FACT

The Magazine of Fertilisers And Chemicals, Travancore Ltd.

Fertiliser Manufacturers Meet in New Delhi

Front Row:— Mr. Sonawalla, Mr. John, Mr. Rahimtoola, Dr. Rai Chowdhry, Head of the Division of Chemistry, Institute of Agricultural Research, Mr. Ananthasayanam Iyyengar, Dy. Speaker, Parliament, Mr. Khaitan. Major Rao of the Technical Development Directorate of the A. H. Q. and Mr. Amin of the Alembic Chemicals.

Back Row.— Mr. Satyanarayana of the Pusa Institute, Mr. R. Chakravarthy, Resident Representative of Seshasayee Bros. Ltd., Mr. C. S. Menon, Mr. Sarathy of Eastern Chemicals and Mr. Ramdas of Eastern Chemicals.

JAN.—MARCH 1953

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Editorial Office: F. A. C. T. Ltd., Udyogmandal P. O., ALWAYE, T. C. State.

A colour film depicting the results of application of different fertilisers in experiments conducted in Govt. Exptal. farms in Hydrabad State, was screened on 1st Feb. 1953 at the Constitution Club, New Delhi. The above photo was taken on that occasion.

Front Row (left to right): Mr. S T. Raja, Col Zaidi. M. P., Mr. Rafi Ahmed Kidwai, Mr. R. Chakravarthy, Resident Representative of our Managing Agents at New Delhi, Mr. Kaitan, Mr. Ashimore and Mr. John of Parry's.

Back Row: Mr. Amin, Mr. Rahimtoola, Mr. R. K. Seshadri of Eastern Economist, and Mr. Balasubramanian of Hindustan Times

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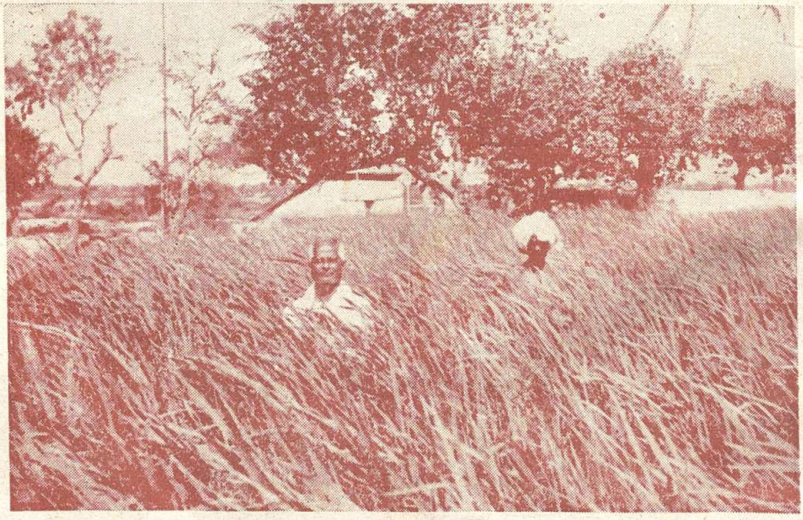

Siamese paddy crop raised by Sri T. S Rangachari, Agent and Correspondent, Indian Express, Tiruchirapalli. Note the full height of the crop. Sri T. S. Rangachari and one of his farm-hands are seen in the photo.

FACT

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The Editorial Board do not hold themselves responsible for the views expressed by contributors.

Books and Pamphlets on scientific, industrial, agricultural and allied subjects are accepted for review in this Journal.

Editor.

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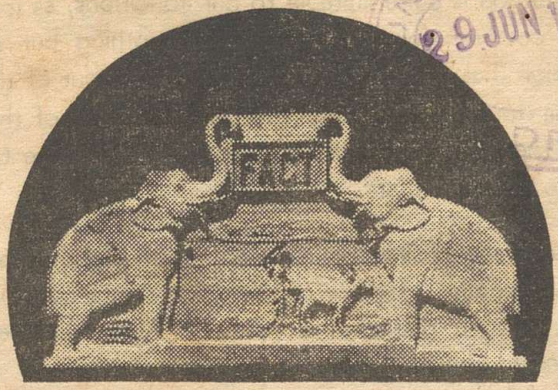
Editor.



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EDITORIAL

Growing Rice The Japanese Way

IT may be news to many when it is said that the paddy soils of Japan are poor in inherent fertility. Most of them had been derived from volcanic parent material consisting of acidic lavas and ash. They are generally deficient in phosphate and potash. Yet, on these sub-normal soils, by dint of hard work, the Japanese farmer has been able to produce phenomenal yields, with the result that rice production in that country has been the envy of other countries for centuries.

Rice is the most important single crop in Japan and it occupies 7·8 million acres, nearly 53% of the total cultivated area. The total rice production is 10·4 million tons, which work out to an average acre-yield of 2987 lbs. of (shelled) rice, equivalent to nearly 4320 lbs. of paddy. A remarkable achievement indeed! The over-all rice production in Japan was in the order of only 4·9 million tons in the year 1880; but in 1942 it had been up-graded to 10·4 million tons, a phenomenal increase of 112%.

In our country we have 75 million acres under paddy, nearly ten times that of Japan; but our aver-age acreyield lies within the range of 800 to 1200 lbs. of paddy, which is less than one-fourth of that of Japan. It will do us good to understand fully the significance of the unfavourable comparison brought out by these figures. If only a small fraction of our area under paddy can be induced to give out such high yields as they do in Japan, then our food problem will be solved rightaway.

India, therefore, stands to gain if some of the salient features of this new mode of cultivation are introduced and well-mastered by our farmers.

The Japanese method is quite suitable to our conditions, as it does not involve the use of any costly machinery. In fact, it is nothing but a very intensive form of cultivation that aims at getting the maximum out of the soil. We are, elsewhere in this Jourra', publishing the chief features of this method. We have catalogued the most important field operations and we trust these will be of immediate use to our readers.

The percentage of literacy in Japan is high and this, combined with the disciplined and progressive ideology of the cultivating class substantially help in the achievement of such phenomenal results. Agricultural extension service is also well organized there. The whole country has been divided into 46 zones, each of which is about 500 square miles in extent. A central experimental station is located in each zone, which has, in addition, nearly 250 technicians. This works out to one extension worker for every village, to maintain liaison between the farmers and the experimental stations.

It is not therefore difficult to realise the fact that in Japan agriculture is conducted in the way, it should be conducted. There is maximum co-operation between the primary producers on the one hand and the Government, the research establishments, manure and fertiliser manufacturers and distributors, etc., on the other. With this background behind him, the Japanese farmer goes about his work in a disciplined way. He cultivates every inch of available land; even steep mountain-slopes are cut out and terraced with scrupulous care. He gives to his crop the same kind of care and attention that a gardener would bestow on a single flowering shrub in his home garden. In other words agriculture is transformed into horticulture in Japan.

The Japanese farmer never fails to manure his crop adequately and inspite of the low fertility-rating of his land, he keeps up its productive capacity at a very high standard; he never permits his soil to become exhausted.

Yes, there are many things indeed that our farmer can, and has to, learn from his Japanese compeer. We feel confident that in the days to come, more and more of our cultivators will enthusiastically adopt this new mode of rice-culture and thus help our Nation to attain the coveted goal of self sufficiency in food.

Editorial Board.

Our Regrets

Owing to some unforeseen events the publication of this issue had been delayed for nearly two months. We deeply regret this long delay.

Editor.

Paddy Cultivation in Kashmir

JIA LAL RAINA, Dy. Director, Agricultural Researches, Kashmir.

PADDY in Kashmir, which is a net work of vallies, overlooked by many snow capped mountain peaks, covers a little above three lakh acres of land. Paddy being the staple food crop of a Kashmiri covers every nook and corner where irrigation facilities are present. The laborious tiller has carved small stretches of land in the mountain slopes and carried water from great distances to his fields. This staircase system of paddy cultivation presents a picturesque view. Efforts are being made to get more land under paddy cultivation and only in the last two or three years many miles of new canals were opened to irrigate big stretches of land.

Kashmiri farmer has been cultivating paddy from times immemorial, and about three hundred types are under cultivation. Out of these local types Budgi, Baber, Lolanzun and Begam predominate because of their high yield of 2400–3280 lbs. per acre. China paddy which has been introduced recently has shown a great superiority in yield over the local ones and the people have started its cultivation on a large scale. The yield under the ordinary conditions of cultivation in vogue comes to 6150 lbs. per acre or in short 100% more than the yield of the local types. Its cultivation has increased to such an extent that only recently there was a demand of 10,000 maunds of seed, which was easily made available by the Department.

Amongst the number of types of China paddy now available in Kashmir China 1039 has gained greater popularity. It is due to its being highest yielder, blast resistant and pigmented.

In Kashmir where paddy has been cultivated year after year the fertility of the soil is not very high and the production has been stabilised at a certain level which does not come down because of the system of cultivation, which is simple and systematic.

Two methods of cultivation are in practice, broadcast and transplantation methods, In the broadcast method the seed is sown in the prepared fields directly by broadcasting the seeds by hand while in transplantation method the seedlings are first raised and then transplanted in the prepared fields. Kashmiri farmer generally adopts the first as it is more productive under Kashmir conditions and resorts to the latter, only where his field was under Rabi-winter crop or the field was highly weedy.

Sri Jia Lal Raina is in charge of agricultural research under the Jammu and Kashmir Govt. In this article, specially written for FACT, he describes how rice culture is being carried on in his State. —Ed.

Preparation of the seed bed

The land for the seed bed is generally ploughed in fall when the soil is still moist, and left so for the winter frosts to act upon it. Thawing takes place and the clods that were left unbroken get pulverised. In the early spring a frugal dose of farm yard manure and sweepings are added and ploughed in, in dry condition. When the manure gets well mixed, the field is irrigated and soil allowed to soak. When soaking is complete, puddling is started and the soil is well mixed and levelled and left to receive the seeds.

Preparation of seed for sowing

Selected seeds are placed in bags of earthenware pots and immersed in water and left there for 2–3 days, after which it is drained and seed permitted to sprout with the heat produced in the bag or the pot. This sprouting can be accelerated or retarted according to our requirement as it depends on the regulation of the moisture and warmth.

Sowing of seed in seed beds

The sprouted seeds are sown mid April- May in the seed beds at the rate of 48 lbs. in a space of 60 feet x 30 feet area to suffice one acre. The irrigation and drainage are looked after for a few days till the seedings have come up. The water is then allowed to stand in beds till the seedlings are ready for transplantation, which is after a month of sowing.

Preparation of the field

Land is generally opened in October just after the harvest, when the soil is still moist or after winter in March–April. Preference is generally given to the fall ploughing because the soil is ploughed easily and it facilitates the subsequent operations and controls weeds to a great extent. In all, four ploughs are given after which manure in the form of farm yard manure and sweepings is mixed and then the fields are flooded. Quantity of manure depends on the distance of the field from the village. The nearer the field, the more manure is added. In all 200–300 maunds of manure is usually applied. In addition to the manure the sod is applied occasionally. Here the turf gets composted in the field and serves as manure. In certain localities the settled sediment of ponds "ravine pockets," which are artificially made in time, are being added to increase the fertility of the soil.

After flooding the field, when the soil gets soaked, puddling is practised and soon after levelling of the field. In levelling the field the levelling board driven by the bullocks is made use of.

Seed sowing by broadcast method

When the field is ready the prepared seed is sown broadcast at the rate of 72 lbs. per acre, in mid April to end May. One inch of water is allowed to stand on the seed sown and care is taken to see that it always remains at this level, until the plants have

grown a few inches in height, when the water level is increased according to requirements.

Transplantation of seedlings

The seedlings raised in the seed beds are transplanted after a month of seed sowing. 2-4 plants are planted in each hill and at a distance of 6–9 inches from hill to hill and row to row. This system when compared to 3" intervening space with single plant in a hill at experimental farms have given better yields with 43·79 to 69·31 per cent more yield on 6" and 9" respectively.

Tillering

Under normal conditions the plants begin to tiller a fortnight after transplantation. The highest number of tillers numbering 50 were obtained in China paddy, in the 8th and 9th week. The total number of tillers in the local types do not exceed 20–25.

Interculture

Interculture of paddy crop is an important operation and great stress is laid on it by a Kashmiri cultivator. It is a two prong operation, when weeding is combined with loosening of soil round about the plant. It encourages tillering due to the aeration of the roots of the seedlings. In broadcast sown fields five weedings are conducted while in transplanted fields only one or two. Weeding generally starts when the plants are 6 inches in height and the subsequent weedings every fortnight after till it ends a little earlier of the flowering time. While conducting the first weeding, filling of gaps is also attended to and in doing so, reserved seedlings in the seed beds or seedlings procured by thinning in broadcast fields is made use of.

Maturity and harvesting

The maturity is determined by the dryness of the straw and the hardening of the grains at the base of the panicle.

It takes about 80–90 days to come to flower after sowing and another 35–45 days to harvesting under Kashmir conditions. Ripening duration experiments that were conducted at the experimental farms and illustration centres, well spread over the valley, revealed that China 1039 matures earlier and takes in all about 110 days as against 120-135 days taken by other Chinese and local types under Kashmir conditions where during the paddy season the maximum temperature varies from 65 degrees F to 95 degrees F and the minimum ranges upto 45 deg. F and the humidity percentage stands at 78 to 86.

(See photos printed elsewhere)

Rotavation and Rice Cultivation

B. M. LAKSHMIPATHI MUDALIAR, B E., M E, M. R. A. S. E.,
Joint Director of Agriculture, Madras.

Introduction

It is a known fact that the low yields of irrigated paddy are in a large measure traceable to late sowings and the same may also be said in the case of this State where predominantly rice growing areas exist and the vagaries of the monsoon do not allow the fields being got prepared for the timely sowings. The indigenous methods adopted also are very tardy in this respect and it is in regard to the gain in time and efficiency, mechanisation of agriculture plays one of its important roles.

The timely preparation of a seed bed for our crops is enabled now-a-days by the use of light weight tractors especially of the wheel types and this timely cultivation of the fields helps to increase soil fertility through improved nitrification and better incorporation of green manure and absorption of humus into the soil from the rural rubbish and compost added. Again, the timely sowing of the seed ensures a good start to the crops, saves them from diseases caused by unfavourable climatic factors.

Maximum yields can only be obtained if the seeding and planting of the crops are done at the proper depth and the seeds are distributed uniformly in the required quantities to suit the moisture and soil conditions. This can best be achieved by the employment of modern agricultural implements and machinery which otherwise is termed as mechanisation of agriculture.

Recent advances in mechanisation of agriculture

With regard to agricultural mechanisation, progress has been rapid in the U. S. A. and U. K. necessitated by conditions created by the recent world war. The most significant changes in modern rice growing in the Western countries and Australia during recent years has been the rapid mechanisation under widely varying conditions and increased yields resulting therefrom.

In U. S. A. most of the operations in rice culture – seeding, manure spreading and plant pathological measures are mechanised. The combine is also rapidly displacing even the harvests. In Australia attempts have been successfully made to mechanise rice cultivation completely. In Malaya also attempts at mechanised rice growing on a large scale are afoot. In British Guinea again, rice cultivation is being largely mechanised. There seems to be ample ground to expect with confidence mechanisation of rice cultivation in India as well with resultant efficiency of operation, timeliness and quick turn-

over. In a few years time rapid changes in this direction may be expected. For example, the cost trials of rice cultivation carried out by Nayanakkara (West Indies) at the Imperial College of Tropical Agriculture in 1950 showed that the typical rice farmer and his wife (growing perhaps ½ to 5 acres of paddy) used 236 man hours per acre to till the soil for their crop. With the help of the rice land Rotary Hoe, the labour requirement was reduced to 50·3 man hours. For larger farmers or contractors, the wheeled tractor and Rotavator reduced the labour requirements to less than 10 man hours.

