Sowing.

The system of sowing the seed direct in puddled lands is occasionally resorted to in some parts of the southern districts as well as in the Nellore and Coimbatore Districts. This course is usually adopted only in the case of early varieties.

Drilling and Dibbling.

The practice of drilling the seeds and treating the crop as a dry one during the early stages of its growth is largely prevalent in the Nellore District where the tanks do not fill early, owing to the S. W. monsoon

rains being insufficient. On the West Coast also the system of broadcast sowing or dibbling the seed in plough-furrows and treating the crop a dry one for some time is occasionally adopted in the case of the 1st crop.

Double Transplantation.

In the Madura district the young plants raised in the nursery are sometimes transplanted to a second nursery and afterwards replanted into the fields.

Irrigation.

From the time of transplantation up to two or three weeks before harvest, the paddy fields are generally kept under 2 to 6 inches of water. Frequent renewal of water is considered desirable to prevent stagnation as well as to facilitate the deposition of as large a quantity of silt as possible.

Weeding.

In transplanted paddy a weeding 5 or 6 weeks after planting is found enough, but in fowl fields another weeding some weeks after the first may also be necessary. In fields where the seed is drilled, the *Pandla Manu* or metlaguntaka is passed over occasionally until water is let in and one weeding is given sometime after.

Topping.

In certain parts where paddy grows too luxuriantly to be able to stand erect till it comes into ear, the tops are cut away with a sickle and used as fodder. Sometimes cattle are allowed to graze over the fields. In rare cases a second cutting may also become necessary.

Insect pests and diseases.

Insect pests and diseases of paddy, though numerous enough, rarely damage the crop seriously, except when planted late. The principal insect pests to which the paddy plant is liable are several leaf eating caterpillars, the grasshopper, the rice-bugs and the borer.* In the Godaveri and Kistna districts considerable damage is sometimes

* Bulletin No. 67 Madras Department of Agriculture.

caused to the paddy crop (especially when transplanted late or when water logging occurs) by the caterpillar of a moth scientifically known as *Cnaphalocrocis medinalis*, the pest being locally known as 'Elivi'.

The borer called 'Usathiru' (*Schoenobius bipunctifer*) is also very common in the Northern Circars, the crop infested with it throwing out a very large percentage of white chaffy ears.

The diseases of the paddy plant do not yet seem to have been well studied. In the deltaic tracts of the Godavari and Kistna districts, a disease, throwing out instead of an ear, a peculiar shoot resembling the onion flower-stalk, is prevalent on poor lands. Other diseases are 'errathegulu' in which the ends of the leaves become reddish and gradually wither up, and 'dumpu' in which the crop becomes depressed in patches and produces, if at all, crumpled ears which do not fully come out of their leaf sheaths.

Insect pests and diseases are, as a rule, more common in the deltaic tracts than in the non-deltaic areas.

Harvest.

As soon as the crop turns yellow and all the grain in the ears gets ripe, the crop is cut by the sickle. In the Southern districts the crop is generally thrashed immediately after harvest by beating on planks. But in the Telugu districts the sheaves are usually allowed to dry in the field and then stacked, the thrashing being done at leisure by being trodden by bullocks. Even in the case of hand thrashing the straw is again trodden by cattle to make it soft and remove any grain that might remain away after the first operation. In the operation of thrashing, the bullocks are either let loose or tied in rows of four or five.

Thrashing being over, the grain mixed with chaff and broken pieces of straw, is winnowed with the aid of the wind, dried and stored in godowns, puris (straw-bins) or underground pits. Seed grain is usually stored in straw bundles, basketbins or sacks.

The average yield of the transplanted crop on fairly rich lands may be taken as 2100 lbs of grain and $1\frac{1}{2}$ tons of straw per acre. More than 4000 lbs of grain and 2 tons of straw are obtained in several places. In the Samalkota Farm in 1912-13 the yield in a certain plot of Rasangi was 4960 lbs of grain and 5200 lbs of straw, thus showing what the paddy plant is capable of.

The cost of cultivation varies greatly in different places but in the vicinity of Pithapuram it may be estimated at about Rs. 24 per acre excluding the estate rent which will be about Rs. 12. The value of the gross yield 2,100 lbs of grain and $1\frac{1}{2}$ tons of straw will ordinarily come to Rs. 60 for the grain and Rs. 12 for the straw, the profit for the cultivator thus being about Rs. 36 per acre. When a high yield is obtained by careful cultivation, the net profit may come up to more than Rs. 150 per acre.*

Improvements.

