FACT

Vol. 7 No. 4
Oct.-December, 1953

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

Editor

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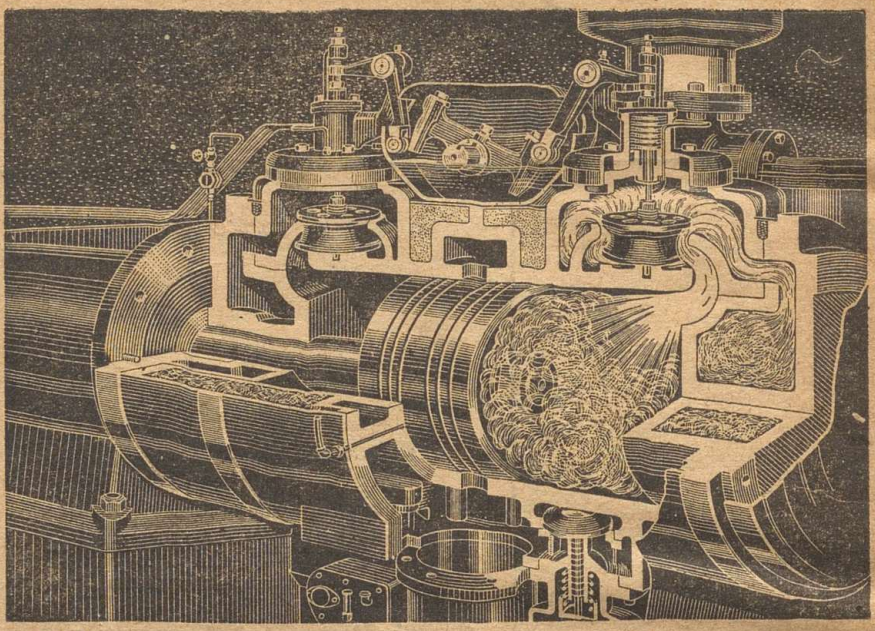

How we mix oil and water ..for better lubrication !

The cylinder of a steam engine is a tough lubrication problem. The reason is that some of the steam nearly always condenses on the cylinder walls, washing off the lubricating oil, and increasing the risk of wear.

The washed-off oil could, perhaps, be replaced by increasing the oil supply to the cylinder. However, this would greatly increase the consumption of oil. Worse still, in a condensing engine the exhaust steam returns to the boiler as feed water; and if too much oil is fed to the cylinder, it may contaminate the feed water and cause boiler failure.

Experience finds the answer

As usual, the makers of Gargoyle Steam Cylinder Oils have an answer to the problem. To resist the washing effect of the condensing steam, they force it to *combine* with the oil in an emulsion.

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Gargoyle Steam Cylinder Oils form an emulsion of a special kind – a *water-in-oil* emulsion. This means that the water is broken up into tiny droplets, each imprisoned in a bubble-like film of oil.

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Somewhere in your industry – in every industry – you can benefit from the four advantages of correct lubrication with Standard-Vacuum Industrial Lubricants:-

- Reduced power consumption;
- More continuous production;
- Decreased maintenance;
- Lower lubrication costs.

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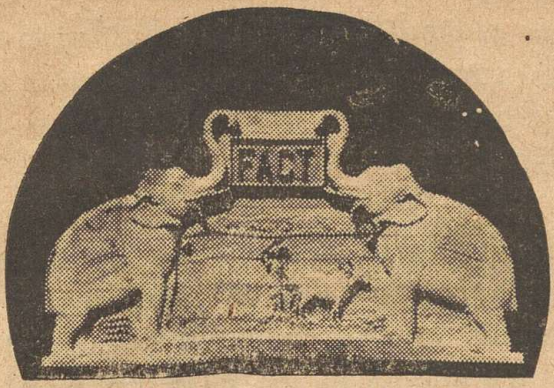

VOL. 7 | OCTOBER-DECEMBER, 1953 | NO. 4

EDITORIAL

MEANS AND METHODS

IT is now generally recognized that the current production of our farm-lands is too low as compared with the production levels prevalent in other agriculturally advanced countries. Strenuous efforts are now being made to maximise agricultural production and this work has become an urgent national task in which everyone, interested in the welfare of our nation should come forward to contribute his mite.

We, for ourselves, have been doing intensive propaganda work with a view to educate our farmers in the art of modern scientific farming. We have been running a large demonstration farm in which we try out different varieties of seeds and manures. We have published a series of pamphlets and booklets on the proper use of manures and fertilisers, on the Japanese mode of rice-culture and other allied problems.

We feel that the best and the most effective form of propaganda is the half-field demonstration right on the ryot's field and run under his own supervision and management. Such a method will not fail to make the primary producer "manure-conscious."

We have now been running a few such demonstration farms and these have yielded very promising results. Elsewhere in this Journal we have published a report on these farms. We intend to increase the number of these half-field demonstrations, so that, ultimately we will be able to cover all the major agricultural regions of this State. The fertiliser mixtures that we issue and apply on these farms are based on a scientific interpretation of soil analysis data and consequently they are capable of correcting all the innate deficiencies of these soils.

Our extension programme will be greatly enlarged in the days to come and we invite all agriculturists to co-operate with us in this national task!.

Editorial Board

Our Regrets

Due to some unavoidable circumstances the publication of this issue had been delayed and we offer our deep regrets for the same.

Editor

THE PREPONDERATING ROLE OF PHOSPHATIC FERTILIZERS IN MOUNTAIN PASTURES

L. J. CARPENTIER

IMMEDIATELY after my return from Sweden, I accompanied Mr. Richard, the French Scientific delegate, on a journey lasting several days through the Dauphine Alps. This region undergoes the Mediterranean climatic conditions in the summer (dangerous heat and drought). The vegetation is luxuriant in spring, but dries up quickly at the beginning of the summer, and recovers in the autumn before the first snow falls.

In the report which follows, I shall confine myself to dealing with alpine pastures, their present state and possibilities of improvement with the aid of fertilization, which has been proved by experiments which Mr. Richard has been carrying out for some years in these elevated pastures.

1. ALPINE PASTURES

These pastures, or rather these sheep and cattle "runs" are at altitudes varying from about 1,500 to 2,300 m. and are as a rule at a somewhat considerable distance from the villages to which they belong. The grass is snow covered for several months in winter, but in spring the vegetation springs quickly and powerfully to life, thanks to the humidity of the soil and the clarity and brightness of the atmosphere which promotes chlorophyllic assimilation.

A great similarity is noticeable here to the conditions met within Northern Sweden. One must not however consider these pastures as an inexhaustible source of nourishment for the livestock, and certain farmers are perturbed by the uncertainty of the future. Sheep are generally satisfied with the rather poor grass which is found at the highest limit of the alpine pastures, and which they graze right down to the roots. In consequence, the weakened plants find it difficult to renew their growth; the shallow layer of arable soil is less solidly held together by the web of roots and is quite often removed by erosion. Year by year, the mountains are encroaching on the pastures, which fact often compels the mountain-farmer to leave the district, as the alpine pastures constitute a large part of his resources.

Each year a part of the mineral resources of the soil is taken away in the grass grazed, and the vegetation finds the plant nutrients dwindling steadily. Certain less appetizing plants are let alone by the livestock. By degrees, species of undesirable plants of a hardier nature are invading the alpine pastures, which are thus being lost. I have, for instance, observed the extension in certain areas of very tough graminaceae, of the species

carex, and especially of tenacious shrubs such as the rhododendron, the last stage in the botanical degradation of alpine pastures.

What is the solution to this serious problem? Logic leads us to advise the replacement of the nutritional matter which has been taken away, i.e. fertilization of the alpine pastures. We shall now see that the results obtained by Mr. Richard in his experiments prove *the necessity of phosphatic fertilization.* Before going further, I would like to express my gratitude to Mr. Richard for the information with which he has supplid me for the purpose of compiling this report.

Owing to the low average temperature prevalent in the alpine meadows, the formation of organic matter is more active than its dissolution, and consequently the nitrogen content of mountain soils increases quicker than it decreases. It is a well known fact that the soil of alpine pastures is one of the richest of all in nitrogen.

2. EXPERIMENTS ON FERTILIZATION IN MOUNTAIN REGIONS AND THE ROLE OF PHOSPHORIC ACID

The improvements brought about present two essential aspects: the quantitative aspect, i.e. increase in yields, and the qualitative aspect, i.e. improved nutritional value of grass. A calculation of the economic value of fertilization is naturally necessary in order to ascertain whether this operation is worth while.

To finish with, we shall say a few words on the role of fertilization in the fight against erosion.

1. INCREASE IN YIELDS

At an altitude of 1,600 m. an application of 150 kg. per ha. of triple superphosphate leads to yields higher by 30 to 40% than those of the check plot without fertilizer.

Another trial at 1,800 m. in the Pelvoux range led to an increase of 1000 kg./ha. of hay, whilst the normal yield of an alpine pasture is 1500 kg./ha. average. During the grazing season the number of cattle feeding there has increased by 40 to 50%.

I cannot pass over, although it is a question of valley pasture at an altitude of 800 m. and not alpine pasture, an experiment carried out near Embrun, where the yields obtained with the aid of phosphatic fertilization reached 5600 kg /ha. instead of 3600 kg./ha. without, i.e. an increase of 2000 kg./ha. This experiment has been controlled afterwards when feeding milk cows. We shall refer again to it when considering the economic value.

2. QUALITY OF PRODUCTS HARVESTED

The hay harvested has been analysed chemically, and the following table gives a summary of the results.

Table 1.

Nitrogen and phosphoric acid content of some samples of hay.
(in % of dry matter)

Trial		Nitrogen	Phosphoric acid
Average of 7 low-lying meadows	T	1.50	0.42
	P	1.65	0.50
Average of 4 lucernes	T	2.32	0.36
	P	2.30	0.45
Alpine pasture (1800m.)	T	2.0	0.38
(Sample of clover)	P	3.2	1.05

T = check plot without fertilizer
P = plot having received superphosphate

These results plead in favour of the use of phosphatic fertilizers. The nitrogen content, i.e. protein content, is always higher, as is also that of phosphoric acid, which, in spite of all, often barely reaches the minimum proportion of phosphate necessary for the normal mineral food of animals.

During our visits to the experimental plots, the herdsmen asserted that the cattle were always trying to break down the fences round these fertilized plots, which fences periodically had to be strengthened. In a trial where super had been applied to an area of 1·5 ha. which had not been fenced off, the animals seemed to prefer this to anywhere else, and stayed there without it having been necessary to keep a watch on them. This observation with regard to "mineral elements hunger" had already been made to me in Bavaria, where an experimental plot to which chemical fertilizers had been applied was regularly grazed by stages which left the square absolutely bare, the limits of the square grazed corresponding almost to a centimetre to that of the plot which had been fertilized.

We ourselves were able to observe a distinct change in the flora, clover being more abundant and richer in mineral elements (see table I). This leads to an increasd protein production, and consequently to an improvement in milk production. This phenomenon was apparent even on plots living on the residue of chemical fertilizers applied the previous year.

After the thaw, the soil is sodden with water which dissolves the P_2O_5 of the superphosphate and makes it available. It stimulates vegetation, and thus the first growth of grass on the fertilized plots is about a fortnight ahead of the rest. That is why the cattle can leave the valley two weeks earlier than usual.

By its effect on the quality of the grass, superphosphate is responsible for an increase in

milk production. First of all, the reduction in yield which is always observed when the herds leave the sheds for the pasture is considerably reduced. For instance, in 1951, at the end of the winter period in the sheds, a herd was giving 168 litres and only 147 a month later on the alpine pastures, i.e. a difference of 21 litres. The following year, the alpine pasture having been fertilized, this difference became 9 litres only-164 litres before, and 155 a month later.

Quite definitely, the increases in milk yields are solely due to the better quality of the hay.

Here is the experiment carried out near Embrun (Hautes-Alpes) where a herd of 4 cows gets 15 kg. per day in the sheds, this hay varying in origin and consequently in quality from one week to the next. Table 2 summarizes the results obtained.

Table II.

	Nature of the hay — origin.	Daily yield from. 4 Cows.
1st week	Check plot without fertilizer	35 litres
2nd & 3rd weeks	Hay having received P_2O_5	40 „
4th week	Check plot without fertilizer	34 „
5th & 6th weeks	Hay having received P_2O_5 & K_2O	36.4„
7th week	Check plot without fertilizer	32.4„
8th & 9th weeks	Hay having received P_2O_5, K_2O & N	33.8„
10th week	Check plot without fertilizer	29 „

The decreases in yield correspond to the reduction in production during lactation.