It is gratifying to mention that the preliminary investigations on puddling with tractor in the Madras State in 1949, 1950 and 1951, showed that puddling with tractors is a definitely feasible item and the triple objects of efficiency, timeliness with turnover and low costs can be secured by mechanisation of this vital operation in rice cultivation.

Rotary tillage and Rotavation

In the field of agricultural implements and machinery the Disc plough which is otherwise known as Rotary ploughing is adopted in large wheat fields. This machinery is replacing the mould board ploughs of the West. These are also being used in the Madras State with very good advantage. Rotary ploughing gives more output and at a lesser cost as compared to mould board ploughing. The Roto-tiller or Rotavator or a kind of rotary cultivation is being increasingly used now for vegetable and garden crops in preference to other methods of tillage.

Rotary tillage is the method of cultivation that is now commonly called "Rotavation" and the principles on which it is based can be summarised as below:-

According to Shawl (1946) the rotary plough was invented about 90 years ago. The rotary plough has been used in Europe for many years but the American farmer has only recently become interested in this type of plough. They are divided into three types viz.,

i) The pull auxiliary engine—where the rotary plough is pulled forward by a tractor but has the cutting knives driven by an auxiliary engine mounted on the frame of the plough.

ii) The pull power-take-off driven–where the Rotary plough is not only pulled forward by the tractor but has the cutting knives also driven by the tractor. The cutting knives or lines are generally mounted on a horizontal power driven shaft which operates at about 300 r. p. m.

iii) The self propelled garden type rotary ploughs have one drive wheel, while others have two. Some garden type

rotary ploughs can also be used for cultivating vegetable crops.

These rotary cultivators have proved to be extremely valuable in horticultural work and for the incorporation of organic matter in the top few inches of soil and for cultivation among crops and in plantations.

According to "World Crops", Rotavation, the modern means of cultivating rice, is a time and man-power saving technique, which is fast superceding the slow and laborious traditional use of manual and animal drawn implements Grèater areas are worked in a fiaction of the time with these. The recent efforts in Ceylon, Thailand, Malaya and Philippines in mechanising rice cultivation are of considerable value in this connection and all countries have been using more and more rotavation.

It is said that in 1951 alone five times as many power bladed rotary hoes went into Indian farms as in 1950. The demand found in some 67 other countries particularly in those which till recently have relied on age old technique and are now striving for rapid mechanisation of their agriculture, to meet the growing food needs of their people.

The Rotavator represents a new and revolutionary science of cultivation which has proved itself by demonstration, field test and practical farm work to be particularly suited to the needs of countries faced with the problems of this kind.

The working and advantage of Rotavator

The Rotavator produces not only the right sort of cultivation but also better tilth by being thorough and quicker and is thus so much more economical. It also adds benefits of increased fertility. Rotavators are available in various sizes. The important aspect about the Rotavator is that it is a tool which puts the maximum amount of tractor power direct to the work of tilling the soil, the basic principle of the machine. The specially bladed rotavator which can now be power coupled direct to most leading makes of tractors provides a forward thrust which assists the tractor in its work and vigorous tests over years have proved that the wheel slip experienced with other cultivators is eliminated. The forward thrust of the hoes aids less soil compaction under the wheels. The cultivating job is done by the hoe shaped blades. They cut clearly through the weeds, green crops, trash, sugar-cane stools, lifting the earth, breaking it up and putting it back with finer particles underneath. During this process the earth is shaken loose and thoroughly aerated.

In preparing seed bed, the chopping up and turning in action of the rotavator blades puts trash and any green manure crops evenly through the soil,

thus ensuring its rapid decomposition into rich humus contact. However, the basic soil crumb structure is preserved intact.

Since the Rotavator will cultivate even more quickly than the tractor powered plough and disc harrow, time is available for the planting of such crops which can be turned in for soil improvement. It gives quick and thorough tillage where surface cultivation is the rule and can handle the entire cultivating processes efficiently. This is also true of the hand controlled models which is a blessing to small farmers. The rotavator has now become a valuable and much sought after implements for all kinds of cultivation.

Role of rotavation in rice fields

It is calculated that more than 60% of world's total rice production is by the wet paddy method. Faced with the rapidly rising population, the traditional crude indigenous cultivation methods gradually have begun to give place to mechanisation. As mechanisation remains a major step towards economy of labour and efficiency of tillage and the cultivation of much wider area, the need for a special wet paddy Rotavator resulted in small hand controlled 6 H. P. "Gem" which rapidly won favour on the small peasant holdings in Trinidad, Malaya and Spain. More recently tractor powered Rotavators with a standard cut of 50" and a cultivating depth of 9" have been successfully employed in various parts of India.

At Mankhand, in Bombay State, the Rotavator covered on an average ¾ of an acre per hour. The quality of the job done was excellent resulting in perfect mixture of soil. The soil was worked to a depth of 7" burying all weeds and the consistency of the puddle was uniform throughout.

In France in the Camargue, the largest number and sizes of rotavators are used in conjunction with 60 and 70 H. P. French tractors.

In South Africa, swamp and marshes have been reclaimed by Rotavators under the Rice Expert of the Colonial Development Corporation, Mr. Gaspar Snokolay.

The rotavator tractor attachment also has entered the wet paddy fields of Madras State. Equipped with the special swept back rice blades it was successfully demonstrated in 1951 in Madras where it did the work of puddling, green manuring and levelling without any of the wheel slip experienced with other types of cultivators.

Other Uses

The Rotavator is now playing an important role in the growing of sugarcane. Here again there is immense saving of time and labour. Two operations with the Rotavator are said to do the whole job of harrowing down the ridges,

ploughing in trash equally distributed which otherwise would have been wastefully burnt requiring further discing and ridging. The increase in soil fertility by mixing the chopped up trash through the soil to form valuable humus is an important factor contributed directly by Rotavation.

They can also be worked in tea gardens for preparing seed beds and hoeing between young tea. These are eminently suited for vegetable and orchard cultivation and for the inter-row cultivation of such crops as cotton, tobacco, maize and millet.

In dry farming also they can do the complete cultivating. They are of robust build.

Conclusion

It is admitted on all hands that there can be no maximisation of food production without mechanisation of farming. Besides producing more food, more cheaply from our present cultivated lands with the aid of agricultural machinery, the best method by which our vast uncultivated land could be brought into production expeditiously and economically is by the use of mechanical equipment.

It is clearly established now that tractor power can produce wider and better cultivation only if it is applied to the proper implements. And many will admit that the pride of place among these implements for its speed, economy and thoroughness of tillage, goes to the "ROTAVATOR".

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Trace Elements in Plants

S. M. SASTRI, M. Sc., F. A. C. T. Ltd., Alwaye.

AGES ago, for ages on end our country had scientific agriculture conducted under the dictates of wise men of the day. These men kept the scientific arguments for themselves and demanded faith from the common man. When these men became impotent, the faith was lost; there was rebellion in thought and procedures became most unscientific without any guiding hand. Unlike us, the man in the Far East still toils hard as per dicates of the past, incorporated with recent scientific findings and maintains his soil and yield at a higher level of productivity. The West on the other hand studied the subject, catalogued their observations, pooled their information and finally gathered a vast knowledge on the subject. A perusal of their scientific findings would stimulate our understanding.

The animal may depend on plants but it is most true to say that plant looks only to elements to live out its life. We all know that the plants' requirements of essential elements are carbon, hydrogen and oxygen, nitrogen, phosphorous and potash, followed by the secondary list of Ca, Mg, sulphur, etc. and the tertiary list of the 'trace elements'. Even the part played by the elements of the second list is not very well appreciated and with the use of chemical fertilisers as against bulky organic manures the level of the supply of the elements of the second and third list should be raised up to get more benefit out of the fertiliser one uses and the crop one harvests.

For example in Thailand the ratio of Ca: Mg. in paddy soils is strictly kept at one for a maximum yield and the soils are kept rich in mobile iron and manganese. The latter element has been shown to have a stimulating action on the growth of rice. The stunted growth of a tomato plant in one's garden, or the unhealthy growth of tobacco or cotton may be due to lack of proper supply of calcium and a deficient supply of magnesium may result in a disease characterised by yellowing of leaves of tobacco or green veins and purplish-red colour between veins in the cotton plant.

Going deeper into the subject one comes across more elements which are required only in traces to maintain a healthy growth of plants. Their concentration in the plant juices hardly exceeds 30–40 parts per million. In common parlance one could say these bring about the same state in plants as a trace of asafoetida does to sambar!

The study of the requirements of such trace elements was being tackled by scientific wor-

kers for the last 83 years. The work was initiated by Knops and Sachs with their water-culture method. By the adoption of micro-analysis and the use of pure salts for nutrient medium it was possible in the last 50 years to gather vast data on the subject of trace elements and now the second phase of development to determine their role in the plant life is in progress.

In 1897 G. Bertrand was the first to discover that the oxidising enzyme, laccase, of Chinese lacquer would function only in the presence of manganese. In 1914 it was found that maize plants growing in water culture required not only manganese but also zinc and five years later the elements boron, aluminium, silicon and chlorine were added to the list of trace elements requirements of the maize plant. Zinc and boron are also required by plants of a large number of species. In 1931, Summer reported additions of traces of copper to nutrient solutions brought about considerable increase in the growth of flax, tomato and sunflower. Lipmann and Mackinney showed that flax and barley grown in water culture fail to produce seed unless copper in traces was present. Even molybdenum was found essential for growth of tomato plants. Even among the lower plants, the fungus Aspergillus niger requires zinc for its growth. Manganese boron, zinc and copper are the four well established trace elements. But there is no limit to the vagaries of Nature—even selenium the element harmful to animals in good dosage, is taken up by a certain type of plant in South America and the intensity of the unpleasant odour the plant emanates could be taken as a seleninum indicator.

The question arises as to the function of these trace elements in plant life. Their function is still under investigation but the example of enzyme laccase, showed to point out that the presence of manganese and zinc is essential for the oxidation and reduction going on in living cells while boron appears to be related in some way to the actual production and maintenance of cells. Insufficiency of boron leads to general disintegration of the tissues including those of the vascular system.

The presence of manganese affects oxidation and reduction brought about by iron salts. In 1930, E. F. Hopkins proved that insufficiency of manganese in the plant puts up the concentration of ferrous iron too high and if manganese is present in too much quantity the ferric iron is in too great a concentration. In either case the vital oxidation and reduction processes controlled by iron are disturbed. Similarly zinc is also shown to be connected with oxidation–reduction in cells and this was shown by H. S. Reed and J. Dupreny from a study of citrus leaves suffering

from a deficiency of zinc. A microscope study of the mottled leaves showed the presence of phenolic materials, phytosterol and lecithin which were absent from normal leaves. The above authors interpreted these as the sub-oxidised products of carbohydrates and proteins. The action of cysteine which has been held to control oxidation-reduction processes in living cells, is catalysed by metals, notably iron, copper and manganese.

The pathological effects of trace elements' deficiency is well known from the following examples:

1) The deficiency of iron in citrus trees makes the leaves small, yellow and they quickly shed; that of copper makes the fruits pulpy.

2) Zinc deficiency in corn makes the plants stunted and flat-topped.

3) The boron deficiency in tobacco makes the growing bud dwarfed and in beet-root it gives black scars on the surface.

The grey-stripe of oats and other cereals is due to manganese deficiency. The symptoms of these diseases are quite definite but in each case the first sign is the local dis-appearance of chlorophyll from small areas of the leaves.

Boron deficiency also leads to disintegration of tissues and this deficiency affects beans and other legumes. Scientists even say that without boron normal growth is impossible.

Fruit trees appear to be particularly susceptible to deficiencies of zinc and copper. Not only citrus but also apple and pear are affected by deficiency of copper; there is a blister-like swelling developing on the young shoots. These shoots lose their leaves and the points may be small and spotted. This disease called exanthema, is no local trouble as it has been recorded in various countries like Florida, South Africa and Australia.

It is clear that both from the economic and scientific point of view the trace elements have great importance and we see other countries supplying the essential of these in their fertilisers according to the requirements. A study of the same in our country and a judicious use of these, consistent with the requirements of particular soils and crops may go a long way in increasing our present yields.

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Chief Features of the Japanese Method of Rice-culture

Here we have not attempted to write a long essay on the Japanese method of paddy cultivation. On the other hand we have just catalogued the salient features of this method, as we definitely feel that by doing so, we will be passing across the information to our readers in a more effective manner.

Preparation of the Seed-bed

1. Always plough the field immediately after the harvest. This is a very good practice as it not only serves to conserve soil-mosture but also helps to put down weeds and crop-pests.

2. The land selected for the nursery must be ploughed several times so as to pulverise the soil-clods and produce an optimum tilth.

3. Divide the plot into a row of raised beds, 4 feet wide, 3 inches in height and of any convenient length depending upon the size of the plot selected.

4. Leave one foot interspace between any two raised beds. This will facilitate weeding and manuring operations later. The lowlying space will also help in draining off surplus water.

5. Before finishing up the raised bed apply one maund of compost or yard manure and 1 to 2 lbs. of manure mixture (consisting of ammonium sulphate and superphosphate in equal quantities) for every 25 feet of seed bed. Cover them with soil and finish up the beds.

6. Dust a mixture of sieved compost and ash over the surface of the beds in a thin layer of one-eighth inch thickness.

Selection of Seed

1. Only the best seed should be selected. Never be satisfied with a seed of doubtful quality and viability.

2. See that the seed is well dried and thoroughly cleaned.

3. Steep the seed in salt water prepared by dissolving half a pound of salt in a bucket of water. The chaff that float on the top should be discarded.

4. Then wash the seed with fresh water to remove traces of salt.

5. Disinfect the seed by steeping it for some time in perenox solution. Mix 1½ lbs. of perenox liquid with 50 gallons of water. 25 maunds of seeds may be steeped is this solution for 15 to 30 minutes.

Sowing

1. Use less seed. About 18-20 lbs. of seed sown in 5 cents of nursery will suffice an acre.

2. Sow the seed thinly in straight rows over the seed beds. Thick sowing results in overcrowding of seedlings, which will become thin and weak. Thin sowing will give us strong and robust seedlings. The Japanese farmer uses only 5 to 6 lbs. of seed in 4 to 5 cents of nursery. As against this our farmers use 80 to 120 lbs. of seed per acre.

3. If you are careful you can raise sufficient seedlings for an acre with 10 to 15 lbs. of seed sown in 5 to 6 cents of nursery.

4. After sowing cover the seed with a thin layer of earth. Press the earth by hand or with a small plank of wood.

After-care of the Nursery

1. In the absence of rains the seed-beds must be watered by hand. You may use a rose-can for this purpose. See that there is always sufficient moisture in the beds.

2. Because of the availability of adequate plant foods the seedlings will develop rapidly. Inspect the nursery every day.

3. Keep the seed-beds clear of weeds. If preliminary cultivation had be done well, the growth of weeds will be less. While removing weeds see that the seedlings are not damaged.