The existing methods of paddy cultivation in the Madras Presidency have been thus briefly described and, in the following pages, it is proposed to suggest some lines of improvement, especially with reference to the Pithapuram Estate, which is situated in the Godavari District and consists of both deltaic and non-deltaic paddy tracts.

Thin sowing and single planting.

The first and the most unquestionable improvement that can be suggested to the roylts over the greater part of the Presidency is the adoption of an economic seedrate by sowing thinly in the seedbeds and planting out the seedlings one by one instead of in bunches. On some of the Government Farms as well as the Pithapuram Estate farm, it has been proved that, if the seed is sown in well prepared seedbeds at about 40 k or 280 lbs only per acre (instead of 560 to 700 lbs or more), the seedlings will be robust and can be easily singled out and planted one by one, seedlings from an acre of seedbed thus sufficing for 10 to 13 acres of the area to

* Scientific Report of the Coimbatore Farm 1912-1913 page 12.

be transplanted. The seed rate, therefore, works up to only 3 to 4 k (21 to 28 lbs) per acre. With some extra care, it can be reduced to even 2k or 14 lbs per acre. In most parts of the presidency including the Pithapuram Estate as already noted, a much higher rate prevails and the adoption of the economic method will enable the ryot to save much of the seed he usually wastes.

In the Southern Districts where the existing method is very defective compared with that of the Telugu Districts, the introduction of this improvement by the Agricultural Department has been very successful, several of the ryots testifying to the three advantages of it, viz :-- saving of seed, saving of labour and increase in yield.

The distance apart at which seedlings have to be planted is a matter to be determined by each ryot for himself, according to the condition of the soil and time of planting. In poor soils and in the latter part of the transplanting season, planting has to be done closer than in good soils, planted early in the season. On the Pithapuram Estate Farm in an average season, 6" has been found the most suitable distance when the seedlings are planted singly, 9" being too far. In the deltaic tracts under fair treatment, singles 9" apart may be more profitable.

The problem of manuring the land is also of great importance in paddy cultivation. In many villages in the large paddy growing tracts of the presidency, the supply of farm yard manure, village rubbish and other manures usually available is so limited that, even in case they are solely used for paddy lands, they may not be sufficient even for a tenth of the whole area every year. Other means of meeting the difficulty have therefore to be devised.

Green Manuring

The practice of green manuring already in vogue in some parts of the Presidency will, if more widely and systematically adopted, solve the question of supplying Nitrogen, the most needed ingredient to the

* Leaflet No. 1 of 1913 Madras Agricultural Department.

sc'l. On the Government Farms as well as on the Pithapuram and Sivagiri Estate Farms, it has been shown that, by this means, the yield of the crop can be considerably increased at a moderate cost (Leaflet No. 18 of 1911 Madras Agricultural Department). For this purpose leaves of wild plants, such as vempali, wild indigo, jilledu, madar and others, may be gathered and used, or crops like sunhemp or daincha may be grown on the land itself.

On the Samalkota Farm daincha, teegapesara and sunhemp have been very successfully grown as ante-monsoon green manure crops, thriving best when sown in April-May under irrigation and this method may be followed by the ryots of the deltaic tracts of the Pithapuram Estate.

In the non-deltaic tracts sunhemp may be sown at the time of the harvest of paddy, especially the early varieties, but the crop cannot be ploughed in when in flower, there being no moisture in the soil at that time. It has therefore to be cut and preserved till the next rainy season. In seasons in which the S. W. monsoon bursts early, sunhemp can also be sometimes grown previous to the paddy crop, the seed being sown immediately after the first showers, at the same time as paddy seed beds. Under favourable circumstances, the crop will grow 3 or 4 feet high in four or five weeks and may be ploughed in as green manure by the time seedlings of the late varieties get ready.*

In the Southern districts daincha, sunhemp, and wild indigo, have all been successful as green manure crops, the last being specially hard and immune from insect pests.

The question of green manuring is sometimes complicated by other conditions. At the recently opened Manganallur Farm, the effect of green manuring was quite disappointing and this was attributed to the land being ill drained. Researches by the Madras Agricultural Chemist have also led him to the conclusion that drainage or at least some movement of soil water is essential for paddy cultivation, especially when bulky organic manures are applied.†

* Journal of the Madras Agricultural Students' Union Vol. I. P. 248.

† Report on the Operations of the Department of Agriculture. Madras 1912-13. p. 5.