Improvements in yield:

with P_2O_5 14%
with $P_2O_5+K_2O$ 9%
with $P_2O_5+K_2O+N$ 9%

Consequently, milk production seems to be particularly affected by the quality of the hay, which is very much improved by an application of phosphatic fertilizer. It remains to be seen whether this operation is a profitable one and we shall see that it is indeed profitable.

3. ECONOMIC VALUE OF PHOSPHATIC FERTILIZATION

This economic value has been calculated on the experiment carried out at an altitude of 800 m. with the resultant increase in yield of 20 hectokilo/ha. of hay. When this additional yield has been sold, taking into account the cost price of the fertilizer, it increases the farmer's income by 25%, provided he sells all his hay.

But this increase in revenue is 2-5 times higher if the farmer feeds this hay to his milch cows

at the rate of 15 kg. per head per day (14,000F/ha. instead of 5,500). One must once more emphasize the essential role of superphosphate as an outstanding agent in the improvement of the quality of vegetable products, as Prof. Svanberg pointed out during his lecture to the Agricultural Committee in Stockholm.

4. EROSION

By stimulating vegetation, superphosphate furthers the development of the grass roots which hold together the shallow gravelly soil along the slopes. In this manner, pastures are preserved which otherwise would be carried away by erosion.

III. PROBLEMS PRESENTED

Whilst it is relatively easy to demonstrate the advantages of phosphatic fertilization in mountain regions, it is, however, more difficult to transport fertilizers to the alpine pastures. Distances are very great, the differences in altitude are considerable, and often there is no road. Certain Municipalities in France, far too few, have erected light cables leading from the valleys up to the alpine pastures, mostly for the transport of wood; these cables can be used for the transport of various materials, fertilizers amongst them. In Switzerland and Austria, it seems that this method is extensively employed and is completely satisfactory.

Moreover, in order to obtain a satisfactory milk yield, the herds must not be taken too far away. A satisfactory solution to this problem has been supplied, as we have seen, by the co-operative sheds, erected at an altitude of 1800 m. and equipped with mechanical milkers. A cable enables the milk to be sent down and the churns to be sent up again. Thus extensive areas of rich pasture land can be utilised in a rational manner.

CONCLUSION

The soil of the alpine pastures has been so much impoverished by extensive grazing, repeated however year after year for centuries, that the need to find a remedy for mineral deficiencies is an urgent one. The experiments carried out by Mr. Richard are conclusive, phosphatic fertilization can improve both yield and quality of the hay, up to the present, very mediocre. We have, in the first paragraph mentioned the special wealth in nitrogen of the alpine pastures. Consequently, the mediocrity in yields and in the quality of the products obtained can only be attributed in the first instance to the lack of phosphoric acid, the *foremost factor limiting fodder production* in the alpine pastures: hence the inference "the preponderating role of phosphatic fertilization in mountain pastures."

From the I. S. M. A. Agricultural Committee News Bulletin, P. E 31, Oct '53

THE VALUE AND CONSERVATION OF CATTLE URINE

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THE present food shortage in the country indicates in a large measure the shortage of plant food elements in our soils which have been constantly removed from them by cultivated crops for a long time. The average wheat crop for instance removes 40-50 lbs. of nitrogen. 20 lbs. phosphoric acid and 60 lbs. of potash per acre. Progressive depletion of these nutrient elements without adequate replenishing by way of manures or fertilizers has reduced the crop producing capacity of our cultivated soils to the lowest level in the world. The process has particularly affected the nitrogen status of the soils, which element constitutes a vital material for the synthesis of proteins in plants. A total nitrogen content of less than 0·05% generally present in Indian soils indicates dangerous limit of soil exhaustion which calls for correction as a first priority for normal growth of crops. Experimental evidence has shown that increased yields ranging from 20-100% and over are obtained by the application of about 40 lbs. of nitrogen per acre in the form of inorganic fertilizers like ammonium sulphate. It is therefore necessary to explore all sources of nitrogenous materials which can be used as manures to make good the primary deficiency of this element in our soils.

CATTLE URINE AND ITS SCOPE

A valuable source of a nitrogenous manure available at the door of every cultivator is the urine voided by his cattle. About 12 lbs. of this are excreted daily by an animal; from this it is estimated that the 182 million cattle heads in India can make available annually about 2·9 million tons nitrogen, 3·37million tons of potash and some 10,000 lbs. of phosphoric acid. This quantity of manure could meet the requirement of about 160 million acres of cultivated land and assuming on average response of 10 lbs. per lb. nitrogen, the resulting increase in yield would be of the order of 29 million tons. These calculations indicate the potential capacity of this source of manure and are given to emphasize its value. It is, of course, impossible to estimate what proportion of these impressive totals is regularly finding its way back to the land, but it is clear that a considerable proportion is lost.

The dung fraction of the animal excreta has not been taken into account for the practical reason that a good proportion of this is being utilized as fuel by

cultivators. Apart from this the manurial effect of dung is comparatively low and slow. This is due to the fact that urine contains the simple water soluble compounds obtained from the digested food while dung represents the undigested and chemically complex residues which have resisted the action of the stomach acids and enzymes. Urine is thus the more useful fraction of animal excreta the utilization of which warrants attention of every conscientious farmer.

DEFECTS IN THE EXISTING METHODS OF COLLECTING URINE

Although the superior manurial value of urine is generally recognized, practical difficulties in the collection and conservation of a liquid manure of this type have largely stood in the way of its utilization to any appreciable extent in agriculture. The chief defects in the existing methods of collection of urine are briefly discussed below.

(*i*) In *katcha* cattle sheds which are more commonly to be found in India, urine is allowed to soak in the earth. For greater efficiency loose earth is some times spread under the cattle for this purpose. It must however be remembered that urine is easily decomposed by micro-organisms present in soil and the valuable nitrogenous compounds lost by volatalization as ammonia. The characteristic smell in cattle sheds only indicates this constant loss of nitrogen taking place. Experiments conducted in this Institute showed that over 75% of the urine nitrogen may thus be lost. Urine earth dug out from cattle sheds after a period of time may have very little manurial value and this method of collecting and conserving urine is therefore unsatisfactory.

(*ii*) Litters of straw, leaves and such other materials spread in cattle sheds also serve to absorb urine but as has already been indicated urine soaked litters are apt to lose nitrogen by the decomposition of urine which sets in fairly quickly. Ordinarily, while litters of this type are good absorbants, they are not efficient for the purpose of conservation of urine and the major part of the manurial value may be lost as in the case of soil.

(*iii*) Urine soaked litters lose additional nitrogen when they are carelessly dumped in exposed heaps for the preparation of farm-yard manure or compost. It has been found in numerous experiments on this aspect that 50-60% of the nitrogen initially present may be lost in the process of decomposition of mixtures of straw, urine and dung. This loss falls particularly on the urine fraction so that the final manure obtained contains only a small proportion of forms of nitrogen which plants can assimilate. It is therefore important to carry out the preparation of manure under controlled conditions,

suggested later, to reduce such losses to a minimum.

(*iv*) In *pucca* cattle sheds provided in some dairies, the liquid cattle shed washings including urine get collected in a cess pit specially provided for this purpose behind the shed The pit is cleared after a few days when it is full, the liquid manure being either sprinkled over compost heaps or just disposed off on some nearby area. Decomposition of urine sets in fairly quickly in such cess pits and by the time they are cleared, appreciable loss of nitrogen takes place invariably. The manurial value of this liquid manure is recognized and in some countries the labour of carting it in barrels and clearing it on cultivated lands is considered worthwhile.

METHODS FOR FULLER UTILIZATION OF URINE

The observations given above point to the susceptibility of urine to decomposition and loss, alone or in contact with the ordinary litters and in manure heaps. In order to derive fuller benefit from the simple water soluble compounds of plant food elements in urine, it is therefore desirable to conserve this fraction separate from dung and not put it in manure heaps to ferment. Experiments conducted at the I.A.R.I. showed that saw-dust used for soaking urine possesses the exceptional property of preventing its decomposition and retaining quantitatively the nitrogenous compounds in their original form. This material could thus be used with profit as litter in cattle sheds wherever available to keep the shed free from any smell as well as for conserving urine effectively. Saw dust also has the advantage of possessing a large absorbing capacity—about 400% by weight and is thus a highly efficient material as an absorbant for urine. The urine soaked saw dust may be used directly as manure or dried and stored for use when required.

Experiments on this aspect showed that soil and straw to which 20% superphosphate was mixed retained urine without decomposition. This suggests that where earth or straw are the litters available for use, mixing of superphosphate with these would enable urine to be conserved efficiently. The urine soaked litters need not be put in manure heaps to ferment and as already indicated could be used as manures directly or dried and stored.

Decomposition of liquid urine has been found to be completely checked in the presence of 0·5% mineral acids. Where arrangements exist for collection of cattle shed washings in cess pits, addition of small quantities of commercial hydrochloric or sulphuric acids would ensure against loss of nitrogen during the period of storage and the liquid could either be utilized as

such or sprinkled over prepared heaps of dry leaves, straw and such materials and allowed to dry in thin layers.

An efficient method of collection and conservation of cattle shed washings from *pucca* or *katcha* cattle sheds in which arrangements exist for the liquid manure to be led out of the shed by a channel was tried at the I. A. R. I. A pit 20 ft. × 6 ft. × 2½ ft. was dug behind the cattle shed which was then half filled with dry leaves and straw. The cattle shed channel conveying the liquid washing of the shed to the cess pit was then redirected and brought to the edge of the pit. A metal channel 6 ft. long was connected with this at the pit edge. with the other and placed in the middle of the pit. The pit was then further filled with straw and leaves and finally sealed up with a 6 inch layer of earth on the top. This arrangement provided for directly conveying the cattle shed washings inside the pit and there soaking the dry leaves and straw. The collection of liquid manure in this method takes place in absence of air and so ensures more thorouh conservation than is possible otherwise. To pits adjoining each other could thus be run for absorbing all the liquid, the material from the saturated pit being cleared and dried, whil the other is in use.

BOILER ROOM INSTRUMENTATION

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THE case for process instrumentation and its economics has been well advocated recently. The problem of operating a boiler plant economically consistent with good performance depends on efficient operation of the boiler and elimination of waste.

To secure from a steam generating plant high efficiency and continuity of operation, it is necessary to have reliable performance records. These day to day records help "trouble shooting" and indicate also possible changes in operating procedure to improve performance. An increase in the cost of steam may be the result of high fuel prices and low boiler efficiency or greater steam demand without good reason. The cause can be easily traced with the help of proper instrument reading.

Evaporative tests are carried out to check boiler efficiency, and calculations are made of production costs of different fuels at different operating conditions. Here again, instrument readings form the basis. If an operator's understanding of their use is limited, then as an investment, the instruments will be a total oss and their upkeep is wasted expenditure.

To check boiler efficiency the heat input and heat output should be measured-the heat input from the fuel consumed and heat output from steam produced. To improve efficiency the preventable losses should be diminished. As we know the losses due to improper combustion from a large slice.

Even without automatic controls, thefollowing instruments are absolutely essential. An understanding of their underlying design and operating principles is necessary for intelligent use.

1. CO_2 Recorder

The CO_2 recorder guides in adjusting the fuel to air ratio so as to regulate minimum excess air. The aim is to obtain a maximum CO_2 reading. The recorder may be operating either by chemical analysis like Orsat analyser or on the Wheat stone net principle.

At times, a combined CO_2 and $CO+H_2$ recorder is used. Similar to the CO_2 recorder, it operates by either the principle of absorption or electrically. In the electrical method, the oxidation of the reducible gases in the presence of hot platinum wire is accompanied by evolution of heat, raising the temp. of the platinum wire which forms one of the arms of the Wheat stones net. This results in the variation of its resistance and hence measurement.

With the use of mixed fuels suggestions are being made for use of an O_2 recorder instead.

2. Steam Flow-meter

A steam flow-meter recording as well as total using the output of the boiler indicates the output of the boiler and unequal distribution of load can be easily seen. This meter works on the differential pressure principle.

3. Feed water meter

This measures the input of the feed water to the boiler. This will aid in adjusting the rate of water feed to the rate of steam generation.