4. Never trample the beds nor should you press the beds too hard while uprooting the weeds. If the seed-bed is hardened the seedlings may break when they are uprooted later.

5. Remove the weeds from both sides of the beds.

6. After complete weeding give another dose of manure mixture (same dose as was given earlier while the beds were formed.)

7. Dust the fertiliser-mixture in a light shower. This gives good and immediate results and does not harm the seedlings.

8. If the growth of the seedlings does not satisfy you, another dose of manure-mixture may be applied later.

9. The seedlings will be ready for transplantation when they attain a height of about 8" and have developed the 6th leaf.

Uprooting of Seedlings

1. While uprooting the seedlings see that they do not break or get damaged.

2. Pick out the seedlings tenderly. See that the root system is in no way injured.

3. You may loosen the soil with a hand-fork before picking out the seedlings.

4. Uproot the young plants one at a time. Hold them between two fingers and pull up vertically upwards.

5. Wash the seedlings in water gently and without jerks. Jerking will weaken the young plants.

6. Tie them in convenient bundles by straw or by their own leaves as is normally done in our country.

Preparation of the Field for Planting

1. The Japanese farmer always ploughs his fields just after the harvest.

2. It is preferable to arise a green manure crop and plough it in situ when it is in bloom. Green manure crops suitable to our regions and soils, such as sunnhemp, kolinji, daincha, etc. can be raised.

3. After a few ploughings apply 15 to 20 cartloads of yard-manure or compost.

4. See that the field receives as many ploughings as possible (8 to 10 at least.) Puddle up the soil well by letting in water during the ploughings.

5. During puddlings apply 200 lbs. of the manure mixture containing equal quantities of ammonium sulphate and superphosphate.

6. See that the bunds are repaired well. The bushy outgrowths over them must be removed and the holes of rats and crabs must be covered up so that the percolation of water from one field to another is minimised.

Transplantation

1. The Japanese farmer always plants the seedlings in rows with adequate spacing.

2. Never plant in a bunch as is normally done in our country.

3. Don't plant more than 2 to 3 seedlings in each point.

4. If the field had been manured well and the seedlings raised in the prescribed manner, it will be enough if you adopt single-planting, that is, planting the seedlings singly.

5. If you prefer, you may use a rope having markings for guiding you in planting the seedlings in straight rows.

6. Always plant the seedlings vertically. If planted in a slanting manner, the seedlings will take one week to take root and grow straight. Therefore if vertical planting is adopted so much time and energy are conserved.

7. Leave at least 10 inches interspace between the rows and between any two seedlings in the same row. Spacing may be increased to one foot and even more if the field had been manured well and you are sure of good development and maximum tillering.

8. Sufficient spacing is indispensable for maximum development. The notion that the more the seedlings planted, the more will be the yield, is wrong.

9. During planting hold the seedlings by their sides and push a finger into the soil ahead of them.

After-care of the Crop

1. Weeding is considered a very necessary practice in Japan. The Japanese farmer never permits unwanted plants to grow in his fields. He carries out the first weeding a fortnight after planting and subsequent weedings at an interval of 10 to 15 days.

2. During the weeding operations the soil around the growing plant is systematically loosened. Such loosening of the earth is considered to be a very important operation by the Japanese farmer. It induces the roots to grow better as aeration is improved. It also increases the tilling capacity of the plants.

3. During such loosening the soil around the plants is well stirred. The Japanese farmer loosens the soil either by hand and by using a small interculturing implement or tool. He does this work almost every 15 to 20 days.

4. Such interculturing operations must be stopped as soon as the plants reach the flag-leaf stage; if continued afterwards it will depress the yield.

These operations may sound laborious but they not only help to keep the fields clean but also increase the yield substantially.

6. One month after planting 200 lbs. of manure-mixture must be top-dressed over the standing crop.

7. You may use the usual mixture, as was used earlier or a complete paddy mixture containing all the three important plant foods, namely, nitrogen, phosphate and potash.

8. It will be preferable if the fertiliser mixture is applied at the time when the two-prong operation of weeding and loosening of earth is being carried out, in which case the fertiliser can be actually worked into the root-zone around the plants.

9. The Japanese farmer keeps on applying fertilisers in several doses at intervals of 15 days during the growing season of the crop. He combines the two main operations of manuring and interculture so harmoniously and effectively, that the crop inevitably responds well and gives out a bumper yield ultimately.

Harvest

1. Under the Japanese system of rice-culture a heavy yield is guaranteed.

2. The Japanese farmer minimises damage by lodging of the crop by tying strings in parallel lines, two feet from the ground and at intervals of 10 feet. The lodged crop rests on these strings and thus the ear-heads do not touch the water and earth and consequently escape damage.

3. When the crop is ready for harvest it is cut close to the ground with sickles as is done in our country.

4. Threshing is carried out by a hand-operated threshing machine, which is simple but very efficient. Some farmers use power-operated machines. Machines that can perform all the three operations of threshing, winnowing and hulling simultaneously are also in use.

Most important Characteristics of this Method

1. The field is ploughed immediately after the harvest.

2. Rigorous selection of seed.

3. Disinfection of the seed.

4. Utilization of a very small quantity of seed per acre.

5. Raising seedlings on raised beds.

6. Generous application of manures and fertilisers to both the field and the nursery.

7. Planting in straight rows.

8. Adequate spacing between plants.

9. Avoidance of the wasteful bunch planting.

10. Periodic and systematic weeding and intercultural operations such as the loosening of earth around plants.

11. Topdressing the crop with generous quantities of fertilisers.

Special Tools and Implements used in Japan

1. *Hand-plough*— A very useful implement intended chiefly for small holdings. In Japan nearly 60% of the farmers are using this implement.

2. *Hand-hoe*—This is meant for interculture. With its help the earth between the rows is turned and loosened. Weeds are uprooted and buried in the mud.

3. *Hand-paw*— Intended for stirring the soil around the plants. This is particularly useful where the land has been hardened.

4. *Threshing-Machine*—

This can be easily operated by the foot. This machine being portable can be taken to the field and worked on the spot. By doing so the loss of grain by shedding during the transport of harvested produce from the field to the threshing floor can be avoided. Since the machine is fitted with ball-bearings it can be worked for eight hours and more without causing fatigue.

5. *Winnowing-Machine*—
This removes chaff and dust from the grain. It can be operated at any time and anywhere. We need not be dependant on wind currents.

GROWTH OF AGRICULTURAL SCIENCE

T. S. R

CHAPTER IV.

Plant Versus Animal

ONE important point that had been brought to prominence in the previous chapter of this series of articles is the distinction between plant nutrition and animal nutrition. This may seem a simple point but all the confusion and clash of ideas arise from not fully grasping this point.

The plant lives on very simple substances such as water, carbon-di-oxide, salts, etc. building them up into highly complex "organic — matter" containing energy derived from the sun. Let us for example take the case of starch formation. The plant makes use of simple "inorganic" materials like carbon, oxygen and hydrogen derived from the carbon-di-oxide of the air and water and with the help of solar energy synthesise them into the carbohydrate, starch; and it does this in a fraction of a second. This is something wonderful and quite beyond the skill and power of any chemist, for he cannot hope to bring about this synthesis so easily and in such an inexpensive manner. The plant not only manufactures starch and other carbohydrates but also still more complicated substances like various amino-acids, proteins, alkaloids, etc. and for doing this it makes use of elements derived from simple salts. Protoplasm, the physical basis of life, is also synthesised by the plant—all these from very simple materials.

Animals, including human beings, on the other hand live on these "organic" materials manufactured by the plants. They get all their energy by breaking down these complex materials. So it may be said, plants build up while animals break down. Liebig was the first great scientist who brought to light this distinction in the way of nutrition. He said that plants could be raised purely on inorganic substances; and this truth was to be actually demonstrated much later by the most modern method of raising plants that now goes by the name of hydroponics.

A Slip

Though Liebig was the first to elucidate the distinction between plant and animal nutrition and to demonstrate the important role played by very simple salts in increasing crop growth, he made one slip. He thought that plants were capable of absorbing nitrogen from the air direct andthis was wrong. At that time it was known that the air contained nearly 80% of nitrogen. Liebig thought it was possible for the crops to obtain their nitrogen requirements as ammonia from

the atmosphere itself. But this was to be disproved later by other scientists.

If only plants can get their nitrogen from the air, then there won't be any necessity for nitrogenous manures and fertilisers at all and we need not be alarmed by the nitrogen deficiency of our soils. There will be unrestricted crop growth, for nitrogen is the element that makes the plant grow. But no, we are not to be let off so easily! Nature has literally surrouded the plant with unlimited quantities of pure nitrogen and at the same time has rendered the plant incapable of taking in nitrogen except through simple salts from the soil.

The Nitrogen Mystery.

Liebig's idea that the source of nitrogen of plants was the ammonia of the atmosphere was soon challenged. John Lawes of Rothamsted who happened to listen to Liebig's London lectures was greatly puzzled and he wanted to put Liebig's assumption to the test. He went back to his estate, which has since become the world's most famous agricultural experiment station, and started work. With great patience he carefully caught the rain that fell on a definite area and determined its combined nitrogen. He found this was equal to only 3 to 5 pounds per acre per annum. But the analysis of plants had revealed that the harvested produce from an acre often contained 10 to 20 times these quantities. It therefore seemed logical to think that all the nitrogen, that a crop obtained, could not possibly come from the air alone. There was some other source, a much bigger source. This mystery could not be solved at once. It took years for Lawes and his collaborator Gilbert to prove to the hilt that air was not the source from which the plant obtained its nitrogen. But this was not enough. They had to find out the alternative source and this they did at last. Lawes applied mineral salts containing nitrogen to his wheat plots. When he did this, the increased growth and yield were such as to make it clear to all concerned that the plants' nitrogen was derived from the soil and not from the air. This experiment was repeated many times and every time there was success. So Lawes concluded that the plant took in nitrogen chiefly through simple soluble salts like the nitrates.

The fact that the nitrogen of organic matter was released in the form of ammonia and that it was converted into nitrate was already known. It was not until 1878, however, when Theodore Schloesing and Alfred Muntz of France published the results of their work on the purification of sewage, that it came to be recognised that these changes inside the soil were actually brought about by biological agencies, namely, the bacteria. This fact was later confirmed by the work of Robert Warrington of Rotham-

A Farewell

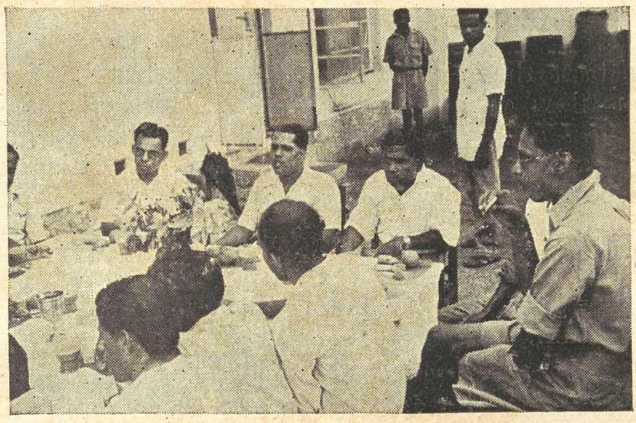


Photo taken at the farewell party given to Mr. N. N. Simha, prior to his departure from FACT.
Facing us (left to right)—Mr. V. N. Kasthurirangan, General Supdt., Mr. Simha, Mr. Narayana Iyer and Mr. Gopinath.

Mr. N. N. Simha, Head of Utilities Division, who left us to take up an appointment in Bangalore.

Republic Day Celebrations—in FACT

Sri P. Rajendran, dressed as a Muslim girl won first prize in the fancy dress competition held during the Republic Day Celebrations in FACT Colony Kindergarten School.

Baby Usha who gave a delightful dance performance during the Republic Day Celebrations.

Measurement of the flow of fluids

Bernoullis Theorem

This important theorem in Hydraulics states that in a pipe carrying a continuous flow of any liquid, *the total energy possessed by the liquid is the same at all sections of the pipe.* What is gained in *velocity head* in any section is lost as *pressure head.* It is expressed in equation form as below:—

$$H_1 + \frac{P_1}{w} + \frac{v_1^2}{2g} = H_2 + \frac{P_2}{w} + \frac{v_2^2}{g}$$

where H_1 and H_2 are heads of the two positions over an arbitrary datum,

P_1 and P_2 are pressures at the two points

and v_1 and v_2 are the velocities at the two points

This principle finds wide application in Hydraulic machinery and is also used in the design of meters for the measurement of flow of fluids.

Venturi Meter

The venturi meter is a practical application of Bernoullis Theorem and makes use of the loss in pressure head that exists in a fluid passing at greater velocity through a constricted section of pipe. The difference of pressure can be read with a manometer and can be coupled to any recording device.

The formula for liquid flow in a venturi meter is as below:—

$$q = 0.65\,\pi\sqrt{2gh} \times \frac{k_v\, r^2 D^2}{\sqrt{1 - r^4}} \times \sqrt{\frac{d_m}{df} - 1}$$

where q = flow in gallons per min.,

k_v = venturi pipe discharge co-efficient (usually between O. 9 and 1),

$r = \frac{\text{venturi throat diameter in inches}}{\text{pipe diameter in inches,}}$

D = Diameter of pipe in inches,

d_m = Specific gravity of manometer fluid,

dj = Specific gravity of flowing fluid,

h = Manometer differential *in feet.*

Orifice Meter

The introduction of a sharp edged orifice in a pipe gives a condition similar to the venturi tube and is likewise used for flow measurement. The pressure differential is determined between the points. The formula and symbols are the same as for the venturi meter. The value of k is different and has to be determined by experiment for any particular design, or taken from standard tables.

With minor variations for compressibility, the above formula is the basis for discharge measurements when the meter is used for measurement of flow of gases.

4

Technical Data

(Compiled by **Paul Pothen**, B. A., B. E.,
Deputy General Superintendent, FACT Ltd.)

Variable Area Meters

These instruments consist of calibrated taper tubes set vertically, with a shaped float in them. Liquid enters at the bottom and leaves at the top. The float is acted on by its own weight, buoyancy, the static pressure of the liquid at the top, and the stagnation pressure at the bottom. The float reaches a point of equilibrium with respect to the annular area between it and the tube, depending on the quantity of liquid flowing through. The meter has to be calibrated by experiment. Proprietory equipment with graduated tubes, calibrated and marked for gas and liquid flow are marketed.

Velocity Meters

The velocity of a fluid flowing in a pipe, varies along the cross section of the pipe, being maximum at the centre and zero at the static layers close to the pipe wall. Still the measurement of velocity at the centre of a pipe provides a mode of metering flow which gives good results when subjected to empiric correction. The Pitot tube and the turbine type instrument are examples of velocity meters.

Pitot Tube

The Pitot tube is a small orifice presented against the flow in a pipe at its centre. The formation of a stagnant cone at the orifice converts velocity head into pressure head and can be measured with a manometer. Correction factors have to be applied by calibration to compensate for nonuniformity of velocity over the section.