The ploughing and irrigation of the land in summer to grow ante-monsoon green manure crops has been found to sometimes produce a baneful effect on the soil. What the exact changes are which are thereby effected is not clearly known, but the Principal of the Agricultural College, Coimbatore is of opinion that "it is partly biological and partly due to the alteration in the texture of the soil, which follows a summer ploughing and subsequent drying, this alteration leading to the blocking of the pore spaces and consequent loss of percolation."* It has also been the common experience on the Pithapuram Estate farm and the vicinity, that fields into which water is let in for puddling in one irrigation turn of the Yeleru Channel but which could not be puddled and planted till the next turn on account of the insufficiency of water, the crop is generally poor. All soils, however, do not seem to be affected in this way.

Use of superphosphates or bone meal.

To supply the deficiency of Phosphoric acid in the soil, the application of superphosphate or bonemeal has been found to be effective in several places. In combination with green manure this has given very good results at Samalkota and Coimbatore Farms.† In the Kistna Delta, where the supply of patimannu is being exhausted, green manure and superphosphate or bonemeal have been found to be a suitable substitute for it. The ryots of the deltaic villages of the Pithapuram estate may, wherever necessity occurs, advantageously use superphosphate or bonemeal, alone, or in combination with green manure.

In the neighbourhood of Pithapuram as well as in other non-deltaic tracts, the use of patimannu is yet rare and, except where it is not available, the use of superphosphate or bonemeal does not seem warranted. In this tract the use of this earth in combination with farm yard manure or green manure is recommended.‡

* Scientific Report of the Coimbatore Farm 1912-13 P. 16.

† Report on the Operations of the Department of Agriculture, Madras 1912-13 P. 4.

‡ Indian Agriculturist Vol. 37 P. 303.

The use of potash manures has not been generally found to be of much use for paddy except in a few places in the Kistna District, owing perhaps to a larger quantity of this ingredient being received through the irrigation water than the other two.*

Other manures that have proved economically successful are castor cake, especially the black one, and poudrette.† Pig manure also gives heavy crops, and is being now used in the vicinity of Pithapuram to some extent.

Choice of variety.

Considerable improvement in the yield and quality of paddy may also be effected by a careful choice of variety, seed selection and production of superior strains. The choice of a suitable variety is generally well understood by the ryots, hardy, heavy yielding, though coarse, sorts being usually selected. But in many places there is yet room to introduce heavy yielding varieties of better quality. Ratnachudi paddy which has stood the test in the Pithapuram estate farm may be safely recommended to be cultivated in all, yield and quality having been both very satisfactory. A variety from Burma, going by the name of Rangoon paddy, has also been found to yield very heavily in the non-deltaic tracts of the Pithapuram estate and may be more largely cultivated. In some of the deltaic parts of the Godavari and Kistna districts, Swarnavari, a recent introduction from the south, is said to have given satisfaction as a dalwa crop and deserves to be encouraged as a substitute for the coarse black paddies usually grown.

Selection of Seed.

The importance of seed selection is little realised by ryots in general, though there is a familiar proverb in telugu '*Vithukoladi Mokka*' meaning "as is the seed so is the plant." If a little seed (say a Kuncham) is selected from the healthy well grown plants every year and a crop raised in the following year from this in a small well prepared plot, the grain from this crop will be suffi-

* Journal of the Madras Agricultural Students' Union Vol. I-p. 235.

† Agricultural Journal of India Vol. VII p. 312.

cient for a large area during the succeeding year. Thus every ryot may with a little trouble secure a constant supply of pure and sound seed. The above method has been adopted in the case of most varieties grown on the Pithapuram Estate Farm and several ryots who purchased seed or seedlings from it have expressed that the crops raised from the farm seed or seedlings yield better.

The Japanese method of selecting heavy seed by immersion in salt water (1 seer of salt to 2 seers of water) is said to have given good results in Mysore.*

Production of superior strains.

The selection of seed from individual plants which show considerable superiority over others is a more scientific, yet simple, method than the above mechanical ones. Some work on these lines is already in progress at some of the Government Farms. Here single plants, true to type, are selected and seed raised from these, rejecting strictly all which, in subsequent generations, do not maintain the superiority at first sown. At Palur a single plant selection from Garudansamba grown on a field scale yielded a much heavier crop than the usual Garudansamba.† Dr. Locke of the Royal Botanical Gardens, Peradenia, is said to have by this means effected an improvement of 50% in the yield of a transplanted crop.§

The process of selection has generally to be carried on through several generations before the type becomes fixed and even afterwards much care has to be exercised to guard against admixture with other varieties and to prevent cross-fertilisation which is said to be more common than usually understood, when plants of different varieties are grown close together.

* Agricultural Journal of India Vol. VII p. 312.

† Report on the Operations of the Department of Agriculture Madras 1912-13
P. 4.

§ Indian Agriculturist Vol 37 p. 303.

Change of seed.