4. Fuel meter (or Air flow-meter)

The need for it is obvious. The boiler itself is used as an orifice and the pressure across part or whole of it is a measure of air flow.

5. A Steam pressure recorder and temperature indicator or recorder

In case only saturated steam is produced the temperature indicator will be superfluous.

6. A Thermometer, for feed water temperature.

7. Draft gauges

These give a complete picture of the draft conditions. These may be adjusted for best combustion efficiency.

8. A recording thermometer for flue gas temperature

It is a measure of heat loss through the flue gas. A record of flue gas temperature when coordinated with steam flow-meter is of considerable value in checking heat absorption efficiency of a boiler. It is one of the best indicators of inside and outside conditions of boiler tubes. A coating of scale on the inside of the tubes or a covering of slag or soot on the outside prevents the maximum amount of heat being transferred. Blowing the soot often results in a temperature drop of 50° to 100°F in the flue gas. A unique method of having a constant check on the efficiency of the boiler is to have both the steam flow-meter and air flow-meter together in one instrument, having two pens. It may be so adjusted that at maximum combustion efficiency, the pen recording the air flow is coincident with the pen recording steam output. Under ideal operation, the paths traced by both pens will be same.

Large boilers have boiler water level recorders and others have only indicators to facilitate noting of level at floor level.

NEED FOR AUTOMATIC CONTROLS

Automatic control is no longer a luxury in industry. On the contrary correct incorporation and use of automatic controls in a process is often vital to its success. For example, automatic controls are the tools for

the operating personnel to operate the boiler units continuously at test efficiencies regardless of variations in fuel, load and other factors. To maintain close control a number of repetitive adjustments have to be made. This is especially so in modern boilers with comparatively small water storing capacities but high combustion rates, which render them highly sensitive to load fluctuations. Moreover the size of the modern boiler is large with the result the auxiliary units are widely separated. Accurate hand control becomes cumbersome and sometimes physically impossible.

The basic problem is the control of heat input to the boiler to balance the steam off take. Certain fundamental problems should be considered first.

They are,

(1) Steam pressure control
(2) Combustion control
(3) Furnace Draft control
(4) Feed water and boiler level control.

1. Steam Pressure Control

Certain machines and equipments are designed for particular steam pressure. The problem of their control becomes complex if the steam pressure is allowed to vary.

With an increase in demand of steam, the pressure in the steam header falls and vice versa. The maintenance of constant steam pressure indicates the rates of generation and consumption of steam are balanced. The basic problem is to maintain this balance. Thus the variation of steam pressure forms the impulse for the automatic combustion control and hence should be discussed along with it.

Combustion control, essentially, consists of the maintenance of proper fuel to air ratio, which will give maximum combustion efficiency. It has been already pointed out that improper combustion forms a large slice of the available losses. In order to maintain a proper fuel to air ratio certain requirements must be met.

A variation in the rate of fuel feed must accompany a proportional change in the rate of air flow. Both the variables have to be measured. It is not sufficient if a mechanical linkage is provided between the fuel feed regulator and the damper. Such linkage cannot provide proportionate changes throughout the operating range. Moreover the fuel-air ratio must be capable of being varied at the discretion of the operator, as this varies with fuels. Finally the fuel feed and air-flow should cope up with the varying demand of steam and maintain a constant pressure in the steam header.

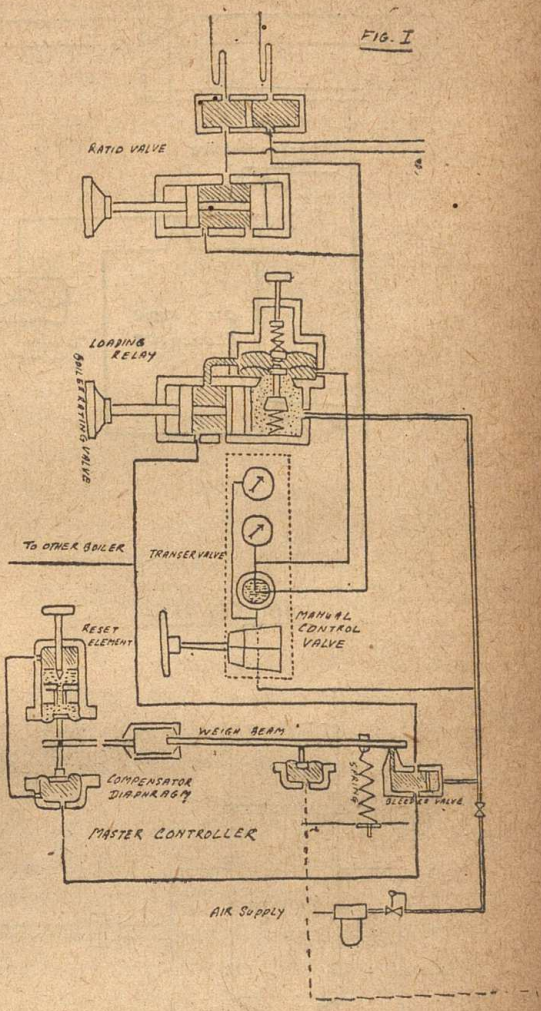
Now we shall see how a simple controller works: (Refer Fig.1)

As mentioned above, the impulse is obtained from the steam pressure, which varies with boiler

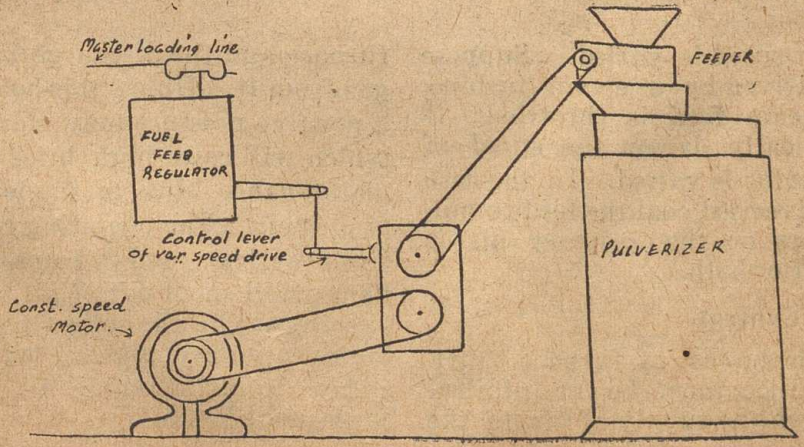
load. This impulse is transferred to a "Master controller" which contains a pressure element (it may even be a Bourdon tube). This pressure element operates an air pilot valve setting up an air pressure depending on its position. This air pressure called the "loading pressure", regulates the air and fuel regulators.

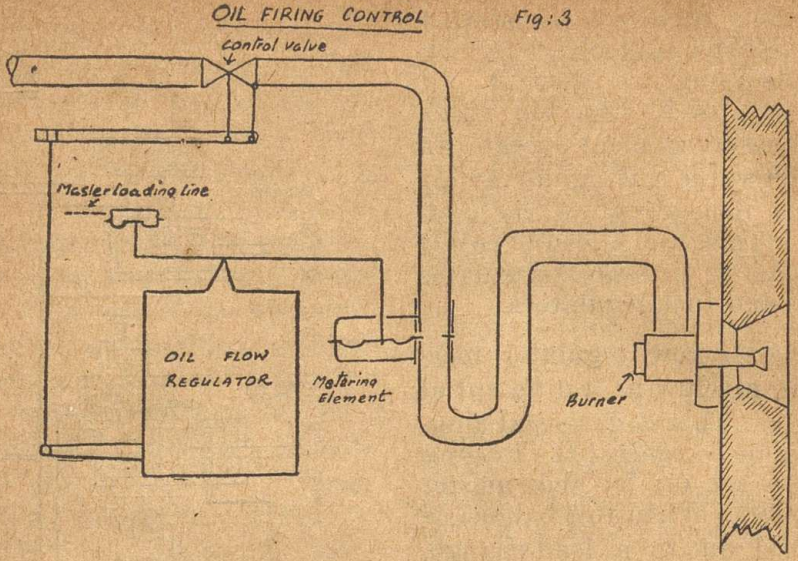
The air flow regulator measures in air-flow as a differential pressure. This differential pressure balances against the loading pressure set up by the master controller. When this balance is disturbed due to a load change, the regulator operates such that the draft is varied till the new differential pressure brings the regulater back to normal.

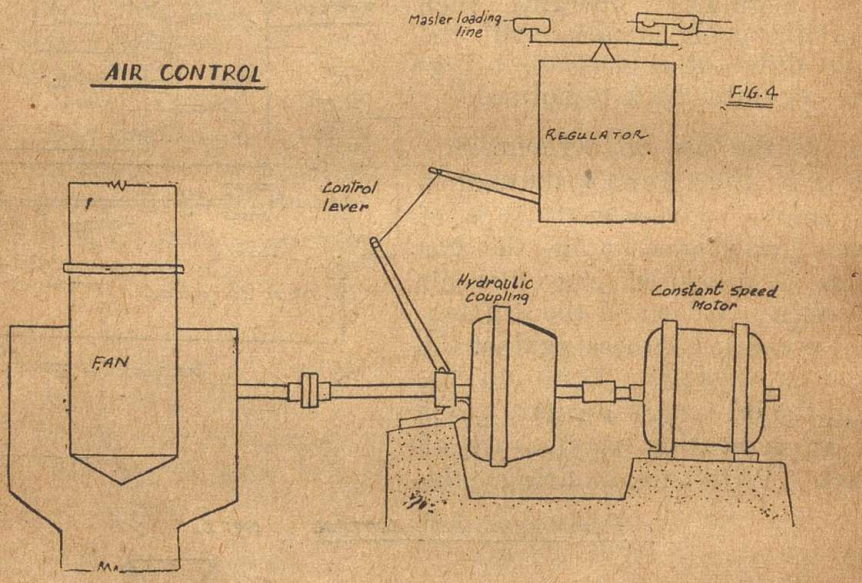
In the case of fuel regulator, (Fig. 2) (Figs. 3 and 4) the method of control varies with type of fuel. With gas firing, the gas flow is measured just like air across an orifice and the differential pressure balances against the loading pressure. With oil firing, the oil supply pressure itself is an indication of its rate of feed. With stoker firing, the



PULVERIZER FEED CONTROL Fig: 2.







stoker speed is varied. Suppose it is driven by a steam turbine, the steam feed is throttled. If electrically driven the speed of the motor is varied. In the case of pulverised coal the feed to pulverisers or the primary air is cut off or both.

Draft Control

In the case of furnace draft, a balance must be maintained between the supply of air to the furnace and the discharge of flue gas from it. Unless this be done, a positive pressure may develop, which will cause high brickwork maintenance due to flame impingement. The operating conditions will be rendered unsafe as flames will shoot out of all boiler openings. On the other hand a highly negative pressure will increase infiltration of air and consequent losses.

So it is essential to maintain the furnace draft at an optimum negative pressure.

Essentially the equipment is a prsesure regulator. A diaphragm responding to the furnace pressure, positions an air pilot valve. The air pilot valve is connected to both the sides of a piston connected by linkage to a damper. This damper cont ols the induced draft if air regulator operates the forced draft and vice versa. The draft may also be varied by varying the speed of the forced or induced draft fan.

Boiler Water Level Control

Basically the problem is to maintain the water level in the boiler drum without undue fluc. tuations in the feed water flow. The earlier low pressure boilers were operated with visual check of water level as seen in the gauge glass. As already mentioned the water capacity in the boiler drum is comparatively small, the introduction of the water walls, etc. Higher steaming rates are possible thanks to the use of gaseous and liquid fuels. Surges may be set up in the boiler, affecting the operation of economiser and superheater contributing to priming and even to carry over to superheater and steam heater. Not only this, the boiler steam pressure may be affected which throws out of gear the equipments of combustion control. Undue fluctuations in water feed will affect the operation of the feed water heaters and feed water pumps. In short a swing in the boiler level may produce a swing in the operation of the entire boiler.

In a boiler producing steam, there is constant ebullition The steam bubbles cause the water to "swell" in which case liquid level is not a true indication of amount of water in the boiler. When there is a sudden drop in pressure in the steam header, the rate of ebullition increases, which produces a "swell", which may be interpreted as a rise in level by a simple level controller and feed rate will be decreased whereas it should actually increase. This problem of "swell" is more pronounced in the moderately high pressure boilers. In the region of pressures like 1200 lbs./sq inch the effect becomes negligible.