The formula for flow measured with a Pitot tube is as below:—

$$q = 0.65\, k_p\, \pi D^2 \sqrt{2gh} \sqrt{\frac{d_m - 1}{dj}}$$

where q = flow in gallons per min.,

k_p = Pitot co-efficient for velocity and flow,

$\simeq$ .83 for a well designed tube,

D = diameter of pipe in inches,

d_m = Specific gravity of manometer fluid,

dj = Specific gravity of flowing fluid,

h = Manometer height *in feet.*

Turbine Meter

This meter consists of a turbine type rotor mounted in the steam, so that it turns at a speed corresponding to the volume of fluid flowing past it. A gear arrangement transfers the rotary movement to a shaft outside, where an integrating mechanism indicates quantity.

Displacement Meters

These operate on the principle similar to the positive displacement pumps and may be actuated by pistons, vanes or rotating tubes. A definite quantity is displaced by every movement, either linear or rotary, such movements being integrated by suitable mechanisms to read the quantity, directly on a dial.

Paddy Cultivation in Kashmir

A Kashmiri farmer levels up his paddy-land, after paddling it.

A well grown paddy crop in Kashmir.

Transplantation of paddy in Kashmir

Photos sent by Shri Jia Lal Raina.

(See pages 3—5)

sted who showed that the formation of nitrates could be arrested by the use of chloroform and that it could be started again my merely adding an extract from a fertile soil. Subsequently S. N. Winogradsky of Russia succeeded in isolating the nitrifying organisms and growing them in pure cultures. Thus the nitrogen mystery was at last solved.

The Legumes

Still, the behaviour of the species of plants belonging to the family of Leguminosae was causing some confusion. It had been noticed that these legumes always contained more nitrogen than was supplied to them. Where and how did they obtain this extra nitrogen? This was a problem that remained yet to be solved. There was a notion that these legumes had the unique capacity to fix atmospheric nitrogen. This idea was correct and there could not be any other alternative way of explaining this peculiar phenomenon. But Lawes and Gilbert tried to demonstrate this, but they could not succeed. Their experiment consisted in raising legumes in soil that had been ignited to drive off all its organic matter and had then been placed in air freed from ammonia by passing it through sulphuric acid. Under these rigorous conditions the legumes were found incapable of fixing any atmospheric nitrogen. In fact they refused to grow at all, unless some form of combined nitrogen was supplied to them.

Many other chemists like J. B. Boussingault of France and W. D. Atwater of Connecticut, also tried but they also failed to prove that legumes could utilise the free nitrogen of the atmosphere. This particular problem of the legumes began to puzzle all the contemporary scientists. They knew they were on the right track, but they could not prove it by actual experiment. It fell to the lot of Hermann Hellriegel to unravel this mystery. In the year 1886 he read his paper on "What nitrogen sources do plants have at their command?" before an assembly of German Agricultural Research Chemists in Berlin. In that paper he had described the results of some of his experiments, which showed that the nitrogen fixation of the legumes was related in some manner to the bacteria that reside in the nodules found on the roots of these particular plants. Hellriegel succeeded in his attempts because he had added an extract of a fertile soil to the nitrogen-free soil used for raising the legumes. Lawes and others had failed before him because they had actually killed the nitrogen fixing bacteria when they ignited the soil for driving out all its nitrogen-content. When Hellriegel inoculated the extract of a fertile soil he had actually injected the nitrogen fixing bacteria which did their work by getting into the plant-roots and fixing atmospheric nitrogen. The legumes and these bacteria help each other. The bacteria fix free nitrogen from the air and utilise the same for their development; but later this combined nitrogen becomes available to the plant. The plant helps the bacteria by supplying them with carbo-hydrates and other non-nitrogenous nutrients for their growth. This kind of mutual help is technically called *symbiosis*.

(To be continued)

Our Special Seed gives a Good Performance

IN the previous issues of this Journal we have published reports regarding the superior quality and high performance of our special paddy seed. The readers are quite aware of our sustained efforts in popularising this seed both in and outside our State.

We had sent a small quantity of this seed to a few of the gentlemen-farmers of Tiruchirapally district and we have received detailed reports from some of them regarding the high yield they had obtained. These reports prove that this seed will be highly suitable for the paddy lands situated along the banks of the river Cauveri.

The following is a letter received from Mr. R. S. Srinivasan of Rajendram, Kulittalai Taluk of Tiruchirapally district. He is a mirasdar owning extensive properties. He and his son Mr R. S. Thothadri (see photo) are deeply interested in agriculture.

Sri R. S. THOTHADRI OF RAJENDRUM

They had invested more than Rs. 70,000 in converting waste lands into a fine farm and in providing the same with adequate irrigational facilities. This large investment by itself proves beyond doubt their deep faith in the success of modern intensive farming techniques.

THE LETTER

To

The Fertilisers And Chemicals, Travancore Ltd.,
UDYOGMANDAL P. O., ALWAYE.

Dear Sirs,

Myself and my son Sri R. S. Thothadri thank you for your interest in our cultivation of the Siamese paddy seed.

As per your instructions, the details of the method of cultivation, manuring and the yield, etc. are being sent along with the photos of the crop and that of my son who was mainly responsible for the cultivation.

We again thank you for your great help and look forward to such ones in the future.

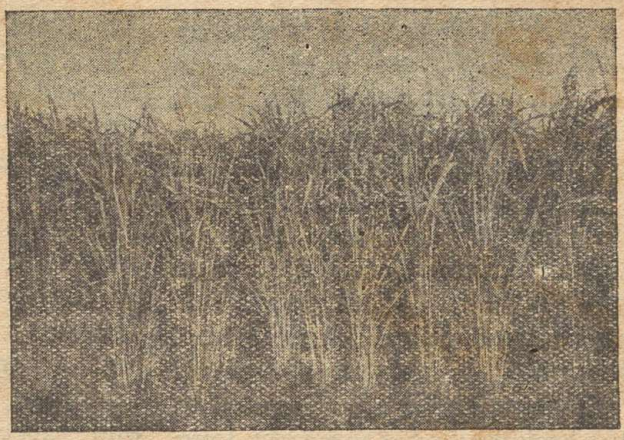
RAJENDRAM,
9th March, 1953

Yours sincerely,
(Sd) R. S. Srinivasan

The Report received from Rajendram

"A nursery of 15 cents was ploughed 6 times. During the last ploughing good farm yard manure and groundnut cake were incorporated into the soil. Three

and a half Madras measures of your special paddy seed were sown on 20th Aug., '52. The nursery was watered regularly. The seedlings were allowed to grow in the nursery for two full months. They were then transplanted in two fields, one field of 20 cents and the other of 55 cents. We had to weed out weak and useless plants, for the transplantation was done on 75 cents only.



Paddy Crop raised by
Sri. R. S. THOTTADRI OF RAJENDRUM.

"These fields (75 cents) were ploughed ten times with heavy country ploughs. Before the third ploughing, five cart-loads of nicely cut green leaves and stalks were trampled into the puddled-up soil. After an interval of 10 days, during the fifth ploughing a good lot of fresh cattle dung was ploughed into. Two cartloads of compost manure and one bag (2 cwts.) of superphosphate were ploughed in during the last ploughing.

"The good and sturdy plants were transplanted *singly, one foot apart.* On the twenty-first day after transplantation weeds were completely removed and on the next day a top-dressing of ammonium sulphate (one-fourth bag) was broadcast. Eight days later one bag of well powdered expeller groundnut cake was also broadcast. During the whole of the period from transplantation, till a week before the date of harvest, the lands were copiously watered. Just before the earheads came out from the sheath we used a light sprinkling of ammonium sulphate to ensure uniformity in the shooting of the earheads.

"The plants grew to a height of *six feet and had 32 to 40 side-shoots* (tillers.) We harvested the fields on 7th February, '53. The 20 cents field yielded 1890 lbs. which come to 9450 lbs. per acre. The 55 cents field yielded 4435 lbs. which correspond to 8154.5 lbs. per acre. At the time of flowering in 55 cents-field there was no water supply for one week because of the low level of water in Mettur Dam and some of the earheads in the side shoots did not come out of the sheaths, till the day of the harvest.

"So when calculated, the total area of 75 cents yielded 6375 lbs. which work out to 8500 lbs. per acre."

"We thank the F. A. C. T. Ltd. for their hearty co-operation

in sending this paddy seed and hope that *every mirasdar in our parts will benefit likewise.*"

The report speaks for itself. To produce an yield of 8500 lbs. on an acre is no easy job. It calls for patient and careful preparation of the field, generous manuring, unstinted irrigation and on the top of all these, constant supervision. Agriculture, though it is the mother of all industries, had been relegated to the back-ground for a very long time. Acute food shortage and periodic famines had brought the food problem to the forefront and now the greatest emphasis is being laid on increasing agricultural production. But, inspite of the extreme importance of this national task, it is not common to see cultured young men of our society working on the land, and it is indeed highly gratifying to find Sri R. S. Thothadri taking such a great interest in farming. He has been mostly responsible for the success of this varietal trial. We offer our congratulations to him and his father for the way in which they had carried out the trial and their unselfish efforts in popularising this seed in their area.

We are very glad to note that the details of the seed trial conducted at Rajendram had been published in full in the "Agriculturist", a Tamil Weekly issued from Tiruchirapally. The following is an extract of the report published in that journal.

"Our friend Sri R. S. Thothadri of Rejendram has spent more than Rs. 70,000 in transforming waste lands into a fine farm and he has been carrying on cultivation in the most modern lines and with a single-minded devotion. He happened to go through a copy of the journal FACT, published by the Fertilisers And Chemicals, Travancore Ltd., Alwaye. After going through a report in that journal regarding the special seed that was being distributed by the Company, he got interested in it and succeeded in procuring a small quantity (3 Madras measures) of the seed. He raised seedlings in a 15 cent-nursery and transplanted them in a 75 cent-field. He was surprised by the rapidity with which the crop developed. He wanted to give maximum publicity so that this remarkable seed could be popularised throughout Tamil-Nad and so he invited us to his farm to see the crop. We were greatly impressed!

"It is really strange that we have not heard anything about this seed till now. We feel that the local government must see that this seed is popularised and distributed to all the farmers in this area and the whole of Tamil-Nad."

After describing in detail the cultural operations carried out by the pioneering farmer, Sri R. S. Thothadri, the paper concludes, "The crop was harvested in January. We publish below the photo of the fully developed crop. The crop was literally six feet in height. There were 32 tillers in most of the stumps.

The crop yielded 8500 lbs. per acre. Sri Thothadri has collected and reserved 7 bags of this grain for seed purposes. We trust that the authorities of the Government Farm at Aduthurai will without delay try out this seed in their farms and distribute it to the farmers in Trichy and Tanjore districts, and thus help to increase food production. We give below the address of our friend who has brought this seed to our area and has directly helped to give it maximum publicity.

Sri R. S. Thothadri,
Rajendram P. O.,
Marudur (S. R)"

Another Report

We have received another report from Sri T. S. Rangachari, Agent and Correspondent, Indian Express and Dhinamani and Mirasdar, Tiruchirapally, and we are glad to publish the same hereunder.

"Messrs. Fertilisers And Chemicals, Travancore Ltd., Alwaye were kind enough to supply the seeds after I got the permit from the Madras and Travancore-Cochin Governments. This seed was tried out in my Agricultural Farm, Srirangam Gardens, located in Poruvai Village near Virolimalai, Kolathur Taluk. The above farm has an area of 26 acres. Out of this 15 acres were recently brought under cultivation. Paddy, cholam and other food-grains are grown. In the other 11 acres dry crops are being raised. There are two wells, one fitted with electrical pump set.

"The seed was sown on 6th August, 1952. The seed-bed of 6 cents received 8 ploughings and 5 cartloads of compost, 2 cartloads of ash, half cartload of green leaves, 50 lbs. of ground nut oil-cake and 10 lbs. of ammonium sulphate. A week before planting some disease attacked the crop and so the seedlings which could have served one acre were used for 60 cents only and the damaged seedlings were thrown away. There were no rains during the period to help the young plants grow better.

"The field in which the transplantation was carried out had received 8 ploughings, 3 cartloads of green leaves, 10 cartloads of compost, 120 lbs. of ground-nut cake. All these manures were applied prior to planting of paddy. The seedlings were planted singly with 9" spacing. Thirty days after planting 120 lbs. of ground-nut cake were applied. After 50 days 80 lbs. of ammonium sulphate were top-dressed. After 70 days some disease was noticed on the crop and an insecticide was employed to suppress it.

"During this period there was hardly any rain worth mentioning. The crop came up very well. On 30th November, '52 there was heavy rain and cyclone. The top portions of the plants were torn and they began to wither. I had to use a medicine for this disease after consulting Agricultural Dept.

"Each plant tillered profusely and the average was 15 to 25 per plant. Mr. K. H. Subramania Iyer, District Agricultural Officer, Tiruchi was pleased to visit the farm on 26th Dec. 1952. After inspecting the crop he opined that the variety was very fine and should have produced an yield of 60 bags of 50 Madras measures each, if the top portions of growth were cut after about 2 months after planting. There were 10 to 15 earheads in each shoot, the rest having failed and each earhead had 250 to 300 grains. After the heavy downpour at the time of the cyclone there were no rains at all till harvest. Weeding was done thrice. Water was supplied to the field from the well by the electrical pumpset regularly and profusely.

(See photo printed elsewhere.)

"Mr. S. Kolandaisamy, Agricultural Demonstrator inspected the fields on 21st December, 1952 and suggested some medicine to save the crop from disease. Messrs. A. K. D. Edward and D. Srinivasagopalan, Plant Protection officers of the Agricultural Dept. visited the farm on 10th January, 1953. Several agricultural enthusiasts from Tiruchi and Srirangam including Mrs. and Mr. K. Vasudevan, Chairman, Srirangam visited the farm and they were pleased to see the growth of the Siamese paddy which had grown to a height of 5½'. The crop was erect and the earheads presented a beautiful appearance.

"The harvest was carried out on 12th February, 1953 in the presence of Mr. S. Kolandaiswamy, Agricultural Demonstrator, the village Karnam and a large number of ryots in the village. The yield was 3620 lbs. per acre. The average yield in the adjoining fields was only about 2000 lbs. at the most.

"The farm-hands were not experienced agriculturists. The diseases which attacked the crop should have been brought under control promptly. Want of adequate rains during the growth of the crop also accounted for the lesser yield. With more care and favourable seasonal conditions *I am confident of getting more yield and I am going to try this paddy next year also.* The total weight of the straw yield was two times more than what we get from local varieties of paddy."

From this report we realise that but for the disease and unfavourable seasonal conditions the seed would have given a much higher yield. We are very glad to note that Sri Rangachari has drawn the attention of the farmers of his area to this seed. We wish him all success in his future trials!

A Doubt Cleared

Since the Siamese paddy seed is of long duration, (over 180 days), it is considered by many agriculturists to be unsuitable for double and trible crop-lands. It is thought that instead of raising this crop, one can as well raise two crops within the same period.

But we have been stressing the fact that this crop must always be transplanted and not to be sown in situ. Of course this can be done only in those lands where there are ample water facilities. By adopting the method of transplantation the crop stands not less than 45 days in the nursery. In that case the transplanted crop will have a duration of only 4½ months in the fields. By thus raising the seedlings at the proper time in a fraction of the holding, the Siamese paddy can be successfully raised even on triple crop-lands. We may add, in this connection, that we have actually demonstrated this in a portion of our farms, located within our factory compound.

We first raised the Monsoon (Kanni) crop and we harvested it on 13th September, '52. Then we planted the Siamese paddy seedlings on these fields on 2nd October, 1952 and this transplanted crop had a duration of just 4½ months and was harvested on 17th February, 1953. The third crop, summer paddy, was sown on the very same fields on 7th March and this was harvested on 12th June, 1953.