Occasional change of seed also appears to be necessary to keep up the yield at a high level. In some parts of the Kistna District, for instance, Atragada which was 15 years ago a favourite variety, gradually deteriorated in yield, and had to be given up in favour of Konamani and Akkullu and these again are now giving place to another variety, Kistnakatukula which is rapidly spreading. The reason for this appears to be, as Mr. De'Sylva in a paper read at the Ceylon Planters' Association puts it,* that "plants grown for long periods under similar conditions of soil and climate adapt themselves to their environments and go what may be termed a quiescent state." When, however, a change of conditions occurs, a new activity is manifested.

Thoroughness in tillage operations also tends a good deal towards the enhancement of the yield of the paddy crop. The use of the iron plough which proved successful on the Sivagiri Farm † may be recommended on sandy soils. The levelling board should always be used to remove inequalities after puddling. The ploughing of the land immediately after the harvest of the previous crop is sometime attended with benefit, especially in loams and sandy loams, but on clay loams and clay soils it appears to be not only of little use to the crop but is often found positively injurious.

Dr. Coleman who has studied the question in Mysore suggests the alteration in the bacterial content of the soil as the probable reason for this.

On the loams of the Pithapuram estate farm, dry ploughing has always been of benefit to the paddy crop, especially in seasons of drought. In 1911 a plot which had received good ploughing during the mango showers could admirably withstand the drought which occurred after transplanting the crop and yielded 849 lbs per acre more than the adjoining unploughed plots. The practice, therefore, can be largely adopted in all similar soils with advantage.

* Agricultural Journal of India Vol 7 page 312.

† Bulletin No. 61 Madras Agricultural Department P. 1.

Careful Irrigation.

Paddy, though a semi-aquatic plant, requires some drainage and any care taken to prevent over-irrigation will be sure to be repaid. It is a well known fact in the Kistna and Godavari deltas that plots irrigated by Karem (a water lift for small depths) called Karem Thodupampalu' yield better than the adjoining plots irrigated by flow, thereby showing that careful and moderate irrigation is beneficial to the paddy crop.

When water has to be lifted from a small depth, the iron karem, largely used at Kadium near Rajahmundry, may be advantageously employed for the purpose elsewhere, being easily workable by one man. Besides care in actual irrigation, a great deal may also be done in the permanent improvement of the plots themselves by lowering and levelling them wherever necessary, so that they may be easily and evenly accessible to water. Much benefit accrued from such work in the Pithapuram estate farm where earth from some of the high plots had been dug out and spread over the adjoining dry and garden lands, thus improving both. For levelling plots the scraper described in pp. 53 and 54 of the Agricultural Journal of India Vol. IV has been found very useful.

Manuring weeds.

Weeding in the wet paddy crop is usually a simple operation, but the hoeing and seeding of the dry paddy crop often costs so much as to force the ryot to abandon the crop altogether. On such lands, especially when the chief weed is hariali, the method of inducing surface rooting by heavy manuring and shallow cultivation with fodder cholam, and subsequently ploughing deep with the cotton soil plough (plough successful at Koilpatti)* may be tried.

Combating Insect pests.

To minimise Uchathiri or the attack of the stem borer in the wet paddy crop, ploughing, and if possible burning of the paddy stubble after the harvest, destruction of egg masses which are conspicuous and

* Scientific report 1912-13 P. 8.

attraction of moths to traps at night are suggested. Early transplantation and careful irrigation tend a good deal to prevent this as well as 'elivi'.

In conclusion it may be said that, though ordinarily no very large increase in the yield of paddy can be effected by any single improvement or in a single year, yet by taking some extra care in each and every detail of its cultivation and for a number of years, there is no doubt that considerable enhancement can on the whole be effected.

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Notes.

Christmas in Madras:—Christmas week in Madras was busier this year than usual. There were people who were pouring in from the mofussil to *enjoy the season*, which means, spending the frugal savings of a year in purchasing articles of little or no value, artistically displayed in all kinds of shops from the China Bazaar upwards, in attending dramas and concerts not understood and in patronising the Park Fair and Madras coffee hotels, apart from getting crushed, both to and fro, in the Railway 3rd class carriages on concession tickets!! There were also those who came to Madras, not only from the mofussil districts of the Presidency but from other parts of India as well, to attend and take part in one or other of the Conferences and meetings held in Madras. The Indian National Congress was the centre of attraction for the non-official population, but the Indian Industrial Conference, the Indian National Social Conference, the All India Temperance Conference, the Theistic Conference, the Theosophical Convention, the Provincial Co-operative Conference, the Christian College Day, the Indian officers' Association, not to speak of others,— each had its own votaries that the Christmas activities in Madras were at a high pitch for over a week. There were opportunities for all, young