A three element controller is used for boilers other than those operating at very high pressures. Both steam and water flows are measured and both operate an averaging relay which positions the feed water valve. A water level controller also acts on the averaging relay. When rates of steam generation and water feed are balanced, the effect of the steam and water elements average out and the level controller acts depending on the level. With an unbalance in the generation of steam and water feed, the relay controls the feed water valve till the balance is regained.

A simpler set up is used with boilers which suffer only from moderate load changes. The feed water elements is dispensed with. The steam flow element controls the relay depending on steam demand. As before the level controller maintains level.

THE PROBLEM OF WAGES

V. V. SUBRAMANIAM

MAXIMUM efficiency in industry does not flow from modern plant alone. A contented labour force is a gilt-edged asset which invariably makes for the smooth working of the unit by a sounder spirit of co-operation and ultimately brings in higher output at lower cost.

What can industry do to have such a labour force? Since workers are also consumers and are occupied with maintaining a standard of living, money normally is among the positive incentives to them. It therefore follows that the adoption of a sound wage structure would go a long way in ensuring industrial peace. I would briefly discuss the subject of wages in the following paragraphs.

For a very long time till the recent world war, wage rates were pitiably small in the country. Labour was treated of as a commodity i.e. wages were high when the supply of labour was scare in relation to the demand and wages were low when the supply of labour was substantially in excess of the demand. One of the aftermaths of war was the rise in prices of the various commodities. Consequently labour began to demand increased wages. The coming into existence of the National Government saw a spate of legislations for the general welfare of labour and stricter enforcement of these acts. Due to the unsettled economic conditions, disputes regarding wages were numerous. Government very promptly began referring such disputes to Industrial Tribunals. The result was, wages rose at a steadily increasing pace, but prices were rising too, and there was no substantial benefit to the wage earner until this day. The percentage of wage increase was small when compared with the increase in the value of food stuffs and other essential articles. Minimum rates as contemplated under the Minimum Wages Act are also being gradually fixed in various industries keeping in view the factors enumerated by the Fair Wages Committee for fixing wage rates, viz., productivity of labour, prevailing rates of wages in the same or similar occupation in the same or neighbouring localities, the level of national income and its distribution and the place of the industry in the economy of the country.

The time is now ripe for employers to realise that the partnership conception of labour is the only solution to cure industrial ills. They should rise above the interplay of temporary factors such as the chaffering of the market, weak bargaining power of

labour etc., and rest upon the concept of fairness and justice in the matter of fixing wages. Both capital and labour must understand that this vexed wage problem is the main obstacle in the way of sound industrial relations. Some of the far sighted employers have already taken steps to tackle this vital problem in a scientific manner by linking wages with production so that the never ending conflicts arising day in and day out and pending dicisions by Industrial Tribunals may be settled once for all and thereby bring everlasting peace in industry.

The principles that should govern a sound wage administration are (a) Wage policies should be carefully developed having in mind the interests of the employers, employees, consumers and local community. (b) Should be developed after having a frank discussion between employers and employees and after evolving an agreed solution on all the points discussed or in other words full concurrence of the two partners in industry should be secured beforehand. (c) Should be clearly expressed in writing to ensure uniformity and stability. (d) Should be re-evaluated from time to time to make certain that they are adequate for current needs and (e) Should be in such a way as to raise wages that are too low and to curtail those that are too high.

Sound wage practices recognize the need for a direct tie up between performance and reward i.e. the wages paid to an individual is adjusted accurately to the importance of his work and to the effectiveness with which he performs it. But it is rather difficult to achieve this kind of balance. One departmental head may use more pressure on management for wage increases to his subordinates than another departmental head. An employee who very often grumbles for rate increase may sometimes get increase. The result of all these will be glaring injustices viz. the reward that should go to the efficient workers would go to those who press hard. If only wages are paid according to performance, will there be economic justice and greater incentive to the employees to do honest work. With a view to remedying the above mentioned defect in the wage structure, industrially advanced countries have adopted a scientific scheme of job evaluation and merit rating. Sometimes due to general economic conditions readjustments of wages may become necessary and these are generally done on a percentage basis. Wage increases to individual employees should be granted by managements of their own accord without waiting for requests from employees. In such a situation the psychological effect on the workers will be stimulating. They will work with renewed zeal hoping that managements will give due recognition of their merits and both labour and management reap the

rewards. Sometimes employees whose work do not entitle them to increases in wages may make requests for increases. Such requests should not be treated lightly. The employees concerned should be called for and told in a diplomatic manner that their performances at the time do not entitle them for wage increases and that they have to do better work for increases. Such a procedure will induce the employees to do their work with more enthusiasm and may in turn bring them increased wages.

Job Evaluation and Merit Rating are the scientific methods used in U. S. A. and other industrially advanced countries for proper rate setting. The principles generally followed are (a) Adoption of wage scales that fit the job demands, (b) Keeping rates in line with those in other industries in the community and area, (c) Keeping rates in one department in line with rates in another department within the same plant, (d) Seizing up how jobs stand in relation to one another and (e) Seizing up the employees' performance of a particular job in terms of the requirements of that job. The different jobs are evaluated based on skill (education, experience and initiative and ingenuity), effort (physical demand and mental or visual demand), responsibility (for equipment or process, material or product, safety of others and work of others) and job conditions (working conditions and unavoidable hazards). Wage increases within the rate range, promotion to higher rated jobs, transfers, etc. are given by merit rating based on quality of work, quantity of work, job knowledge, dependability, aptitude and attitude. The advantages of job evaluation and merit rating established on an impersonal, factual and scientific basis are the following. It provides a fair day's wages for a fair day's work, shows the relative value of jobs, eliminates inequalities of wages for similar work and establishes minimum and maximum rates for jobs and employees are moved towards maximum rates according to their ability, skill and general qualifications.

The more common wage plans are the time rate, the piece rate and the time rate plus a bonus for peformance above standard. The time rate plus bonus plan is of recent origin in India. A few first class concerns who have adopted this plan have found that the plan works very satisfactorily bringing in increased production and sound labour-management relations. This plan may be tried in other industries also but before introducing the production bonus scheme standard time rates on the basis of job evaluation and merit rating as described above should be fixed. The plan should be well-thought-out, easily understandable and acceptable to labour. The practice in India

hitherto had been to give annual increments to workers. According to the job rating scheme wages are linked with performance and thereby the system of granting annual increments gets wiped out. This should be clearly explained to labour as otherwise trouble may arise when the plan is put into operation. I think it won't be out of place here if I just give a warning to the supervisory staff who generally do the ratings that in evaluating the jobs as also in evaluating the employees' performance on the jobs, they should be frank, sincere and impartial and should judge independantly and finally give a fair and square opinion. Employers should often be emphasising that the value of the personnel ratings depends entirely upon the fairness with which the ratings are made and that personal likes, dislikes, snap judgments or superficial informations should be eliminated. Failure to evaluate accurately will lead to trouble and discontent among labour.

Government too have got to play a great part in the problem of wages. They should be keenly watching the price structure and should leave no stone unturned to bring down the soaring prices of essential commodities. Then only a satisfactory solution of the wage problem can be evolved. If the rise in prices are not checked the rate of wages may have to be revised or the present dearness allowance paid for high cost of living should be revised. In western countries wages are raised or lowered according to changes in economic conditions and no system of paying dearness allowance is prevalent in those countries.

No industry that has set out to establish a sound wage structure has regretted it and none that has not done so with faith and imagination has prospered

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Cart versus Car

A bullock-cart is very safe to drive and it will never knock a man down in the street. On the other hand a car inspite of its greater usefulness and efficiency, if driven by unskilled hands will be a source of danger. But, for this reason, no one would ever think of starting a campaign against motor-cars and try to drive them off the road.

In the same way bulky organic manures are safe to apply but have only limited capabilities. The fertilisers, however, have a greater potentiality to increase yields; but some skill is needed in using them properly. Even the best organised campaign can never succeed in preventing an ever increasing use of these materials. Time marches on!

Madar Floss—Some Observations

JOHN PHILIP, B. A. B. Sc , Chemical Control, FACT Ltd.

Madar (calotropis sp.– Erikku in Malayalam) is a plant that grows wild on almost every soil in India. Though it blossoms all through the year, fruits are borne only in summer. The pericarp of the fruit violently bursts in two when dry and the seeds, with the broom–like appendages, are flung around. The seeds are then airborne and scattered far and wide

The broom–like appendages of the seeds are the "floss" of the madar. The floss has got a silken gloss about it that makes it highly attractive. But the pity of it is that the virgin floss, as it comes out of the dry fruit, is rather very delicate and so breaks at the slightest pressure. Having thus practically no tensile strength, its fibres do not lend themselves to spinning into yarn. The fibres are, hence, lost to the textile world.

Nevertheless, the floss is serviceable in a different way. Used for stuffing pillows, mattresses and similar articles, it finds some practical application. It is estimated that "at present about 12,000 maunds of floss are collected per year, of which more than half is exported. The most important centre of the trade is Hathras in the Aligarh District of Uttar Pradesh. The floss is a natural economic raw-material and a proper organization for its collection in villages can provide part-time seasonal work to a good fraction of the under–developed population." (vide, "Journal of Industry and Trade", May, 1953.)

It is simply unthinkable that the madar floss that has got such a highly silken appearance, should be lost as a textile fibre. It is high time now to subject it to systematic research to see if it could be processed for use as a textile fibre. I, for one, have observed certain things about it in my cursory investigations.

Instead of allowing the fruits to dry up on the plant itself, pluck them (care should be taken not to spill the poisonous sap in the eyes) while they are still green and yet ripe enough or when the green tinge just begins to fade. Let the plucked fruits dry up in the shade. Sufficiently ripe fruits will automatically burst when they get dry. Do not allow them thus to burst on their own accord. Before attaining the stage of bursting, press the fruits between the fingers and when the pericarp parts in two, carefully scrape off all the seeds (ripe seeds will be black) and put the floss in an open basket. The floss will automatically expand and separate into fibres. The fibres

Mr. K. C. Ahamad of Etathala at whose farm we ran a very successful demonstration farm. The crop, ready for harvest has lodged and is lying at his feet.

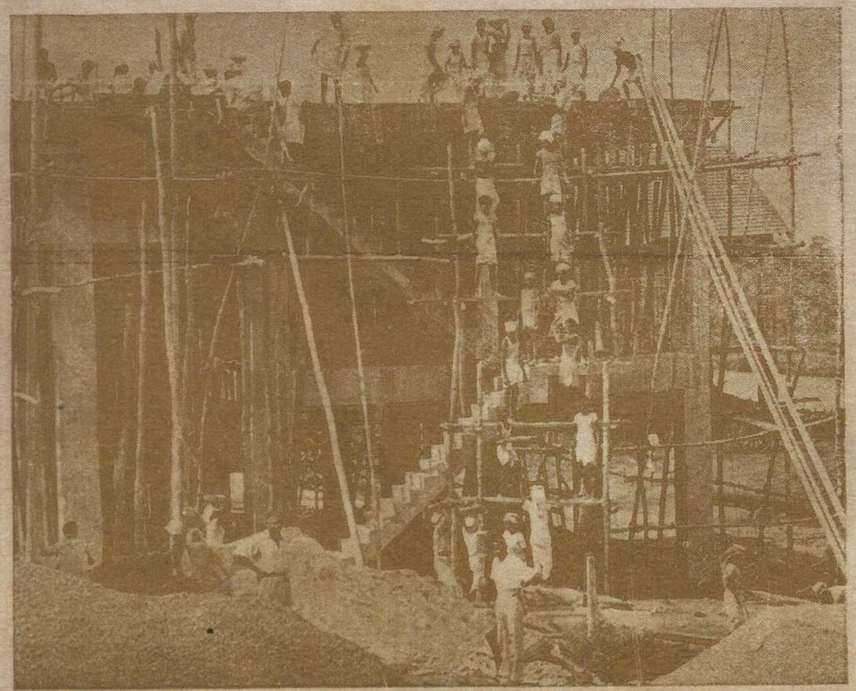
A close-up view of a bumper crop raised in our Experimental Farms. The seed is a new variety of Jeerakathari. The crop gave out an yield of 4556 lbs. of paddy, per acre.