Thus we have raised three crops in one year using the Siamese paddy as the second crop. Hence, the doubt that this new seed cannot be raised on trible crop—lands because of its long duration, stands cleared. All those farmers who have tried out this seed uniformly admit that it is by nature a very heavy yielder. The one sigle objection against it was its long duration; but this need not stand in our way provided we plan out before hand for raising the nursery and for doing the preliminary cultivation work for each crop as soon as the previous crop has been harvested. For doing all these one should have unfailing water supply. Given these facilities we can easily raise three paddy crops as described above and as a result we can make the land produce the maximum quantity of paddy each year.

Trial of China Paddy

We are very glad to announce that we have received samples of four strains of China paddy and these are now being tried out in our farms. These varieties had been sent to us by Shri Jia Lal Raina, Deputy Director of Agricultural Researches, Jammu and Kashmir Government. He was kind enough to send us these seeds at our request and in return

we have sent him four local varieties of paddy including the Siamese paddy, to be tried in Kashmir.

We have just completed the field-trial of the China paddy. This paddy is of short duration maturing in 85 days. Since we got only a very small quantity of seed we tried them in small plots. We have now multiplied the seed and we intend making a second trial on a large scale during this season. We will be publishing a report on this paddy at the end of the present trials. The preliminary multiplication trial shows that one or two of the four strains will be highly suitable to our region. We will get this confirmed by further trials and then we will be glad to distribute this new seed to interested farmers.

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1. Every scene, even the commonest, is wonderful, if only one can detach oneself casting off all memory of use and custom and behold it, as it were, for the first time simply, artlessly, ignorantly, like a baby, who lives each moment by itself and tarnishes the present by no remembrance of the past.

2. Stating the thing broadly, the human indiordual lives usually far within his limits; he possesses powers of various sorts which he habitually fails to use.

——— William James.

3. Always do right this will gratify some people and astonish the rest.

——— Mark Twain.

YOUR QUERIES ANSWERED

(In this Section answers are given by our Agricultural Chemist to questions received from the public on Soil Agriculture and use of Fertilisers.)

Question No. 103

I hear that it is a good practice to mix superphosphate with farm yard manure. May I know how this procedure improves the quality of the manure?

Answer

Farm yard manure is generally poor in phosphates because the grain portion of the crops which is rich in phosphates is diverted for human food and only the stalks, poor in phosphates, are fed to the cattle. In our country there is general neglect of human excreta and consequently the major portion of phosphates taken out of the soil by crops do not return to the land. This severe drain has been going on for ages and the phosphate level of our lands has been steadily coming down. Systematic soil analysis conducted so far has shown serious deficiency of phosphates in our farm lands. Yet, this alarming fact has not drawn much attention so far mainly due to the much greater poverty of nitrogen. For most crops nitrogen is the more dominant plant food than phosphate and consequently its deficiency is more serious. But we have to remember that unless the phosphate deficiency also is corrected, any amount of nitrogen feeding will not help to bring in a bumper yield since the phosphate will act as the limiting factor. The wisdom of using a mixture of nitrogenous and phosphatic fertilisers for paddy (as is adopted in the Japanese method of paddy cultivation) can be well appreciated in this context.

This phosphate deficiency in the farm yard manure can be corrected by adding a phosphatic fertiliser like superphosphate to the manure. 10 tons of yard manure or compost will supply about 100 to 150 lbs. of nitrogen but only 40 to 50 lbs. of phosphate. If legume fodders are raised in the farm and fed to cattle there

may be a slight increase of phosphate in the manure; yet it will not be enough and as such the crop will suffer from an unbalanced feeding. To balance this deficiency it will be better to add a supplement of 50 to 100 lbs. of P_2O_5 (equivalent to 312 to 625 lbs. of superphosphate) which will work out to a rate of 5 to 10 lbs. of P_2O per ton of manure. Since about 100 c. ft. of freshly packed compost yield after 4 to 6 months of decomposition about a ton of ripe manure, the above dose will correspond to about 50 to 60 lbs. of superphosphate per 100 c. ft. of freshly packed manure. This fertiliser may be added in portions by dusting it over the successive layers during the preparation of the compost. If the manure pit has walls impervious to water then it will be preferable to spread the fertiliser in a thin layer on the flooring and also on the drains. This practice helps to conserve the urine by preventing its loss as ammonia and consequently adds both nitrogen and extra—phosphate to the manure.

This method of adding superphosphate to the bulky manures like yard manure and compost is in vogue in countries like the U. S. A. and it deserves to be taken up by our farmers.

Question No. 104

In the Japanese method of rice culture it is prescribed that the paddy seed should be steeped in salt water. Why?

Answer

Other conditions being equal, a better seed will give a better yield. This is always true. Hence maximum care must be bestowed on the selection of seed. Even after selecting a particular variety of seed and after cleaning and drying it well, there may be unwanted, partially filled grains in it. These have to be discarded. The general practice of our farmers is to steep the seed in water and then discard the chaff that float on the top. But this step is not enough and the Japanese farmer goes one step forward. He uses salt water for this purpose. Because of its higher density only the well filled grains will sink down while the partially filled grains rise to the surface and they can be easily removed. If we had used fresh water these latter grains would have sunk down and we would have used them for sowing. They may even germinate but the seedlings will be of poor quality, not strong enough to complete with healthier ones.

Thus, we see that the use of salt water for steeping the seed is aimed at a more rigorous selection of the seed and this method of selection can be adopted by our farmers also with great advantage.

Question No. 105.

I hear that when ammonium sulphate is applied, it takes out everything from the soil and leaves it in a poor state. Is this true?

Answer

It has to be said that this criticism is put forward by many people, some of whom sincerely believe in it.

In the first place, please remember that ammonium sulphate does not take anything out of a soil. On the other hand it adds itself to the soil. It is a nitrogenous fertiliser containing 20% nitrogen which it releases for the crop. With increased nitrogen intake the crop shows a wonderful response, develops to its full height and gives an increased yield.

Then why is it said that this fertiliser leaves the soil in a poor state? We have to remember that most of our farmers are ignorant of the action of the different fertiliser–ingredients and most often they do not adopt a balanced manuring scheme. They merely buy ammonium sulphate and apply it to the soil. This results in the quicker growth of the crop, which naturally takes a bigger quota of other ingredients also such as phosphate, potash, etc. from the soil. This is only to be expected. If our aim is to have a bigger yield then we should be prepared to pay its price. One connot have the cake and eat it too!

From this it follows that when only ammonium sulphate is applied, the crop not only takes in the nitrogen it supplies, but also more of the available phosphate and potash from the soil. This naturally impoverishes the soil temporarily. But do we lose these plant foods? Of course not. We get them in the form of the grain and straw, which are exactly what we want. Hence the loss sustained by the soil is equal to the gain we get. The soil-losses have therefore to be made good by additions of more plant foods in the form of manures and fertilisers, so that the productivity is kept up.

None can deny the fact that if the yield is to be increased the crop has to be induced to take the maximum of plant-foods it can take from the soil. Ammonium sulphate, because of its rich nitrogen content, has exactly that power and it is rather strange to hear a complaint against it. At present the output of most of our farm-lands is low. Only those who are satisfied with low output and those who do not take the trouble of feeding the soil well with manures and fertilisers regularly can permit themselves to be frightened by a heavy feeding of the crops and the resultant soil exhaustion. Such soil exhaustion is inevitable and is only a temporarily phase as it can be made good promptly by the application of more plant foods.

Question No. 106

What is meant by the term 'soil-mulch' which I came across, recently in a book on agriculture?

Answer

The term 'soil-mulch' stands for any operation or contrivance

intended to conserve the moisture in the soil. As you know, soil-moisture is of utmost importance to crop growth. Without adequate moisture in the soil the plants will dry up and even manures and fertilisers can play their role effectively only when there is adequate moisture in the soil. Consequently the farmer has to see that soil moisture is well conserved and not easily lost.

You might have noticed that water has a tendency to pack up a loose soil. Whether it is rain water or irrigation water, it closes up a loose soil and makes it more compact. If the soil is left in that condition, the moisture will easily rise up by the force of capillarity and once it reaches the surface it evaporates because of sun's heat. To prevent this rise of water we have to break up the top soil and this is called mulching. This can be effected by a hand tool, like the hand-hoe or an implement like the junior-hoe drawn by cattle. When the top soil is broken up and kept in a loose condition the water cannot easily rise up to the surface and consequently the subsoil moisture is not lost. Thus the loosened top soil acts as a cover and because of its airfilled inter spaces offers resistance to the downward passage of sun's heat also. Sometimes instead of breaking up the top soil other contrivances are used for conserving the moisture. For example, straw or dried leaves can be spread over the soil and these also act as an effective cover. In other countries even paper is used for mulching the nurseries and the germinating seedlings come up through this cover after piercing it by their pointed shoots.

Such mulching operations are of supreme importance in dry farming areas where the rainfall is low and where there are no adequate irrigational facilities. In such areas the soil-moisture derived from the few rains has to be jealously guarded as it would ultimately decide the fate of the crop.

Wail not for the precious chances passed away,
Weep not for the golden ages on the wane!
Each night, I burn the records of the day;
At sunrise, every soul is born again.

They do me wrong who say I come no more
When once I knock and fail to find you In;
For every day I stand outside your door
And bid you wake, and rise to fight and win.

—— Walter Malone.

Ourselves

FACT Technical Society

It gives us great pleasure to publish below the activities of the above society during the first quarter of the current year.

Thanks to the drive of the office bearers of 1953, the members of the society had the proud privilege of listening to three lectures on topics of varied interest, from men of erudition and experience, each one an authority in his field.

The first lecture was on "Rectifiers" delivered by Mr. Lingerie of the Brown Boveri Ltd., the leading electrical and allied equipment manufacturers of Switzerland. This eminent electrical engineer at the outset compared the different types of rectifiers like the water cooled and air cooled ones and he explained the advantages of the one over the other. Rectification of the electric current is done wherever AC supply has to be converted to direct current supply. The fundamental principle on which a rectifier is excited were explained with the help of diagrams The speaker dwelt on the uses of rectifiers in connection with the change of phase, alteration of AC to DC and for high voltage transmission. The significance of mercury vapour rectifiers in these places were also discussed. He also explained the probabilities of arcing. Finally he talked about some of the largest installations of rectifiers in the world and explained how they are maintained and kept free from breakdowns in the machinery.

The second lecture was delivered by Prof. K. R. Venkataraman on 4th February 1953. The topic was "Medieval South Indian Agricultural Organizations."

Though the cream of the society is composed of qualified engineers and chemists, they listened with enthusiastic interest to a lecture of historical and agricultural significance. The speech was an exquisite exposition on the background, genesis, growth and development of the agricultural and industrial organizations of South India during medieval times. The trading and allied organizations had their own guilds and codes of conduct, laws and rules regarding the conduct of their normal business. Royalty respected these guilds and the latter were held in high esteem by the society at that period.

There were the many classes of artisans, like the blacksmith,

metal-worker, washerman, etc. who made themselves useful and indispensable by the quality and integrity of their work. The land was controlled by the agricultural community, who duly performed all the agricultural operations at the proper seasons. The society had its own militia and banks; it built its own temples and carved out tanks. It established various charitable institutions and schools.

The trade organizations established contacts far and near, even to the Grecian Archipilago and Persian Gulf in the West and Indo-China and Indonesia in the East. The merchandise from India were well received in all directions of the globe both because of their quality and excellence and also because of the high sense of integrity of the Indian traders.

The Jewish settlers joined these trading establishments, when they took refuge in India after the sack of Jerusalem. In Cochin, for instance the artisans came under the sway of Jewish noblemen.

The traders, agriculturists and the artisans put their responsibilities to society first and their own rights and privileges next. After the close of the 10th century these guilds disappeared not because of their own inherent weakness, but because of the quakes and shake up that took place in Indian society due to the corrupting influence of the Western conquests.

Closely following this lecture, on 5th Feb. 1953, the society had the honour of listening an exposition on "The Developments in Formosa" by Mr. V. S De Bousset, formerly the superintendent of our sulphate plant. Mr. De Bousset had spent four years in Formosa as a representative of the White Engineering Corporation, consultants and industrial advisors to the Government at Formosa. The lecturer touched up on the different ways by which he and his principals had been helping the Chinese Nationalists to keep their home in order and to rehabilitate their economy.

The Island produces, or has plans to produce, 4,50,000 tons of nitrogenous fertilisers. It is expected that the yield of paddy per acre would be 2000 lbs. based on the use of these fertilisers. The distribution is through farmers' co-operatives which exchange rice for fertilisers.

38% sulphur-bearing pyrites are used for the manufacture of acid and superphosphate. Arrangements are afoot to make sulphuric acid from 22% sulphur-bearing pyrites. The pyrites cinders are used to make pig-iron.

FACT SPORTS ASSOCIATION

The general body meeting of the above body met in the month of December, 1952 to elect the office-bearers for the new year. The following is the new team headed by Sri V. S. Pillai as the general secretary.

1.	General Secretary	...	Sri V. S. PILLAI.
2.	Captain for Tennis	...	„ L. R. C. POTTI.
3.	„ Indoor games	...	„ P. K. NAIR.
4.	„ Cricket	...	„ MARKOSE.
5.	„ Badminton	...	„ PANIKKAR.
6.	„ Basket Ball	...	„ C. P. PAUL.
7.	„ Volley Ball	...	„ GOPAL
8.	„ Foot-Ball	...	„ C. N. MENON.
9.	„ Gymnasium	...	„ ITTANPILLAI.
10.	„ Convent games	...	„ PARAMESWARAN PILLAI.
11.	Officer-in-charge of Library	...	„ SARMA.

This new team started work in right earnest and things began to move. Great enthusiasm was evinced by the colony residents in organising games and matches under the able guidance of the new general secretary. Sports activities got started in January itself and the following are the results of some of the official matches played.

Cricket

Matches were played against Travancore Rayons Ltd., Ernakulam Cricket Club and the Alwaye U. C. College Cricket team. We had the unique and most creditable honour of winning all these matches. Well done, indeed! Our hearty congratulations to the team!

Foot Ball

Of the matches played against Alwaye Town Team and that of Indian Rare Earths Ltd., we succumbed to Alwaye Town but overwhelmed Indian Rare Earths. It was indeed a "rare" honour.

In the inter-disvisional tournament, the Engineering Division lost to the rest of the factory. The Sulphate Division succumbed to the rest of the factory.

FACT foot ball team played with that of the Travancore-Cochin Chemicals Ltd., and won a victory after a good fight.

Badminton

The Gas Division team won the match played against the rest of the factory.

Basket Ball

Two matches were played, one against U. C. College and the other against the Y. M. C. A., Alwaye. Though we lost both these matches, we have to state, we gave a good fight. In the inter-divisional tournament, the sulphate division won the match played against the rest of the factory.

Volley Ball

We lost the two matches played against the U. C. College team and the Indian Rare Earths team.

Through the columns of this Journal the General Secretary and the committee members thank everyone who had participated in the activities of our Sports Association. They also thank all the outside teams who had enthusiastically participated in the various matches with our teams.

ജപ്പാനിലെ കൃഷി സമ്പ്രദായങ്ങൾ

C. S. VENKITASUBBAN, B. A., B. Ag., Assistant Director of Agriculture.

ഭക്ഷ്യോല്പാദനവിഷയത്തിൽ നമ്മളേക്കാൾ എത്രയോ മുന്നാണിയിൽ നില്ക്കുന്നവരാകുന്നു ജപ്പാൻ കർഷകരെന്നു സാധാരണയായി നാം കേൾക്കാറുണ്ട്. സ്വയംപര്യാപ്തതയെ ഉദ്ദേശിച്ച് കട്ടംകൃഷിയിൽ ഏർപ്പെട്ടിരിക്കുന്ന ഈ സന്ദർഭത്തിൽ ജപ്പാൻ മാതൃക നമ്മുടെ മുൻപിൽ കൊണ്ടുവരുന്നതും അവരുടെ ഉല്പാദനരീതികളും മനസ്സിലാക്കി പ്രവർത്തിക്കുന്നതും അത്യാവശ്യമാകുന്നു. നമ്മുടെ രാജ്യത്തിലെന്നപോലെതന്നെ ജപ്പാനിലെ പ്രധാന വിളവും നെല്ലാകുന്നു. കൃഷിക്കുപയുക്തമായ 150 ലക്ഷം ഏക്കർ ഭൂമിയുള്ളതിൽ 78 ലക്ഷം ഏക്കർ, അതായതു് 53 ശതമാനം, ഭൂമിയിൽ നെൽകൃഷി ചെയ്യുവരുന്നുണ്ടു്. ഏക്കർ ഒന്നുക്കു് 2,550 റാത്തൽ അരി (നെല്ലല്ല) എന്നു കണക്കനുസരിച്ചു് ആകപ്പാടെ 104 ലക്ഷം ടൺ അരി ശരാശരി ഒരു കൊല്ലത്തിൽ വിളയിച്ചുവരുന്നു. ഇതു ആശാസ്യമായ വിളവു് ആദ്യംമുതല്ലു് ഉണ്ടായിരുന്നതോ ഭൂമിയുടെ ഫലപുഷ്ടികൊണ്ടു് ഉണ്ടാവുന്നതോ അല്ല. കഴിഞ്ഞ അറുപതു സംവത്സരങ്ങൾക്കിടയിൽ നെൽവിളവിനെ 113 ശതമാനത്തോളം വർദ്ധിപ്പിച്ചിരിക്കുന്നു. ജപ്പാനിലെ നെൽവയലുകളും പ്രത്യേകം പുഷ്ടികൂടിയവയല്ല. ശാസ്ത്രീയരീതികളിൽ നിരന്തരമായ ശ്രദ്ധ പതിപ്പിക്കുന്നതുകൊണ്ടു മാത്രമാകുന്നു വിളവിനെ ഇരട്ടിപ്പിക്കുവാൻ സാധിച്ചിരിക്കുന്നതു്.

ജപ്പാൻ നിവാസികളുടെ പ്രധാന ഭക്ഷണവും അരിയാകുന്നു. വൻകിട വ്യവസായങ്ങളിലും കൈത്തൊഴിലുകളിലും വളരെ പുരോഗമിച്ച ഒരു രാജ്യമാണെന്നു വരികിലും, ജപ്പാൻ ഇപ്പോഴും ഒരു കർഷകരാജ്യമായി കരുതാം. മേൽപറഞ്ഞ 150 ലക്ഷം ഏക്കർ ഭൂമിയിൽ 54 ലക്ഷം കുടുംബങ്ങൾ കൃഷിപ്പണി നടത്തിവരുന്നു. ഒരു കുടുംബത്തിനു് ശരാശരി 2.6 ഏക്കർ സ്ഥലം മാത്രമെ കൃഷി ചെയ്യുവാനുള്ളു. എന്നാൽ കുടുംബാംഗങ്ങളെല്ലാം കൃഷിസ്ഥലത്തെ ഒരു വാത്സല്യമേറിയ തോട്ടംപോലെ ഏറ്റവും നിസ്സാരമായ സംഗതികളിൽപോലും വളരെ ശ്രദ്ധ പതിപ്പിച്ചു് കൃഷി നടത്തുന്നു. അതുകൊണ്ടു് ജപ്പാനിലെ ഇടതിങ്ങിയ ജനസംഖ്യയായ 750 ലക്ഷം ജനങ്ങളുടെ ആഹാരത്തിനു് വേണ്ടിവരുന്നതിൽ 85 ശതമാനവും ഈ പറഞ്ഞ സ്ഥലങ്ങളിൽ ഉല്പാദിപ്പിക്കുവാൻ കഴിയുന്നുണ്ടു്. ഇതു് എങ്ങനെ സാധിപ്പിച്ചു വരുന്നുവെന്നു് നമുക്കു് പൊതുവെ നോക്കി മനസ്സിലാക്കാം. ഉല്പാദനവിഷയത്തിൽ ആദ്യമായി വിത്തിന്റെ കാര്യത്തിൽ തന്നെ വളരെ നിഷ്കർഷയായ ശ്രദ്ധ പതിപ്പിക്കുന്നു. സ്വന്തമായി നല്ല വിത്തുകൾ തിരഞ്ഞെടുത്തുപയോഗിക്കുവാൻ സാധിക്കാത്തപക്ഷം, കർഷകസ്ഥാപനങ്ങളിൽനിന്നു സമ്മതപത്രത്തോടുകൂടിയ വിത്തുകൾ വാങ്ങി ഉപയോഗിക്കുതാകുന്നു. രണ്ടും മൂന്നും കൊല്ലങ്ങൾ കൂടുമ്പോൾ, വിത്തുമാറ്റം എന്ന നടപടി കർഷകരിൽ സാധാരണയാകുന്നു. ചില കർഷകർ കൊല്ലംതോറും എന്നു കണക്കിൽതന്നെ വിത്തു മാറിവരുന്നു. തങ്ങൾ ശേഖരിച്ച വിത്തു പകരം കൊടുത്തു കൃഷികസ്ഥാപനങ്ങളിൽനിന്നു് ഗുണം കൂടിയ വിത്തുകൾ വാങ്ങി ഉപയോഗിക്കുന്നു. കളകളുടെ വിത്തും മറ്റും നീക്കം ചെയ്യുവാൻ ആദ്യമെതന്നെ യോജിച്ചു അരിപ്പുകൾ ഉപയോഗിച്ചു് വിത്തുകളെ അരിച്ചെടുക്കുന്നു. ഇപ്രകാരം അരിച്ചതിനുശേഷം വിത്തുകളെ ഉപ്പുവെള്ളത്തിൽ (ഘനം കൂടിയ ഉപ്പുവെള്ളം) ഇട്ടു് പൊന്തികിടക്കുന്നവയെ എല്ലാം വാരിയെടുത്തു മാറ്റുന്നു. അടിയിൽ താണുകിടക്കുന്ന ഘനം കൂടിയ വിത്തുകൾ മാത്രമെ വിതയ്ക്കുവാൻ സ്വീകരിക്കുന്നുള്ളു. വിതയ്ക്കുന്നതിനുമുമ്പു് രാസസംബന്ധമായ മരുന്നുകൾ വിത്തുകളിൽ കലർത്തി രോഗബീജങ്ങളെ നശിപ്പിക്കുന്നു.

വിത്തു തിരഞ്ഞെടുപ്പിൽ പ്രത്യേകം ശ്രദ്ധവച്ചു് ശേഖരിക്കുന്ന വിത്തുകൾ മാത്രമെ ഇപ്പോൾ ഉപയോഗിക്കാൻ സാധിക്കുന്നുള്ളു. ജപ്പാനിൽ നെൽകൃഷി തൊണ്ണൂറു ശതമാനവും നടിയലായിട്ടാകുന്നു നടത്തിവരുന്നതു്. ഞാറ്റടികളിൽ (Nurseries) വിത്തു പാകുന്നതിനുമുമ്പായി നി

ലും വ്യത്തിയായി ഒരുക്കം ചെയ്യുന്ന ഇന്ത്രിയവളങ്ങളും രാസായനവളങ്ങളും ധാരാളമായി ഭൂമിയിൽ ഉഴുതു ചേർത്തതിനു ശേഷമെ വിത്തു പാവുകയുള്ളൂ. മുളപ്പിച്ച വിത്താകുന്നു സാധാരണയായി ഉപയോഗിക്കുന്നതു്. വിതയ്ക്കുന്ന പ്രവർത്തി കൈകൊണ്ടും ഉപകരണങ്ങളും ഉപയോഗിച്ചും നടത്തിവരുന്നു. കള പറിക്കുന്നതിനും രോഗനിവാരണത്തിനു് മരുന്നു പാമ്പുന്നതിലും കൃഷികീടങ്ങളും തുടങ്ങിയ ഉപദ്രവങ്ങൾക്കുവേണ്ട പ്രതിവിധികളും നടത്തുന്നതിലും കർഷകർ വേണ്ട ശ്രദ്ധ പതിപ്പിച്ചുവരുന്നു. ഇങ്ങനെ ഞാറുകളെ വളരെ പുഷ്ടിയോടും ആരോഗ്യത്തോടുംകൂടി വളർത്തിവരുന്നു.

കൃഷിസ്ഥലങ്ങൾ പൊതുവായിരിക്കുന്ന കാരണത്താൽ പണികൾ മിക്കവാറും കൈയായുധങ്ങൾ ഉപയോഗിച്ചാകുന്നു നടത്തിവരുന്നതു്. മൃഗങ്ങളെ പൂട്ടി ഉഴുവുന്ന സമ്പ്രദായവും ചില കൃഷിക്കാർ നടത്തിവരുന്നുണ്ടു്. കർഷകർ നല്ല അദ്ധ്വാനശീലന്മാരും, കൃഷിഉദ്യോഗസ്ഥന്മാരുടെ ശാസ്ത്രീയമായ ഉപദേശങ്ങൾ കൈക്കൊള്ളുന്നതിൽ നല്ല ഉൽക്കണ്ഠയുള്ളവരുമാകയാൽ, പൂട്ടൽ, ചേറുകലക്കൽ, മൂടി വലിക്കൽ മുതലായ പണികളിൽ യാതൊരു കോട്ടവും വരുത്തുന്നില്ല. ഈ പണികളെല്ലാം വേണ്ടതുപോലെ നടത്തി സമൃദ്ധിയായി വളം ചേർത്തിനുശേഷമെ നടിയിൽ ആരംഭിക്കുന്നുള്ളൂ. ഒരു പിടിയിൽ നാലഞ്ചു തൈക്കൾ വീതം ഒൻപതിഞ്ചു ഇടവിട്ടു് നടിയിൽ നടത്തിവരുന്നു. നടിയിൽ കഴിഞ്ഞാൽ നന ആവശ്യംപോലെ ചെയ്തുവരുന്നു. കള പറിക്കൽ ഒരു പ്രധാന ഏർപ്പാടായിട്ടാണു് കരുതിവരുന്നതു്. നടിയിൽ കഴിഞ്ഞു് പതിനഞ്ചു ദിവസം ആകുമ്പോൾ ആദ്യത്തെ കള പറിക്കൽ തുടങ്ങുന്നു. പിന്നീടു് പത്തുപതിനഞ്ചു ദിവസം ഇടവിട്ടു് നാലഞ്ചു തവണകളിലായി കളകൾ പറിച്ചുവരുന്നു. നിലം ഒരുക്കുമ്പോൾ കലർത്തുന്ന വളത്തിനു പുറമെ നടിയിൽ കഴിഞ്ഞും തൈകൾ വളരുമ്പോൾ ആവശ്യംപോലെ വളങ്ങൾ ഇട്ടുകൊടുക്കുകയും ചെയ്യുന്നു. കൊയ്യുന്നതു് അരിവാൾകൊണ്ടു മാത്രമാണു്. മെതിയൽ മുതലായ പ്രവർത്തികൾ കൈകൊണ്ടും, ചെറിയ മോട്ടോർ ഉപകരണങ്ങൾ ഉപയോഗിച്ചും നടത്തിവരുന്നു.

മേൽപറഞ്ഞ മാതിരി ജപ്പാനിലെ നിലങ്ങൾ സ്വതെ ഗുണം കുറഞ്ഞവയാകുന്നു. ഒരു നല്ലവിളവെടുക്കുന്നതിനു വേണ്ട വളങ്ങളുടെ 66 ശതാംശം മാത്രമെ അവിടത്തെ മണ്ണിനു് നൽകുവാൻ സാധിക്കുന്നുള്ളൂ. ബാക്കി വേണ്ടതെല്ലാം തക്കതായ വളങ്ങൾ സന്ദർഭാനുസരിച്ചു ചേർത്തു് നൽകപ്പെടുന്നു. ഇതെങ്ങനെ നടത്തുന്നു എന്നു് താഴെ മുറുക്കത്തിൽ വിവരിക്കാം.

ഞാറടികളിൽ വളമിടുന്ന സമ്പ്രദായം.

വിതയ്ക്കുന്നതിനുമുമ്പെ നിലം വളം ചേർത്തു് ഒരുക്കുന്നു. 4 സെൻറ് വിസ്തീർണ്ണമുള്ള സ്ഥലത്തേക്കു് 5-6 റാത്തൽ പാകൃജനകവും 3-4 റാത്തൽ വീതം ഭാവകവും ക്ഷാരവും എന്ന തോതനുസരിച്ചു് വളങ്ങൾ ചേർക്കുന്നു. തൈകൾ മൂളച്ചു് ഒരിഞ്ചു പൊക്കമായാൽ ചാരം ചിന്തിക്കൊടുക്കുന്നു. 4 സെൻറ് സ്ഥലത്തുനിന്നു് ഒരേക്കർ കണ്ടത്തിനുവേണ്ട ഞാറു കിട്ടിവരുന്നു.

കണ്ടങ്ങളിൽ വളമിടുന്ന സമ്പ്രദായം.

മണ്ണിൻെറ തരംപോലെ 80 മുതൽ 100 റാത്തൽവരെ പാകൃജനകവും, 70 മുതൽ 80 വരെ റാത്തൽ ഭാവകവും ക്ഷാരവും ഏക്കറിനുപയോഗിക്കുന്നു. ഇന്ത്രിയവളങ്ങളും കൃത്രിമവളങ്ങളും കൂട്ടിക്കലർത്തിയ മിശ്രിതവളമാകുന്നു സാധാരണയായി ഉപയോഗിച്ചുവരുന്നതു്. മിശ്രവളങ്ങൾ ഇടുന്നതിനാലാകുന്ന കൂടുതൽ ഗുണങ്ങൾ അനുഭവപ്പെട്ടവരുന്നതു്.