Our Ammonium Chloride Plant-Progress Photos

(The photos published below reflect the rapid pace with which the new project is pushed through to its final completion)

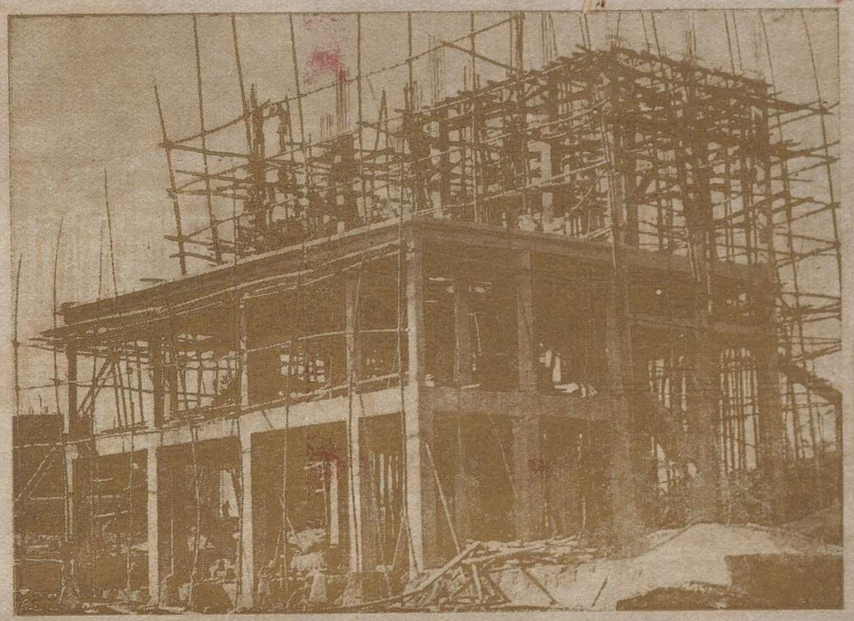
(1)

Front view of the Chloride Plant building when it has reached the first floor level of the Plant Building. Photo taken on 16th Nov. '53.



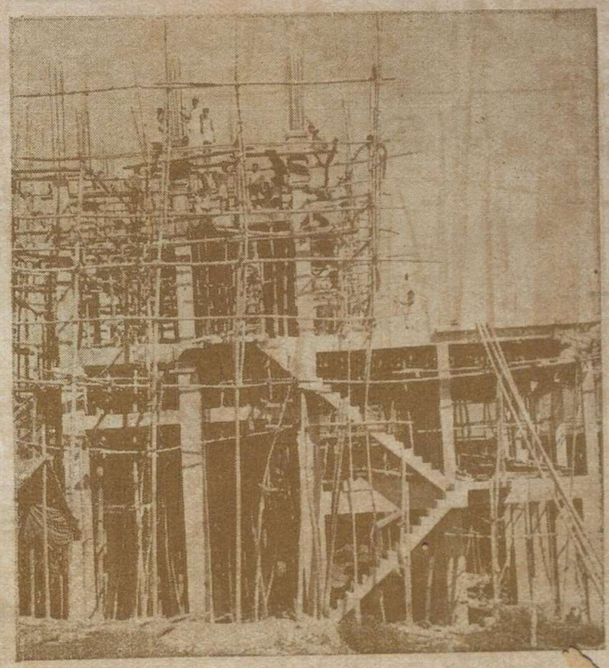
(2)

Concreting of the first floor of the Plant building and top floor of the Storage building in progress Photo taken on 16th November, '53.



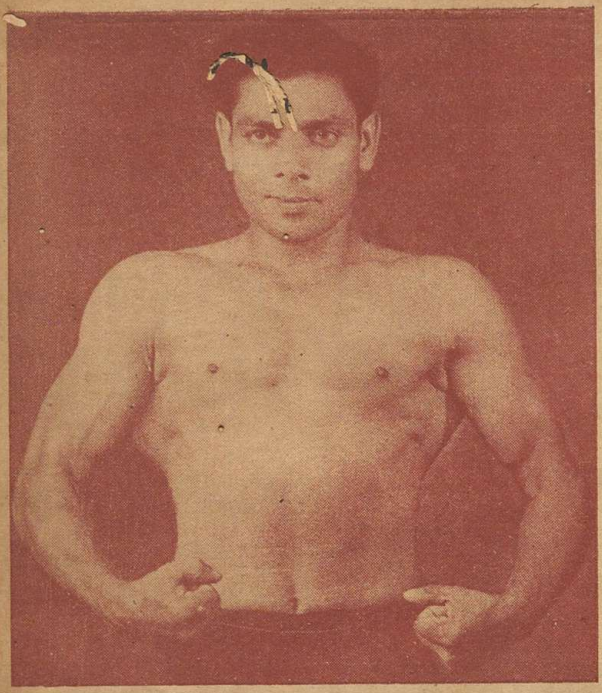
(3)

A view of the Plant from the river side. Concreting is in progress for the columns above the first floor. Photo taken on 23rd Nov. 1953

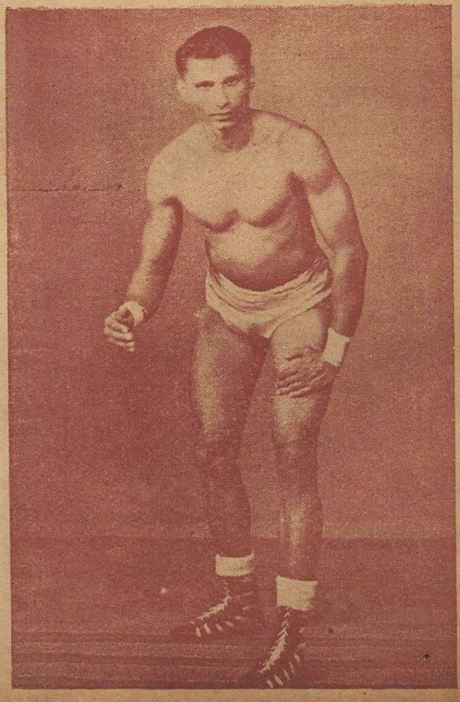


(4)

Columns above the first floor level of the Plant building being cast. Photo taken on 23rd Nov. '53.



Mr. Ittanpillai of the Maintenance Dept. who had been awarded the title of Mr. FACT for the year, 1953.



Mr. Gopalan of the Welding Section, one of our outstanding athletes.

thus prepared are found to be stronger and amenable to spinning into yarn.

Immersion of this fibre in caustic soda solution gives it greater pliability and the spun yarn does not exhibit too many intractable fibres jutting out here and there. But the caustic is seen to impart an unwelcome brownish tinge to the fibres.

The mada floss, being thus amenable to change for the better, I am of opinion that it could be tapped for service to men as a good textile fibre with a gloss that can match silk. Centres selected for Community Project Schemes could benefit by this if a proper drive is made in this direction.

We Know Now!

Take a living plant and reduce it to its elements; it will bef ound that water is the most important constituent; next comes carbon. Of the dry matter of the plant fully half is carbon; oxygen and hydrogen compose most of the remainder with a few of other elements, one of them being nitrogen. The amount of nitrogen is small, being only about one-fiftieth of the dry matter, yet it is so important that no plant can exist without it. The remaining ash is formed of a number of other elements, phosphorous, silicon, chlorine and the metals potassium, sodium, calcium magnesium, iron and manganese.

Highly interesting, no doubt, you may say, yet crops were grown long before people had any knowledge of these facts. Our ancestors also used manures to make their crops grow. That is true, indeed. Such things as dung, leaf-mould and chalk were used from time immemorial, but they were used blindly!

SEEING IS BELIEVING

T. S. R.

Service

Our readers are aware of the fact that we have been running an extensive demonstration farm in Elur near our Factory. In this farm we have been trying out scientific method of cultivation and we have also tried out new varieties of seed such as these received from Siam and China. We have periodically published reports regarding these trials. These published notes have attracted the attention of numerous interested farmers from whom we are daily receiving letters with a request for small quantities of these seeds. It has been our great pleasure to gratify these requests; we have been distributing these high quality seeds to the agriculturists both in and outside this State. We have received detailed reports about their performances and we have published in these columns some of these reports. Lately we have been doing intensive work in the national task of popularising Japanese mode of rice-culture. We have published a pamphlet on this topic for distributing to interested farmers.

Soil Testing

In addition to this work we undertake soil analysis and recommend suitable scientific operations to rectify the defects and deficiencies in a farm-soil. We are getting a regular flow of soil samples which we subject to thorough analysis and send out technical reports. We have received thankful appreciations from many pace-making farmers who have been benefited by these advice.

But

In spite of a wealth of experimental evidence to prove the superiority of modern scientific farming which necessarily involves the liberal use of fertilisers, yes, inspite of all this, there is still some lingering scepticism amidst a substantial fraction of agriculturists regarding the continued use of fertilisers. This scepticism is born of age-old conservatism and unless this is removed the farmers will be resisting any new departure from their usual, or rather ancient, method of cultivation, which is highly superficial.

A Decision

With a view to deal with this problem directly we decided to start a series of demonstration farms right on the farmers' fields. Though our own farms directly run by us have more than proved the efficacy of fertilisers to increase the production, it is quite likely that our figures may be looked up on with doubts. Hence a demonstration run on his own field, under his

own supervision and management will never fail to convince him of the superiority of modern methods. As soon as this decision was taken we contacted several prominent agriculturists of this locality who readily offered their fields for this work. Our idea was to raise paddy under the Japanese Mode of Cultivation accompanied by liberal uses of fertilisers to raise up the level of production. At present we are engaged in running these farms which have given promising results and we intend to increase the number of these half-field demonstrations.

We are glad to publish here the results we obtained in a few of these farms

At Etathala

Etathala is a small village situated about four miles south west of Alwaye. In this village we ran a half-field demonstration in Mr. K. C. Ahmed's farm. Mr. K. C. Ahmed (see photo printed elsewhere) is a prominent agriculturist of the locality owning extensive properties. He takes great personal interest in farming and inspite of his other engagements he finds time to run personally a substantial portion of his farm. He has installed a pump and this enables him to irrigate his crops copiously and thus he has made himself and his crops independent of the whimsical climatic conditions. When we contacted Mr. Ahmed and told him of our purpose in running a demonstration in his area, he willingly offered his lands and also promised to extend to us his full co-operation and give us all the facilities that we needed.

We selected just a few kandams of an area of 35 cents that lay in the midst of his other paddy fields. On these kandams we carried out a demonstration on the Japanese method of paddy cultivation. FACT paddy mixture was applied prior to transplantation which was performed on 25th September, 1954. The planting was done in straight rows with ten-inch-spacing and each point had maximum of two seedlings. Periodic weeding and the loosening of the top soil around the seedlings were scrupulously carried out and for doing this the Japanese hand-paw was made use of. One month after transplantation another half dose of FACT paddy mixture was topdressed. The total dose of paddy mixture applied to the demonstration plot was just 1¼ cwts. Unfortunately, the plots were flooded completely because of excessive rains immediately after the second application of our paddy mixture. Inspite of this the crop came up well. Our mixture was a balanced one supplying all the three important plant foods nitrogen, phosphate and potash. A few days after the transplantation there was a general attack in that area of paddy leaf miner and the case worm. Though most of Mr. Ahmed's crop and the neighbouring area were affected by the pest, our demonstration plot remained free of any damage.

This fact proved that because of liberal manuring the crop was coming up vigorously and it possessed high disease resisting power. Yet, to be on the safe side and to prevent any damage by the onslaught of the insect enemies we carried out control measures by dusting gammexane on our demonstration plot and the neighbouring areas. This preventive measure put a stop to all the disease symptoms in that area.

The crop was harvested on 20th January 1954 and the threshing conducted on the next day. The total gross yield obtained was 62 parahs which worked out to nearly 177 parahs per acre corresponding to 3186 lbs. a high yield indeed on a land that was usually giving a yield of 1512 lbs., an increase of 1674 lbs. of paddy. Mr. Ahmed was highly pleased at the result and we are glad to publish his remarks below:

"I am indeed very glad that the Fertilisers And Chemicals, Travancore Ltd., have selected my lands for running a demonstration farm. I am deeply impressed with the results obtained in this demonstration of Japanese method of agriculture. A high yield has been obtained and I feel confident that the yield can be still further increased by increasing the dosage of manure. I am now convinced of the capacity of FACT paddy mixture to increase yields. I will consider it my duty to recommend this mixture to the agriculturists of this locality. In my opinion it will be ideal to carry out agricultural propaganda work through the medium of village panchayats. In these days of scarcity of good and trustworthy manures I am glad to find that FACT has come out with a good fertiliser mixture to serve the agriculturists."

At Elur

Another demonstration farm was run by us at Elur in Mr. Mooppan's lands. Mr. M. V. M. Mooppan, one of the biggest land-owners of Elur, readily agreed to place his lands at our disposal. We selected a few kandams, as at Etathala, just in the middle of his extensive properties. We gave out relevant instructions for the cultivation under modern lines and we were very glad to note that these were scrupulously carried out by Mr. Mooppan. Our paddy mixture was applied at the rate of 4 cwts. per acre. The crop came up vigorously after the application of our mixture and gave out a yield of 2520 lbs. of paddy per acre; these lands usually gave out an yield of 1000 lbs. of paddy per acre. Thus we showed an increased yield of 1520 lbs. of paddy because of improved methods and manuring. This increase can be kept up so that very easily as high an yield of 4000 lbs. of paddy per acre can be produced on his lands. Mr. Mooppan is now greatly interested in these new methods and he has offered to place these kandams selected by us at our disposal for a number of seasons. We intend to continue our experiments and convince Mr. Mooppan and the surrounding farmers that modern methods pay their way.

(To be continued)

Your Queries Answered

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

Question No. 114.

What is meant by "Synthetic" farm yard manure ?

Answer:—

Ordinary farm yard manure is a mixture of vegetable and animal wastes. The litter (waste straw) in the manure decays rapidly because the decomposing bacteria are supplied with nitrogen and phosphates drawn from the animal excreta, dung and urine, which form part of the farm-yard manure. Rapid decomposition can be ensured only when the bacteria are well nourished with easily available nitrogen, phosphates, etc. If only vegetable wastes are available and no animal excreta is to be had then there will be difficulty in converting these garden wastes into a good manure, for the bacteria have no source of available nitrogen and other vital foods. To cover this difficulty a process was worked out at Rothamsted Experimental Station. In this new method the straw is mixed with nearly six per cent of its weight of what may be termed as a manure for bacteria, called '*Adco*'. After adding *adco* to the vegetable refuse the whole heap is kept moist by adding water periodically. The compost is allowed to decompose for a few months, during which the garden wastes decay quickly and get converted in a black, powdery manure. The fertilising elements in the *adco* after promoting decay remain in the manure to enrich it for crop production. This final product is called synthetic farm yard manure.

This process is particularly useful for kitchen gardeners who do not keep animals and who may find it difficult to obtain adequate quantities of stable manure.

Question No. 115.

What are the functions of lime in the soil and how it is to be applied ?

Answer:—

The following are the important functions performed by lime in a farm-soil.

1. Lime hastens the decomposition of organic matter and produces the much-needed humus in the soil.

2. Lime aids in nitrification, that is, in the production soluble nitrates, that can be readily absorbed by the plants.

3. It helps the legumes to fix more nitrogen in their root-nodules.

4. Lime removes acidity in the soil. Presence of adequate

quantities of this material effectively prevents the soil from becoming acid in reaction.

5. Lime renders insoluble iron phosphates more available to the crop.

6. It helps to make potash more available.

7. Lime opens up stiff clay soils.

8. It helps to bind up the loose sandy soils.

From the points enumerated above it can be gathered that the presence of lime is indispensable for soil fertility. Periodic additions of this material *must form* part of soil management.

In agriculturally advanced countries like U. S. A. and U K. most farmers apply liberal doses of lime once in every three years. About one ton of slaked lime or 2 tons of calcium carbonate can be applied on an acre. The lime or chalk can be dumped on the land when it is lying fallow and the heaps are to be spread uniformly. In foreign countries they use specially designed lime distributing machines.

Question No. 116.

Kindly explain what is meant by the law of diminishing returns and how it works in agriculture.

Answer:—

We know that addition of manure and fertiliser always gives an additional yield. This increase in yield is directly proportional to the addition of manures. But this is only true up to a certain point after which the yield-increase is not proportional to the increase of manures but gets depressed. The law of diminishing returns states that additional manure invariably gives additional crop, but beyond a certain point the yield per unit of manure added falls off, so that the extra crop is obtained at higher cost per ton than a smaller crop would be.

Laws and Gilbert showed that 1 lb. of nitrogen supplied as manure adds between 40 and 50 lbs. of dry matter to the crop of cereals. This does not mean that if we go on increasing the dosage of nitrogen, we will be getting proportionately more yield in an endless manner. As the nitrogen dose is increased the yield will also increase in direct proportion; but this will be true only up to a certain point after which the extra yield per pound of nitrogen will grow less and less so that progressively the production cost of this additional yield will go on increasing. The optimum level at which the extra yields start diminishing will not be the same for all soils and conditions. From this it naturally follows that for a particular set of conditions the maximum economic dose has to be actually ascertained by experimentation. Generally for poor lands this optimum level will be higher than for fertile ones.

Another point that has to be remembered in this connection is the fact that an abnormal increase in the dose of nitrogen may even turn out to be injurious to the crop. The leaves may be crinkled, the crop may lodge prematurely and the plants also become liable to the attack of fungi and insects. The yield also will be severely restricted. These things happen because the other plant foods act as limiting factors and also because the crop suffers from overfeeding of one or more plant foods.

From all these it can be gathered that the law of diminishing returns is an inexorable one which can never be set aside under actual field conditions. The economic dosages of fertilisers and manures have to be fixed after taking into account the various factors that come into play and after careful experimentation.

Question No. 117.

Is it true that ammonium sulphate resists leaching as compared with the other nitrogenous fertiliser, sodium nitrate ?

Answer:—

This is quite true. Ammonium sulphate has a tendency to stay in the soil and resist leaching by drainage water. On the other hand sodium nitrate is easily washed out of the soil. This can be readily demonstrated by a simple laboratory experiment.

Pack up a glass funnel with 50 gms. of a heavy soil which has passed through a 100 mesh sieve. Moisten with water where the soil touches the funnel and then flood the soil with a half per cent solution of ammonium sulphate. Collect the first 2 or 3 c. c. of the filtrate and apply the Nessler test and do the same with an equal quantity of the original solution. The two liquids will show a striking difference in reaction to this test. That which has passed through the soil has lost almost all its ammonia. This shows that the soil colloids have the capacity to retain the ammonia in the fertiliser.

Now repeat the experiment with a fresh lot of soil and a one per cent solution of sodium nitrate. Do the brown ring test on the filtrate and the original solution. It will be seen that the nitrate shows no diminution in quantity. This proves the fact that the nitrate is not retained by the soil but comes out with the water.

These experiments prove that ammonium sulphate is superior to sodium nitrate as the former is not easily lost from the soil and consequently the crop will be able to get more nitrogen from it than from sodium nitrate.

FACT TECHNICAL SOCIETY

The 5th General Body Meeting

The General Body of the FACT Technical Society met at 6 p. m. on 27th December, 1953 in the premises of the FACT Kindergarten School to transact business as per agenda Sixty-two members were present on that day and Mr. M. C. Verghese, Superintendent, Ammonia Synthesis Plant presided over the function.

The President welcomed the members in a brief speech and then requested the secretary, Sri. S. Sundaram to present the Annual Report for 1953.

Annual Report for 1953

Friends,

It gives me great pleasure to welcome you all to the meeting this evening.

During the year we have tried to do our best, despite quite discouraging circumstances. The total activities of the society have been confined to lectures, study classes, excursions, technical film shows and cyclostyling and distribution of technical notes. Much success could not be achieved in the arrangement of any symposium this year due to the break-up we had here for a few months.

On the whole there were six lectures this year. Mr. Lingeri of M/s. Brown Boveri Ltd., spoke on Rectifiers on 12—1—1953. Mr. K. R. Venkataraman gave an interesting non-technical lecture on Medeaval South Indian Industrial and Agricultural Organizations on 4—2—1953. Closely followed the talk by Mr. V. S. Debusset on 5—2—1953 about Developments in Formosa. After the depression of the lay-off we had an inspiring lecture by Mr. K. C. Reddy, the Hon. Minister for production. He spoke to us on 20—9—1953 cheering us by his encouraging advice. On 30-9-'53, one of our own members and well-wishers Shri B. V. D. Menon gave us a very humorous and lively talk on the impressions gathered during his trip to Europe, U. K., U. S. A. and Canada. The members of the Pharmaceutical Enquiry Committee of the Ministry of Commerce and Industry visited our factory on 21—10—'53. Maj. General Bhatia, the Chairman gave us an indication of the work entrusted to them and done so far. Prof. Seshadri of the Delhi University spoke to us about Vitamin C, while Drs. K. R. Nanje and Chandran of the committe gave us an idea of the impressions they had gathered so far.

Though our activities had dipped down to depressing depths for a period of 6 to 7 months, yet we feel we have done fairly well with these meetings. Generally the attendance at these meetings was satisfactory, considering the other activities that were going on in the evenings.

EXCURSIONS

Four excursions were arranged during this year. The places visited were the Indian Rare Earths Ltd., The Peringalkuthu Hydro-Electric Project, The Jamuna Thread Mills Ltd., and the Travancore-Cochin Chemicals, Ltd. Thanks to the interest and initiative of our Shri Paul Pothen, our company placed a 27 seater vehicle at our disposal for the trip to Peringalkuthu and the Jamuna Thread Mills Ltd. The excursion was very successful and pleasant. The excursion party composed of regular members only and the applications to be taken in were more than expected. The enthusiasm and response of the members were high and it resounds to our credit that these excursions passed off with great success.

FILM SHOWS

Three films of technical and educative value were screened this year. A techni-colour short on Beaver Valley combined with a few films lent by courtesy of the Ministry of Education of the Government of India were enjoyed not only by members, but also by their families. The firm of Holleriths lent us an interesting film on 'Figures at Work' dealing with the different aspects of their calculating machines. We are happy to record here that our friends from the Tata Oil Mills and The Travancore Rayons Ltd. responded to our invitations to attend this film. Two shorts on Earth Moving Machinery lent by M/s. Larsen and Toubro were also screened on the occasion. We had another interesting film on Tungsten Carbide Tipped Tools loaned out from our good friends, Volkart Bros. Generally the attendance at these shows was very good.

STUDY CLASSES

Shri Paul Pothen, whose interest in the welfare of the Society is very great, gave three lectures on 'Hydraulics'. The other proposed classes could not be continued since many of our members happened to be otherwise engaged in sports and other activities in the evenings. Also these classes had to be discontinued because the response from members was poor. We expect, as suggested by the esteemed President of last year, that our management and managerial staff will fully appreciate the value and importance of these classes in the interest of their workers and assistants and will encourage them by incentives, to make use of these classes to improve efficiency in general.

PUBLICATIONS

Another important branch of work has been launched this year thanks to the initiative and guidance of our president. Preliminary work has already been carried out in the compilation of a) Development lectures delivered by technicians in the beginning of the FACT Project, b) Papers on subjects of industrial, technological and chemical engineering importance collected and prepared by Mr. M. C. Verghese were cyclostyled and 46 pages

were distributed to 17 members and 3 non-members. Enough material has also been collected for, c) publishing a quinquennial report of our activities and a tourist guide to FACT for distribution to guests and visitors. We request and recommend this and items similar to this, as a useful field of expanding activity to be fruitfully followed up in the coming years. We also expect that more and more of our highly qualified and eminent colleagues would come forward with technically class material of sparkling quality, collected from the anvil of their experience, for publication.

EXECUTIVE COMMITTEE

The executive committee met nine times this year. The attendance at the meetings was good. Though the Committee took decisions unanimously, yet whenever issues had to be decided on merit, there was no dearth of liveliness and spark in our discussions preceding unanimity. The deliberations were far from acrimonious, and the occasional heat indicated only the energetic enthusiasm and lively interest which members took, in the affairs of the society.

MEMBERSHIP

The number of members in the beginning of the year was 83. During the year 19 new members joined. One member resigned. Eleven members have been removed due to default. The total number of members on date is 90.

BALANCE SHEET

Our general financial position has been good-better than last year. We have succeeded in keeping our expenses within the approved provisional budget without sacrificing efficiency. We had Rs. 722—9—8 at the beginning of the year. We have spent only Rs. 432—13—6 during the year while our actual collections have been Rs. 562—9—6. The total sum on hand on date Rs. 852 -5-8 which would leave an approximate net surplus of Rs. 107, though a deficit of Rs. 22—9—8 was expected during the year. As a result of long standing default of membership subscription we have been constrained to write off Rs. 56—8—0 as bad debts. On date the arrears of subscription still to be collected is Rs. 30 only.