പച്ചിലവളങ്ങളും ധാരാളമായി ചേർത്തുവരികയും ചെയ്യുന്നു. ഇതിലേക്കായി സാധാരണ വളർത്തുന്ന ചെടി "സോയാബീനാ" ആകുന്നു. നടുന്നതിനു് മൂന്നാഴ്ച മുമ്പെ ചെടികൾ വെട്ടിയിട്ടു് നിലത്തോടു് നല്ലവണ്ണം ഉഴുതുചേർക്കുന്നു. ഇങ്ങനെ ഏക്കറിനു് മൂന്നു മുതൽ അഞ്ചു വരെ ടൺ പച്ചിലവളം ചേർക്കുന്നു. പച്ചിലവളം കൂടാതെ "സോയാപിണ്ണാക്കു്" മലം, കൂട്ടവളം മുതലായ ഇന്ത്രിയവളങ്ങളും ധാരാളമായി ഉപയോഗിക്കുന്നു. ഇന്ത്രിയവളങ്ങൾ മിക്കവാറും നിലം ഉഴുവുന്നതിനുമുമ്പേ ചേർക്കുന്നു. ഇവ ചേർത്തിൽപിന്നെ ചാരം ഏക്കറിനു "മൂന്നിലൊന്നു" ടൺ എ

ന്നതോതിൽ ചിന്തിക്കൊടുക്കുന്നു. ഇതിന്റെ ഉദ്ദേശം പച്ചില മുതലായ ഇന്ദ്രിയവളങ്ങളും വേണ്ടപോലെ ദഹിച്ച് ചെടികൾക്ക് എളുപ്പത്തിൽ വലിച്ചെടുക്കത്തക്കവിധത്തിൽ പാകപ്പെടുന്നതിനാകുന്നു. ചെടികളുടെ സംഗ്രഹണശക്തി മനസ്സിലാക്കിയശേഷമെ ഗുരുത്വം കൂടിയ വളങ്ങളും ചേർക്കുന്നുള്ളു. അമോണിയം സൾഫേറ്, അമോണിയം ഫോസ്ഫേറ്, പൊട്ടാഷ് തുടങ്ങിയ ഗുരുതരങ്ങളായ ഉരങ്ങളും മൂന്നിൽ രണ്ടുഭാഗം നടുന്നതിനു മുമ്പായും, ബാക്കി ഒരു ഭാഗം രണ്ടു തവണകളായി—അതായത് നട്ട് മൂന്നുനാലു ആഴ്ചയ്ക്കു ശേഷവും, കതിരു വരുന്നതിന് മൂന്നാഴ്ചയ്ക്കുമുമ്പായും—ഇട്ടുകൊടുക്കുന്നു. ഗുരുത്വമേറിയ അമോണിയം സൾഫേറ് ഇങ്ങനെ പല തവണകളായി ചേർക്കുന്നതുകൊണ്ട് അതിന്റെ യാതൊരു അംശം പോലും നഷ്ടപ്പെടാതെ, ചെടിക്ക് ഉപകാരമായിത്തീരുന്നു.

നല്ല ഇനം വിത്തുകളും രസായനവളങ്ങളും തമ്മിൽ ഉഡുമായ ബന്ധം ഉണ്ടെന്നാകുന്നു ജപ്പാൻകാരുടെ അനുഭവം. നല്ല വിത്തുകളുടെ ഗുണങ്ങളും മുഴുവനും, വിളവിൽ അനുഭവപ്പെടണമെങ്കിൽ രസായനവളങ്ങളും ധാരാളമായി ഉപയോഗിച്ചേ തീരൂ എന്നു പ്രമാണമാകുന്നു അനുഭവത്തിൽ കണ്ടുവരുന്നതു്. അതുപോലെതന്നെ ധാരാളമായി വളം ചേർക്കുന്നതിന്റെ ഫലം മുഴുവനും അനുഭവിക്കുന്നതിന് ഗുണം കൂടിയ വിത്തുകളും ഉപയോഗിച്ചാലെ സാധിക്കയുള്ളു.

വിത്തിലും വളത്തിലും, പണികളിലെന്നപോലെതന്നെ നനയിലും നല്ല ശ്രദ്ധ പതിച്ചുവരുന്നു. ജപ്പാനിലെ ജലസേചനപദ്ധതികളെല്ലാം നെൽകൃഷിയെ അടിസ്ഥാനപ്പെടുത്തിയിട്ടാകുന്നു ഏർപ്പെടുത്തിയിരിക്കുന്നതു്. വിതയ്ക്കുമ്പോഴും നടുമ്പോഴും വെള്ളത്തിന് യാതൊരു കുറവും ഉണ്ടായിക്കൂടാ എന്നാകുന്നു ജപ്പാൻ കർഷകരുടെ മതം. നെല്ലിന്റെ ചെറുപ്രായത്തിൽ വെള്ളം മതിയാകുവോളം ഉണ്ടായിരുന്നാൽ പിന്നീടു വരുന്ന ജലക്ഷാമം അത്ര ഗണിക്കത്തക്കതല്ലെന്നാണ് അവരുടെ അനുഭവം. തക്ക സമയത്തുള്ള നടീയിലിലും (വിതയിലും) ആദ്യകാലങ്ങളിലെ നനയിലുമാകുന്നു ഒടുവിലത്തെ വിളവ് സ്ഥിതിചെയ്യുന്നതെന്നാകുന്നു ജപ്പാൻ കർഷകരുടെ ചിരകാല അനുഭവം.

ജപ്പാൻകാരുടെ പ്രധാന ഭക്ഷണം അരിയായതുകൊണ്ട് നെൽകൃഷിയിൽ മേൽപറഞ്ഞ മാതിരി കഴിയുന്നത്ര ശ്രദ്ധ പതിച്ചുവരുന്നു. ജപ്പാൻ കർഷകർ പഠിപ്പുള്ളവരായിരിക്കുന്നതിനാൽ ശാസ്ത്രജ്ഞന്മാരുടെ ഉദ്ദേശങ്ങളും വളരെ ശ്രദ്ധയോടുകൂടി കൈക്കൊള്ളുന്നുണ്ട്. പ്രചരണങ്ങളിലും ഉപദേശങ്ങളിലും ധാരാളമായി വിദഗ്ദ്ധന്മാരെ ഗവൺമെൻറ് നിയോഗിച്ചിരിക്കുന്നു. ഒരു വില്ലേജിൽ ഒരു വിദഗ്ദ്ധൻ എന്ന കണക്കനുസരിച്ച്, രാജ്യമാസകലം കർഷകശാസ്ത്രജ്ഞന്മാരെ നിയോഗിച്ചിരിക്കുന്നു. "കർഷകർ സാമർത്ഥ്യമുള്ളവരും പഠിപ്പുള്ളവരുമാകുന്നു. അതുകൊണ്ട് വിദഗ്ദ്ധന്മാരുടെ ഉപദേശമോ സേവനമോ ആവശ്യമില്ല" എന്ന തെറ്റിദ്ധാരണ ജപ്പാനിലില്ല. നേരെമറിച്ച് കർഷകർ പഠിപ്പുള്ളവരും സാമർത്ഥ്യമുള്ളവരുമാകയാൽ അവർക്ക് വിദഗ്ദ്ധന്മാരുടെ ആവശ്യം എല്ലായ്പോഴും നേരിടുന്നു എന്ന തത്വത്തിലാകുന്നു ഒരു വികസിച്ച പ്രചരണപ്രസ്ഥാനം ഗവൺമെൻറ് ഏർപ്പെടുത്തിയിരിക്കുന്നതും.

ആവർത്തിച്ച് ചുരുക്കി പറയുന്നതായാൽ ജപ്പാൻകാർക്ക് കൂടുതൽ ഉല്പാദനം നടത്തുവാൻ ശേഷി കാണുന്നതു് താഴെ പറയുന്ന സംഗതികൾകൊണ്ടാകുന്നു:—

1) നല്ല വിത്തുകൾ ഉപയോഗിക്കുക.
2) കൂട്ടുവളം ചെയ്യുക.
3) നന ആവശ്യംപോലെ നടത്തുക.
4) സസ്യരോഗങ്ങൾക്ക് നിവാരണമാർഗ്ഗങ്ങൾ അപ്പോഴപ്പോൾ നടത്തുക.
5) ബുദ്ധിയുള്ള കർഷകരായിരിക്കുക; ശാസ്ത്രജ്ഞന്മാരുടെ ഉപദേശങ്ങൾ സ്വീകരിക്കുന്നതിൽ സന്നദ്ധതയുള്ളവരായിരിക്കുക.
6) പ്രചരണത്തിനും ഉപദേശത്തിനും ധാരാളം ശാസ്ത്രജ്ഞന്മാരുടെ സേവനം.
7) കൃഷിവിഷയങ്ങളിൽ പ്രവർത്തിക്കുന്ന സഹകരണസംഘങ്ങളുടെ ധാരാളമായ എണ്ണങ്ങൾ.
8) ഒരു വാത്സല്യമായ തോട്ടംപോലെ നെൽകൃഷിയിലുള്ള ശ്രദ്ധ.

നിങ്ങൾ ചോദിക്കുക

(കൃഷി, മണ്ണ്, രാസവളത്തിന്റെ ഉപയോഗക്രമം എന്നിവയെപറ്റി പൊതുജനങ്ങളിൽനിന്നും ലഭിച്ചിട്ടുള്ള ചോദ്യങ്ങൾക്ക് ഞങ്ങളുടെ അഗ്രിക്കൾച്ചറൽ കെമിസ്റ്റ് ഈ പംക്തിമുഖേന ഉത്തരം പറയുന്നു.)

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കന്നുകാലിവളത്തിന്റെ കൂടെ സൂപ്പർ ഫോസ്ഫേറസ് ചേർക്കുന്നതു നല്ലതാണെന്നു പറയുന്നു. ഈ രീതികൊണ്ടു വളത്തിന്റെ ഗുണം കൂട്ടുന്നതു് എങ്ങനെയാണെന്നു് അറിയിക്കാമോ?

ഉത്തരം

ചെടികളുടെ ധാന്യഭാഗം മനുഷ്യോപയോഗത്തിനെടുത്തശേഷം ബാക്കിയുള്ള തണ്ടുമാത്രം കന്നുകാലികൾക്കു് ആഹാരമായി കൊടുക്കുന്നു. തണ്ടിൽ ഫോസ്ഫേറസ് കുറവാണു്. അതുകൊണ്ടു് കന്നുകാലിവളത്തിൽ ഫോസ്ഫേറസ് കുറവായിട്ടേ കാണാൻ മാർഗ്ഗമുള്ളു. നമ്മുടെ രാജ്യത്തു് മനുഷ്യമലം ത്യാജ്യമായി തള്ളിയിരിക്കുന്നതിനാൽ മണ്ണിൽനിന്നും ചെടികൾ എടുക്കുന്ന ഫോസ്ഫേറസ് തിരിയെ മണ്ണിൽ പോകുന്നില്ല. പല തലമുറകളായി ഇതു തുടർന്നുവരുന്നതിനാൽ നമ്മുടെ ഭൂമിയിലെ ഫോസ്ഫേറസ് കുറഞ്ഞുകൊണ്ടേ വരുന്നു. ഇതേവരെയുള്ള മണ്ണു പരിശോധനയിൽ നമ്മുടെ പാടങ്ങളിൽ ഫോസ്ഫേറസ് തീരെ കുറവാണെന്നാണു് കണ്ടിരിക്കുന്നതു്. അത്യധികമായ നൈട്രജൻ ക്ഷാമത്തിൽ ശ്രദ്ധ കേന്ദ്രീകരിച്ചിരിക്കുന്നതിനാൽ ഈ ഗുരുതരമായ കുറ്റം ഇതേവരെ ആരും ശ്രദ്ധിച്ചിട്ടില്ല. മിക്ക വാഹനസൗകര്യങ്ങൾക്കും ഫോസ്ഫേറസിനേക്കാൾ നൈട്രജൻ സുപ്രധാനമായ ആഹാരമായതിനാൽ അതിന്റെ കുറവു് വളരെ ഗുരുതരമായ ഒന്നാണു്. ഫോസ്ഫേറസിന്റെ കുറവിനെ പരിഹരിക്കാതിരിക്കുന്നിടത്തോളം കാലം നൈട്രജൻ എത്രതന്നെ കൊടുത്താലും മികച്ച വിളവെടുപ്പു് അസാദ്ധ്യമായിതീരുന്നു. നൈട്രജൻ, ഫോസ്ഫേറസ് എന്നിവ അടങ്ങിയ രാസവളങ്ങളും കൂട്ടിക്കലർത്തി ഉപയോഗിക്കുന്നതു് (ജപ്പാൻ കൃഷി സമ്പ്രദായത്തിലുള്ളതുപോലെ) വളരെ ശ്രേഷ്ഠമാണെന്നു് ഇവിടെ പറയേണ്ടിയിരിക്കുന്നു.

കന്നുകാലി വളത്തിലുള്ള ഫോസ്ഫേറസിന്റെ കുറവു് സൂപ്പർ ഫോസ്ഫേറസുപോലെയുള്ള രാസവളങ്ങളും കൂട്ടിക്കലർത്തി പരിഹരിക്കാവുന്നതാണു്. പയറുവർഗ്ഗങ്ങൾ കന്നുകാലി വളത്തിലോ, കമ്പോസ്റ്റ് വളത്തിലോ നിന്നും 100 റാത്തൽ മുതൽ 150 റാത്തൽ വരെ നൈട്രജൻ ലഭിക്കുമ്പോൾ 40—50 റാത്തൽ മാത്രമെ ഫോസ്ഫേറസ് ലഭിക്കുന്നുള്ളു. പയർ

വർഗ്ഗങ്ങൾ കൃഷിചെയ്ത് കന്നുകാലികൾക്ക് ആഹാരമായി കൊടുക്കുകയാണെങ്കിൽ കന്നുകാലിവളത്തിലെ ഫോസ്ഫേറസ് കുറെ കൂട്ടാവുന്നതാണ്. അതു മാത്രംകൊണ്ട് ഫോസ്ഫേറസിന്റെ ന്യൂനത മുഴുവനായി പരിഹരിക്കുവാൻ സാധ്യമാകുന്നതല്ല. ക്രമീകൃതമല്ലാത്ത ആഹാരംകൊണ്ട് പെടിയുടെ വളർച്ച ബാധിയ്ക്കപ്പെടുകയും ചെയ്യുന്നു. ഈ ന്യൂനത പരിഹരിയ്ക്കുവാൻ 50-ഓ 100-ഓ റാത്തൽ ഫോസ്ഫേറസ് (312 മുതൽ 625 റാത്തൽ വരെ സൂപ്പർ ഫോസ്ഫേറസ്) ചേക്കാവുന്നതാണ്. ഈ കണക്കനുസരിച്ച് ഒരു ടൺ വളത്തിൽ 5 റാത്തൽ മുതൽ 10 റാത്തൽ വരെ ഫോസ്ഫേറസ് ഉണ്ടായിരിക്കും. 100 ഘനയടി കമ്പോസ്റ്റ് വളം നാലോ, അതോ മാസംകൊണ്ട് അഴുകിചേരുമ്പോൾ ഒരു ടൺ തികഞ്ഞ വളമായിതീരുന്നതാണ്. മേൽപ്പറഞ്ഞ കണക്കനുസരിച്ച് 100 ഘനയടി കമ്പോസ്റ്റ് വളത്തിനു 50-ഓ 60-ഓ റാത്തൽ സൂപ്പർ ഫോസ്ഫേറസ് ചേർക്കേണ്ടതാണ്. കമ്പോസ്റ്റ് വളം തയാറാക്കുമ്പോൾ ഒന്നിടവിട്ട് ഓരോ തട്ടുകളിലായി സൂപ്പർ ഫോസ്ഫേറസ് വിതറണം. വളക്കുഴിയുടെ ചുവരുകൾ വെള്ളം കടക്കാത്തതാണെങ്കിൽ മേൽപടി രാസവളം കുഴിയുടേയും പാത്തിയുടേയും അടിഭാഗത്തു നിരത്തിയിടണം. ഇപ്രകാരം ചെയ്യുന്നതുകൊണ്ട് മൂത്രത്തിലുള്ള നൈടജൻ നഷ്ടപ്പെടാതെ വളത്തിൽതന്നെ ചേരുന്നതാണ്.