The provisional budget for the ensuing year is before you for approval. We have itemised all possible expenses that could be reasonably anticipated next year. You might observe that we have provided Rs. 400 for entertainment and travelling. This would include the amount to be footed for today's dinner bill also. Added to this year's sum carried over, the estimates are conservative on all items. We have itemised furniture. We wish to point out that it is extremely essential for us to possess a storewel safe. As you know our documents and files are increasing every year. The present wooden almirah is definitely not proof against white ants and cockroaches. You all know very

well that round about us we have instances where precious books have been devoured by white ants because they were kept in wooden almirah. I request you all to consider this favourably and vote for Rs. 100 to be spent on a permanent asset, though we have indicated Rs. 50 only against this.

One more new item as against previous years in the provisional budget is for publications. We have already discussed the importance of this branch of our activities. I request you to take note of it and approve of the same.

The auditor's report and the statement of the balance sheet for the year ending 1953 were unanimously approved and passed. In the provisional budget, the secretary strongly pleaded for raising the amount for the purchase of a Storewell type of steel safe from Rs. 50 to Rs. 100. The members deliberated for some time on the suggestion of the Secretary and unanimously sanctioned Rs. 100 for the purchase of this capital asset. They also permitted the necessary alterations to be made in the provisional budget accordingly. Mr. V. N. Kasturirangan proposed for this sanction, and was seconded by Mr. Paul Pothen. The provisional budget for 1954 was passed unanimously after making these alterations for the guidance of the next year's Executive Committee.

AMENDMENT TO BYELAWS

As per the byelaws the president converted the General Body Meeting into a special general body meeting by an announcement from the chair, to consider the following amendments to the byelaws. These were duly proposed, seconded and passed unanimously.

EXISTING BYELAW	AS AMENDED
1. 15-a) Annual General Body meetings shall be held in the month of December every year with a fortnights' notice to the members.	The Annual General Body meetings shall be held in the month of *January every year*, not later than 15th with a fortnight's notice to the members.

Moved by Mr. R. S. Rajan. Seconded by Mr. R. Swaminathan.

2. 15-b) At this meeting the Annual report of the Society with an audited account of the preceding year and a provisional budget for the succeeding year shall be presented by the Committee to be adopted by the General Body.	At this meeting, the annual report of the Society with an audited account of the preceding year *ending 31st December* and a provisional budget for the succeeding year shall be presented by the Committee to be adopted by the General Body.

Moved by Mr. R. S. Rajan. Seconded by Mr. M. C. Pillai.

3. 15-d) Matters regarding the budget for the succeeding year shall be discussed in a subsequent general body meeting	Matters regarding the budget for the succeeding year shall be discussed *in the same* general body meeting.

Proposed by Mr. R. S. Rajan Seconded by Mr. P. V. Parameswaran.

4. 16-h) Every person who has been a member for a continuous period of not less than two quarters only can participate in the election and can vote for a candidate etc. etc.	Every person who has been a member for a continuous period of not less than two quarters *immediately preceding the date of the* General Body meeting only can participate in the election and can vote for a candidate etc. etc.

Proposed by R. S. Rajan. Seconded by Mr. R. Narayanan.

5. 20) The Byelaws may be varied amended, or *rescinded* by two-thirds majority of members present in a General Body meeting called for the purpose.	The Byelaws may be varied, amended or rescinded by two-thirds majority of members present in a General Body meeting called for the purpose or in the Annual General Body meeting.

Moved by Mr. M. C. Verghese. Seconded by Mr. N. Sathyanathan.

The names of the Office bearers for 1954 who were elected unanimously, were announced as follows: Mr. P. K. Seshan, Supdt., Gas Division—President. Mr. N. S. Thyagarajan Chemical Engineer—Secretary. Mr. R. S. Rajan, Utilities Divison — Treasurer.

Committee Members.

Mr. K. S. Raghunath, Mr. P. G. Menon, Mr. R. Swaminathan, Mr. T. S. Hariharan, Mr. M C. Pillai and Mr. C. P. Rangarajan of T. C. C. Ltd.

As nominations from the Sulphate Divn. were declared invalid and as no nomination had been received from the General offices, members from those concerned divisions were requested by the President to elect the representatives. Messrs. A. K. Gopinath and N. Sathyanathan were elected as the representatives for the Sulphate and General Offices Divisions respectively by the concerned members. As no nomination was received and as there was not the requisite number of eligible voters from the Chemical Control Division the co-option of an executive representative for this division was left to the discretion of the Executive for 1954.

PRESIDENT'S ADDRESS

Then the President addressed the gathering. He said,

"It is my duty now as the outgoing President of the Society to say a few words. Naturally I should speak of the activities of the Society during the year and the years to come. As you have patiently heard the Secretary's Report and had a chance to

see and discuss the Balance Sheet, you are now quite aware of the status of the Society. It is satisfactory to see that during the year our membership has increased and our financial position has improved. You have also heard how varied our activities have been this year. Unfortunately we could not carry out many of the things that were planned during the beginning of the year due to a break of 3 or 4 months and due to certain other reasons.

"During the five years of the working of this Society certain facts have crystallized out. I shall first refer to this Society's aims and ideals. Although the members of the Society and its office bearers may very much like to make its activities attractive and beneficial, it has been experienced that due to our set up it is difficult to carry out too ambitious a programme in matters of lectures, study classes, study tours, symposiums, cinemas, publications, etc. It is therefore my considered opinion that we should have only limited ambitions and that we should try to make these limited aims fulfilled. Our Society should serve as a ready platform for any distinguished visitor or invitee to speak to us. It should go on organizing study tours and picnics and cinemas. If it can hold one symposium a year and conduct study classes in one subject, I should consider it more than sufficient.

"It is in the matter of the recorded information that I wish to lay some emphasis today. Although the spoken word has its directness of appeal and personal touch behind it, the limitations are too severe. The physical effort needed both by a lecturer and his listeners in making it convenient to attend are the main reasons. Obviously the spoken word can only reach a few at a time. Compare this with the written word. It can carefully and accurately be compiled and if it can be reproduced cheaply; every member of the Society has access to it and can go through it at leisure and make use of it and refer to it. The phenomenal growth of the written and printed word today in the world shows us the power behind it. I therefore strongly recommend that this Society in future years should endeavour in this direction a little more.

"Of course everybody will agree that the best way to impart information is by both the spoken and the written word, i. e., the spoken word must be backed up by the written word. A beginning has been made this year and about 50 pages of foolscap sheets of notes were reproduced and distributed to about twenty members cheaply. The work on re-editing the development lectures of FACT is being carried out. It has been also found that a small booklet explaining what processes and products are in vogue in FACT should be prepared and would serve as a momento to every visitor of FACT. The expense of compilation and printing can be easily realised by

charging about two annas for each copy. I hope these two items of work will be carried out under the auspices of our Society during the coming year.

"I shall now commend to you the office bearers of the Society for the ensuing year and shall on your behalf wish them all success and co-operation. I am grateful to the Secretary and Treasurer and the Divisional representatives of this year for their co-operation and enthusiasm for the work of the Society. Thanks are also due to each and every member without whose willing co-operation the Society cannot function.

"We wish to close the year on an interesting item and I shall not keep you waiting. I hope every one will enjoy the Society's Dinner tonight which the Office bearers hope will make-up any voids in our work this year. Thank you"

After the President finished his address, Mr. S. Sundaram, the Secretary of the Society performed the pleasant function of thanks-giving. He said,

"The little we could accomplish this year is the result of kindness and co-operation given to us by one and all. We wish to place on record our deep debt of gratitude to Mr. K. A. Varugis, and the other Members of our Management for their unstinted and consistent support to all our activities, for their helpful suggestions for our betterment, and their active encouragement to all the good that we have tried to do through the forum of the Society. My thanks go out to the Jamuna Thread Mills Ltd., The Indian Rare Earths Ltd. and the Engineers and Officers of the Peringal Project, who viewed wit heach other to make our visits to their respective places useful, educative, pleasant and delightful. The Welfare Department has helped us a lot for arranging our meetings. The Safety Department has helped us a lot for arranging our meetings. The Safety Department has loaned us the 16 m. m. projector whenever we required it. The Office Manager and his staff have helped to type and circulate our notices. The Trav.-Cochin Chemicals have permitted us to see their Plants. We are grateful to all the concerned gentlemen in these Departments and Organisations.

"Shri Sankaranarayanan audited our Accounts for this year again. He is too modest to accept our gratitude in public. Yet it is our privilege more, than duty to place on record our grateful appreciation of his services.

"As Secretary, I thank the members of the executive committee for their valuable and wise guidance.

"We thank you all for your kindness in responding to our invitation to this meeting. Gentlemen, but for your kind support and interest, this Society would not have been as strong as it is today. We humbly request you

to extend the same co-operation in the years to come helping this five year old child to grow stronger and stronger.

"We have every faith that FACT will live long and grow strong with the years. FACT Technical Society will also grow more and more prosperous day by day radiating glory all around. We believe that this Society will be a Jewel in the Industrial Body politic of Travancore-Cochin and its forum will be the Mecca of Technocrats and eminent Chemical Engineers."

The incoming President, Mr. P. K. Seshan heartily commended the work already accomplished and while requesting for further co-operation from the members, he hinted at an ambitious schedule of work for a prosperous '54.

The meeting ended at 7-30 p. m. and at 8 p. m. there was an excellent dinner that was thoroughly enjoyed by the members, coming as it did after a strenuous session.

Precious Beyond Gold!

Take up a handful of the "dead earth" of your garden and examine it. You are holding a very large number of rock particles mixed with a certain amount of decayed and decaying animal and vegetable matter. Apparently it is all dead enough, yet put a pinch of that soil under a powerful lens and you will see millions of living creatures, that multiply with immense speed. These are the bacteria and the top layers of the soil are full of them. Three or four feet down, however, they almost cease to exist and below a certain depth the soil is dead indeed.

Without these tiny atoms of restless life no plant can grow. Although they are invisible to the naked eye, they are precious beyond gold, for without them the surface of our planet would be as dead as that of our satellite, the moon!

Ourselves

FACT Annual Sports, 1953

The closing months of 1953, were full of activity for the FACT Sports Association. A series of interdivision matches were played in football, basket ball, volley ball, badminton and tug of war and there were matches for indoor games as well. Almost on every day there was a match and every game was played out with determination and zeal by all the teams.

The activities came to a climax towards the final days, the 19th and 20th of December, when the annual sports meet was conducted. Heats for certain items of sports and finals for a few items were held on the 19th afternoon and the remaining items were started at 10 a. m. on the 20th. There was keen competition for every item, and spectators came in their hundreds to see the tough fights and to encourage the competitors. Mr. V. S. Pillai, the General Secretary of FACT Sports Association, Mr. S. B. Iyer, field director for sports, Mr. S. N. Ramakrishnan Nair, the Labour Welfare Officer, members of executive committee of Sports Association and staff of Welfare Office were very busy in conducting everything at the proper time in the proper manner. M/s. P. N. Menon, Paul Pothen and M. C. Varghese, who were among the panel of judges took a lot of pain in the execution of their job in the most appropriate manner.

The running commentary of the celebrations over the mike by Mr. A. K. Gopinath was very interesting and helpful.

By 5 p. m. on 20-12-'53 all the items of sports were over and the people began to move towards the meeting place in front of the Dormitory buildings. The evening programme started with fancy dress competition, which was followed by Mr. FACT selection both of which were very much appreciated by the large gathering. There was also a wrestling match between M/s. Khader and Sarma, which was followed by physical feats by Thankappan and party.

Mr. V. S. Pillai then read a short account of the activities of the FACT Sports Association during 1953 and invited the attention of the Management and employees to the necessity of starting a Relief Fund for those who became victims of accidents

at the sports field and providing a children's corner for the use of the colony children. He then invited Mrs. B. V. D. Menon to distribute prizes.

After the distribution of prizes there was a grand music performance by Tripunithura sisters, and the day's programme came to a close at 9 p. m. with the singing of National Anthem.

The following were the prize winners:

	INTERDIVISION		TOURNAMENT
1.	*Badminton* ...	Winners	Combined team of Administration Gas and Transportation divisions.
2.	*Football* ...	„	Combined team of Ammonia and Utilities divisions.
3.	*Basket Ball* ...	„	Combined team of Ammonia and Utilities divisions.
4.	*Volley Ball* ...	„	Engineering division.
5.	*Tug of War* ...	„	Engineering division No. 1
6.	*Relay Race* ...	„	Ammonia division.