ഇപ്രകാരം കന്നുകാലിവളത്തോടും കമ്പോസ്റ്റ്വളത്തോടും സൂപ്പർ ഫോസ്ഫേറസ് ചേർക്കുന്ന രീതി അമേരിയ്ക്കാ മുതലായ പാശ്ചാത്യരാജ്യങ്ങളിൽ നടപ്പുള്ളതു നമ്മുടെ കൃഷിക്കാർ അനുകരിക്കാവുന്നതുമാണ്.

ചോദ്യം 104

ജപ്പാൻ കൃഷി സമ്പ്രദായത്തിൽ വിത്തു് ഉപ്പുവെള്ളത്തിൽ മുക്കിയിടണമെന്നു പറയുന്നു. എന്തുകൊണ്ട്?

ഉത്തരം

മറ്റു സ്ഥിതിഗതികളെല്ലാം തുല്യമാണെങ്കിൽ നല്ല വിത്തുകൊണ്ടു് നല്ല വിളവെടുക്കാമല്ലൊ. ഇതു് എപ്പോഴും ശരിയാണു്. അതുകൊണ്ടു് വിത്തു തിരഞ്ഞെടുക്കുന്നതിൽ ഏറ്റവും കൂടുതൽ ശ്രദ്ധ ചെലുത്തണം. വിത്തു കഴുകി ഉണക്കി തിരഞ്ഞെടുത്താലും മോശമായ ചില വിത്തുകളും കാണാവുന്നതാണു്. അവ കളയേണ്ടതാണു്. വിത്തു വെള്ളത്തിൽ താഴ്ത്തി പൊങ്ങിവരുന്നവ പതിർ കളയുന്നതാണു് സാധാരണ നമ്മുടെ കൃഷിക്കാരുടെ പതിവു്. ഈ രീതി മതിയാകാതെ ജപ്പാൻ കൃഷിക്കാരൻ ഒരടി മുന്നോട്ടു പോയിരിയ്ക്കുകയാണു്. അവർ ഇതിനു് ഉപ്പുവെള്ളം ഉപയോഗിക്കുന്നു. ഉപ്പുവെള്ളത്തിന്റെ ഘനമാനം കൂടിയതുകൊണ്ടു് പൂർണ്ണമായ വിത്തുകൾ മാത്രം താഴുന്നതും, അപൂർണ്ണമായി, രോഗികമായി നിറഞ്ഞ വിത്തുകൾ (പതിർ) കൂടി പൊങ്ങി കിടക്കുന്നതും, എളുപ്പത്തിൽ മാറ്റിക്കളയാവുന്നതുമാണു്. ശുദ്ധജലം ഉപയോഗിക്കുമ്പോൾ രോഗികമായി നിറഞ്ഞ വിത്തുകൾ താഴ്ന്നുപോകാവുന്നതും, അവകൂടി വിതയ്ക്കുന്നതിനു് ഉപയോഗിച്ചുപോകുന്നതുമാണു്. അവയും മുളച്ചുവരുമെങ്കിലും, മോശമായ ഈ ഞാറുകൾ മറ്റുള്ള നല്ല ഞാറുകളോടൊപ്പം ശക്തിയായി വളർന്നുവരികയില്ല.

ഇപ്രകാരം വിത്തു തിരഞ്ഞെടുക്കൽ ഏറ്റവും കൂടുതൽ കാര്യക്ഷമമാക്കാൻവേണ്ടി ഉപ്പുവെള്ളം ഉപയോഗിക്കുന്നു. നമ്മുടെ കൃഷിക്കാരും ഈ രീതി പ്രയോജനകരമാംവണ്ണം അനുകരിക്കാവുന്നതാണു്.

ചോദ്യം 105

അമോണിയം സൾഫേറസ് ഉപയോഗിക്കുമ്പോൾ അതു ഭൂമിയിലുള്ള എല്ലാറ്റിനേയും എടുത്തുകളഞ്ഞു് ഭൂമിയെ മോശമായ നിലയിലാക്കുന്നു എന്നു പറയുന്നു. അതു വാസ്തവമാണോ?

ഉത്തരം

ഇപ്രകാരമുള്ള വിമർശനം പല ആളുകളും പറഞ്ഞുകാണാറുണ്ട്. ചിലർ അതു് ബലമായി വിശ്വസിയ്ക്കുകയും ചെയ്യുന്നു.

ഒന്നാമതായി അമോണിയം സൾഫേറ്റ് ഒന്നിനേയും മണ്ണിൽനിന്നും എടുക്കുന്നില്ല. മാത്രമല്ല, അതു് തന്നാത്താൻ മണ്ണിനോട് ചേരുകയും ചെയ്യുന്നു. 20% നൈടജൻ അടങ്ങിയിട്ടുള്ളതാണു് ഈ രാസവളം. അതിലുള്ള നൈടജൻ അതു് ചെടിയ്ക്കുവേണ്ടി വിട്ടുകൊടുക്കുന്നു. കൂടുതലായി നൈടജൻ എടുക്കുന്നതിനാൽ ആശ്ചര്യകരമായ ഒരു മാറ്റമുണ്ടായി ചെടി അതിന്റെ പൂർണ്ണവളർച്ചയിൽ എത്തി കൂടുതൽ ഫലപുഷ്ടിയുള്ളതായിതീരുന്നു.

എന്നാൽ എന്തുകൊണ്ടാണു് ഈ രാസവളം മണ്ണിനെ മോശമാക്കുന്നു എന്നു പറയപ്പെടുന്നതു്? നമ്മുടെ കൃഷിക്കാരിൽ മിക്കവാറും ആളുകളും പലതരത്തിലുള്ള രാസവളത്തിന്റെ പ്രവർത്തനത്തെപറ്റി അറിഞ്ഞുകൂടാത്തവരും, പലപ്പോഴും നിശ്ചിത തോതിലുള്ള വളം ചേർക്കാനുള്ള പദ്ധതി അനുകരിക്കാത്തവരും ആകുന്നു. അവർ അമോണിയം സൾഫേറ്റ് വാങ്ങി അപ്പാടെ മണ്ണിലിടുകയാണു്. തന്നിമിത്തം ഫോസ്ഫേറ്റ്, പൊട്ടാഷ് മുതലായ മറ്റു പദാർത്ഥങ്ങളെ മണ്ണിൽനിന്നും കൂടുതലായി എടുത്തു് വിളവു വർദ്ധിപ്പിക്കുന്നു. ഇതാണു് നാം ആശിക്കുന്നതും. വലിയ വിളവെടുപ്പാണു് നമ്മുടെ ഉദ്ദേശമെങ്കിൽ അതിനുവേണ്ട വില കൊടുക്കാനും നാം തയാറാകണം.

അമോണിയം സൾഫേറ്റ് ഉപയോഗിക്കുമ്പോൾ അതിൽനിന്നും ലഭിക്കുന്ന നൈടജൻ മാത്രമല്ല ചെടികൾ എടുക്കുന്നതു്. പിന്നെയോ, കിട്ടാവുന്നിടത്തോളം ഫോസ്ഫേറ്റും പൊട്ടാഷുംകൂടി ഭൂമിയിൽനിന്നും എടുക്കുന്നു. ഇതു് താല്ക്കാലികമായി ഭൂമിയുടെ ഫലപുഷ്ടിയെ കുറയ്ക്കുന്നു. എന്നാൽ നമുക്കു് ഈ സസ്യാഹാരങ്ങൾ നഷ്ടപ്പെടുന്നുണ്ടോ? തീർച്ചയായും ഇല്ല. അവയെല്ലാം ധാന്യരൂപത്തിലും വയ്ക്കോലായിട്ടും നമുക്കു് ലഭിക്കുന്നു. നാം ആഗ്രഹിക്കുന്നതും അവയാണല്ലൊ. അതുകൊണ്ടു് ഭൂമിയിൽ ഉണ്ടാകുന്ന നഷ്ടം നമുക്കു് കൂടുതൽ ലഭിക്കുന്ന ധാന്യത്തിനു തുല്യമാണു്. അതുകൊണ്ടു് (വളവും രാസവളവും ചേർത്തു്) സസ്യാഹാരങ്ങൾ ധാരാളം ചേർത്തു് ഭൂമിയുടെ നഷ്ടം നികത്തേണ്ടതും അതു് ഭൂമിയെ ഫലപുഷ്ടിയുള്ളതാക്കിത്തീർക്കുന്നതുമാണു്. വിളവെടുപ്പു് കൂടുതലാണെങ്കിൽ എത്രയും കൂടുതൽ ആഹാരം ഭൂമിയിൽനിന്നും എടുക്കുന്നതിനു് സസ്യങ്ങളെ പ്രേരിപ്പിക്കണമെന്നുള്ള വസ്തുത അവിതർക്കിതമാണു്. നൈടജൻ കൂടുതൽ അടങ്ങിയിട്ടുള്ള അമോണിയം സൾഫേറ്റിനെപറ്റിയുള്ള വിമർശനം ആശ്ചര്യകരമാണു്. ഇപ്പോൾ നമ്മുടെ പാടങ്ങളിൽ മിക്കവാറും മോശമായ വിളവെടുപ്പാണു്. മോശമായ വിളവെടുപ്പുകൊണ്ടു് തൃപ്തിപ്പെടുന്നവരും വേണ്ടത്ര വളങ്ങളിട്ടു് ഭൂമി ഫലഭൂയിഷ്ടമാക്കാൻ മടിയുള്ളവരും മാത്രമെ കൂടുതൽ സസ്യാഹാരങ്ങൾ ഉപയോഗിച്ചു് ഭൂമിയുടെ ഗുണം കുറയ്ക്കുന്നതിനെപറ്റി ഭയപ്പെടേണ്ടതുള്ളൂ. ഇപ്രകാരമുള്ള ഭൂമിയുടെ ഗുണക്കുറവു് അനിർവാര്യമാണു്. എന്നാൽ അതു് താല്ക്കാലികവും മറ്റു സസ്യാഹാരങ്ങൾ ഉപയോഗിച്ചു് നികത്താവുന്നതുമാകുന്നു.

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ഈയ്യിടെ കൃഷിശാസ്ത്രസംബന്ധമായ ഒരു പുസ്തകത്തിൽ "മണ്ണുമൂടൽ" (soil mulch) എന്നു കാണുകയുണ്ടായി. അതിന്റെ അർത്ഥമെന്താണു്?

ഉത്തരം

മണ്ണുമൂടൽ എന്നാൽ മണ്ണിന്റെ ഈർപ്പം പോകാതിരിക്കാൻ ഉദ്ദേശിക്കപ്പെട്ടിട്ടുള്ള ഏതെങ്കിലും ഉപകരണം (അല്ലെങ്കിൽ ശാസ്ത്രപ്രയോഗം എന്നർത്ഥം.) ഭൂമിയിലെ ഈർപ്പം കൃഷിക്കു് അത്യധികം പ്രധാനപ്പെട്ടതാണെന്നു് നിങ്ങൾക്കറി

യാമല്ലോ. ആവശ്യമുള്ള വെള്ളത്തിന്റെ അഭാവത്തിൽ ചെടികൾ കരിഞ്ഞുപോകുന്നു. ഭൂമിയിൽ വേണ്ടത്ര ഈർപ്പമുണ്ടെങ്കിൽ മാത്രമെ വളങ്ങളും രാസവളങ്ങളും പ്രയോജനകരമായി പ്രവർത്തനം നടത്തുകയുള്ളൂ. അതുകൊണ്ട് മണ്ണിൽ വേണ്ടത്രനനവുണ്ടായിരിക്കേണ്ടതിനും, മണ്ണിലെ ഈർപ്പം നഷ്ടപ്പെടാതെ സൂക്ഷിക്കുന്നതിനും കൃഷിക്കാർ ശ്രദ്ധിക്കേണ്ടതാണ്.

ഇളകിയ മണ്ണ് കൂട്ടിച്ചേർക്കുക എന്നുള്ളത് വെള്ളത്തിന്റെ ഒരു ഗുണമാണല്ലോ. മഴവെള്ളമായാലും, ജലസേചനമായാലും, ഇളകിയ മണ്ണിനെ വെള്ളം കട്ട പിടിപ്പിക്കുന്നു. അപ്രകാരംതന്നെ ഇരിയ്ക്കുയാണെങ്കിൽ മണ്ണിന്റെ ഈർപ്പം ഉപരിതലത്തിൽ വരികയും, വെയിൽ കൊണ്ട് ആവിയായിപ്പോകയും ചെയ്യുന്നു. ഇപ്രകാരം വെള്ളം ഉപരിതലത്തിൽ വരുന്നതു് തടയ്ക്കാൻവേണ്ടി മൺകട്ടകളെ ഉടച്ചിടണം. ഇതിനെയാണ് മണ്ണുമൂടൽ എന്നു പറയുന്നതു്. ഉപരിതലത്തിലെ മണൽകട്ടകളെ ഉടയ്ക്കുമ്പോൾ അവ ഇളകികിടക്കുന്നതാണ്. അപ്പോൾ താഴെയുള്ള വെള്ളം വേഗത്തിൽ ഉപരിതലത്തിൽ വരാതിരിക്കുന്നതിനാൽ അടിത്തറയിലുള്ള ഈർപ്പം നഷ്ടപ്പെടാതിരിക്കുന്നു. ഇപ്രകാരം മുകളിലെ ഇളകിയ മണ്ണ് ഒരു മൂടിയുടെ പ്രയോജനം ചെയ്യുന്നു, ഇളകിയ മണ്ണിന്റെ ഇടയ്ക്കുള്ള വായു നിറഞ്ഞ സ്ഥലം വെയിലിന്റെ ചൂടിനെ അകത്തു കടത്തിവിടാതെ തടുക്കുകയും ചെയ്യുന്നു. മുകളിലത്തെ മണ്ണിനെ ഉടയ്ക്കാതെ ഈർപ്പം സംരക്ഷിക്കാൻ വേറെ മാർഗ്ഗങ്ങളുമുണ്ട്. ഉദാഹരണമായി വയ്ക്കോലൊ, കരിയിലയൊ മണ്ണിന്റെ മുകളിൽ നിരത്തി ഇടുകയാണെങ്കിൽ അതും ഒരു മൂടിയുടെ പ്രയോജനം ചെയ്യുന്നു. ചില രാജ്യങ്ങളിൽ കടലാസുകളെ മൂടികളായി ഉപയോഗിക്കുന്നു. മുളച്ചുവരുന്ന ചെടികൾ ഈ കടലാസിനെ കീറിക്കൊണ്ട് മേല്പോട്ട വളരുന്നു. മഴ കുറവുള്ള സ്ഥലങ്ങളിൽ "മണ്ണുമൂടൽ" വളരെ പ്രാധാന്യമുള്ളൊരു കാര്യമാണ്.

നിങ്ങളെ പ്രശംസിക്കുന്നതു് മറ്റുള്ളവരായിരിക്കട്ടെ. അതു് ഒരിക്കലും നിങ്ങളുടെ നാക്കായിരിക്കരുതു്.

സോളമൻ.

വിജ്ഞാനം വിലമതിക്കത്തക്കതാകണമെങ്കിൽ വിവേകത്തിന്റെ പ്രസന്നതകൂടി വേണം. നന്മ അവസാനംവരെ മന്ദഹസിച്ചുകൊണ്ടിരിക്കും.

എമേഴ്സൺ.