Other items:

'56' Cards Tournament

Winners:	M/s.	1. C. P. Paul 2. C. J. Verghese 3. K. C. Skaria
Runners up:	M/s.	1. S. N. Ramakrishnan 2. A. V. George 3. M. V. Jacob

Bridge Turnament

Winners:	M/s.	1. N. D. Gopinath 2. S. Padmanabhan
Runners up:	M/s.	1. S. B. Iyer 2. P. Krishnan Nair

Swimming	1st Prize ...	Mr. T. J. Varghese
	2nd Prize ...	„ C. N. Menon
Shot-put	1st Prize ...	Mr. S. Raghavan
	2nd Prize ...	„ P. G. Menon
1-Mile Race	1st Prize ...	Mr. J. George
	2nd Prize ...	„ Arumugham

440-Yds. Race	1st Prize ...	Mr.	K. V. John
	2nd Prize ...	„	D. G. Noel
220-Yds. Race	1st Prize ...	Mr.	K. V. John
	2nd Prize ...	„	K. C. Iype
100-Yds. Race	1st Prize ...	Mr.	R. K. Menon
	2nd Prize ...	„	K. C. Iype
Hop-step & Jump	1st Prize ...	Mr.	D. G. Noel
	2nd Prize ...	Mr.	R. K. Menon
Long Jump	1st Prize ...	Mr.	D. G. Noel
	2nd Prize ...	„	K. C. Iype
Pole Vault	1st Prize ...	Mr.	P. K. Sadanandan
	2nd Prize ...	„	Ittanpillai
Sack Race	1st Prize ...	Mr.	V. R. Sarma
	2nd Prize ...	„	R. K. Menon
Three-legged Race	1st Prize ...	M/s.	C. N. Menon and M. K. Thankappan
	2nd Prize ...	„	M. M. Thomas and V. C. Abraham
Fancy Dress Competition	1st Prize ...	Mr.	P. G. Menon
	2nd Prize ...	„	V. R. Sarma
Mr. FACT	1st Prize ...	Mr.	Ittanpllai
	2nd Prize ...	„	B. S. Gopal
High Jump	1st Prize ...	Mr.	D. G. Noel
	2nd Prize ...	„	R. K. Menon
Champion-ship Cup		Mr.	D. G. Noel

Special Prize for Best Athlete (over 40 years) ..

Mr. B. S. Gopal. (Donated by Mr. S. N. Ramakrishnan)

M. S. Thomas

ഭക്ഷ്യോൽപ്പന്നങ്ങൾക്ക് മിനിമം ന്യായവില ലഭിക്കേണ്ടതു് കാർഷികാഭിവൃദ്ധിക്കു് അനുപേക്ഷണീയം

ഇ. ഐ. ചാക്കോ, പ്രസിഡണ്ടു്, ടി. സി. ചെയിമ്പർ ഓഫ് ആഗ്രിക്കൾച്ചർ.

മാവേലിക്കരനിന്നു്, സാമാന്യം നല്ല തോതിൽ കപ്പകൃഷി ചെയ്തുകൊണ്ടിരിന്ന ആളും കയറ്റുമതി നിരോധനം നീക്കികിട്ടുന്നതിനു് ടി. സി. ചെയിമ്പർ ഓഫ് ആഗ്രിക്കൾച്ചറിനോടു സഹകരിച്ചു് സജീവമായി പ്രവർത്തിച്ചുകൊണ്ടിരുന്ന ആളുമായ ഒരു മാന്യ സുഹൃത്തു് തഴെ പറയുന്ന പ്രകാരം എഴുതിയിരിക്കുന്നു:—

"അടുത്ത വിളവെടുപ്പുസമയം മുതൽ മാക്കറിൽ വലിയ തോതിൽ കപ്പ വന്നടിയാനുള്ള സാദ്ധ്യതയുണ്ടു്. വിളവെടുക്കുന്ന കപ്പ എന്തുചെയ്യണമെന്നു ഭയപ്പെടത്തക്കവിധം ആയിട്ടുണ്ടു്. കപ്പപ്പൊടിയുടെ സ്റ്റാർച്ചു് (starch) വില അഞ്ചേര അണയിൽനിന്നു നാലായി കുറഞ്ഞു. അതുകാരണം ഇവിടെ നടന്നുകൊണ്ടിരുന്ന കപ്പപ്പൊടി വ്യവസായവും നിലച്ചു. സ്റ്റീകം, കട്ടികം ഉൾപ്പടെ പലരും ഈ വ്യവസായത്തിൽ ഏർപ്പെട്ടിരിക്കയായിരുന്നു. മരച്ചീനിപ്പൊടി പരിമിത തോതിലെ വ്യവസായികൾക്കു് ആവശ്യം വരികയുള്ളൂ. ആ നിലയ്ക്കു് മുൻപു് ചെയിംബറിൽനിന്നു് പത്രം മുഖേന പ്രസ്താവിച്ചിരുന്ന പ്രകാരം ഇന്ത്യൻ യൂണിയനിലെ ഇതര പ്രവിശ്യകളിലും, കര, നാവിക, വ്യോമസേനകൾക്കും ഗോതമ്പുപൊടിയോടുകൂടി ചേർത്തു് ചപ്പാത്തി മുതലായവ ഉണ്ടാക്കുന്നതിനും വാട്ടി ഉണങ്ങിയ കപ്പയുടെ റവപ്പൊടികൊണ്ടു് ഉപ്പുമാവു മുതലായ പലഹാരങ്ങൾ നിർമ്മിക്കുന്നതിനും അഖിലേന്ത്യാ വിപണികൾ ഉണ്ടാകേണ്ടതു് അത്യന്താപേക്ഷിതമാണു്. അതിനു വേണ്ടതു് ചെയ്യേണ്ടതിലേക്കായി കാലെക്കൂട്ടി അറിയിക്കുകയാണു്. ക്രൂടാതെ ഇവിടെ (മാവേലിക്കര) ഇപ്പോൾ ശരാശരി അഞ്ചു ടൺ കപ്പ ഉല്പാദനം ഏക്കറിനുണ്ടു്. അടുത്ത വർഷം ശരാശരി ഉല്പാദനം എട്ടു ടണ്ണാകും. തെങ്ങിൻതോപ്പുകളിൽക്കൂടി ഇപ്പോൾ കൃഷി ഇറക്കിവരുന്നു. ഈവക കാര്യങ്ങളെല്ലാം കാലെക്കൂട്ടി കണ്ടു് അടുത്ത കൊല്ലം നാം ഒരു വിഷമഘട്ടത്തിൽ എത്താതിരിക്കുവാൻ വേണ്ടതു ചെയ്യേണ്ടിയിരിക്കുന്നു."

മേൽ വിവരിച്ച എഴുത്തിൽ അടങ്ങിയ വിവരങ്ങൾ കുറെ അതിശയോക്തിപരമല്ലയൊ എന്നുള്ള സന്ദേഹത്തിൽ കഴിയുമ്പോഴാണു്, അടുത്ത ദിവസങ്ങളിലെ പത്രങ്ങളിൽ സിവിൽസപ്ലൈസു് കമ്മീഷണർ ശ്രീ. തോമസു് മാഞ്ഞൂരാന്റെ ഒരു പ്രസ്താവന കണ്ടതു്. നിയന്ത്രിതവിലയ്ക്കു് വിതരണം ചെയ്യുന്നതിനു് ഗവർമ്മെണ്ടിന്റെ വശം ധാരാളം മരച്ചീനി സ്റ്റോക്കുണ്ടെന്നും, ആലപ്പുഴയിലെ വിതരണത്തിനു് അലോട്ടുചെയ്തിരുന്ന പതിനെട്ടു ടൺ മരച്ചീനി (62 കണ്ടി) ആവശ്യക്കാർ ഇല്ലാത്തതിനാൽ സ്റ്റോക്കായിട്ടു് ഇട്ടിരിക്കയാണെന്നും അതിൽ പ്രസ്താവിച്ചിരുന്നു. ഇനിയെങ്കിലും കയറ്റുമതി നിരോധന പ്രക്ഷോഭണക്കാർ ഗവർമ്മെണ്ടിനെ, ഉപഭോക്താവിന്റെ വിലക്കുറ്റത്തിനെ പറ്റി മുറവിളികൂട്ടി അലട്ടുകയില്ലെന്നും, ഗവർമ്മെണ്ടിനാകട്ടെ തങ്ങളുടെ നിരോധന നയം മരച്ചീനിയെ സംബന്ധിച്ചു് അസ്ഥാനത്തായിരുന്നു എന്നു് ബോദ്ധ്യമാകുമെന്നും, ഇനി ഒരിക്കലും മനഃപൂർവ്വമല്ലെങ്കിലും കർഷകരെ ബുദ്ധിമുട്ടിച്ചു് നഷ്ടപ്പെടുത്തുന്ന നില കൈക്കൊള്ളുകയില്ലെന്നും വിശ്വസിക്കട്ടെയോ?

ഭക്ഷ്യധാന്യ ദുർഭിക്ഷതയില്ലാത്ത അമേരിക്കൻ മുതലായ രാജ്യങ്ങളിൽ ഗോതമ്പു്, ഉരുളക്കിഴങ്ങു് മുതലായ സാധനങ്ങൾക്കു് കാലാവസ്ഥാനുകൂല്യം കൊണ്ടും, സാങ്കേതിക വൈദഗ്ദ്ധ്യംകൊണ്ടും അമിതവിളവു് ലഭിക്കുന്ന സമയങ്ങളിൽ പൊതു വിപണികളിൽ അമിതമായി വിലയിടിയുന്നപക്ഷം, കൃഷികൊണ്ടു് മിതമായ ഒരാദായം കർഷകനു ലഭിക്കുന്നതിനു പര്യാപ്തമായ ഒരു മിനിമം നിശ്ചിതവില നൽകി രാജ്യത്തെ ഭക്ഷ്യാവശ്യത്തിനു വേണ്ടതിൽ കവിഞ്ഞുള്ള കാർഷികോല്പന്ന

ങ്ങും ഗവർമ്മെണ്ട് വിലയെടുത്തു് സമുദ്രത്തിൽ തള്ളുകയൊ, വളമാക്കുകയൊ ചെയ്തു് കർഷകരെ പ്രോത്സാഹിപ്പിക്കുകയാണു് പതിവു്. ഇന്ത്യയിൽ ഭക്ഷ്യസ്വയംപര്യാപ്തത കൈവരുത്തുന്നതിനു് പ്ലാനിംഗ് കമ്മീഷന്റെ നിർദ്ദേശാനുസരണം പല പദ്ധതികളും ആവിഷ്ക്കരിച്ചു് നടത്തിക്കൊണ്ടിരിക്കുന്ന ഈ അവസരത്തിൽ ബർമ്മാ, സയാം മുതലായി വിപുലതോതിൽ നെൽകൃഷി നടക്കുന്ന രാജ്യങ്ങളിൽനിന്നു് സ്വതന്ത്രമായി ഇറക്കുമതി അനുവദിക്കുന്നപക്ഷം, രണ്ടാംലോകമഹായുദ്ധത്തിനുമുൻപു് നെല്ലിനും അരിക്കും അമിതമായി വിലയിടിവു് ഉണ്ടായതുപോലെയുള്ള ഒരു സ്ഥിതിഗതി ഇവിടെ വീണ്ടും ആവിർഭവിക്കുന്നതാണു്.

അങ്ങനെ വരുന്നപക്ഷം കർഷകർക്കു് വീണ്ടും ദുർദ്ദശ ആരംഭിക്കുന്നതായിരിക്കും. മരച്ചീനിയുടെ വിളവു് അമിതമായി വർദ്ധിക്കുംതോറും ഒന്നിടവിട്ട വർഷങ്ങളിൽ വിളയിടിഞ്ഞു് കർഷകർ ക്ലേശം അനുഭവിച്ചിരുന്നതു് ഏവർക്കും അറിവുള്ളതാണല്ലൊ. ഈ ദുരവസ്ഥയ്ക്കു പോംവഴിയായി താഴെ പറയുന്ന മാർഗ്ഗം സ്വീകരിക്കാവുന്നതാണു്.

മൈസൂരിലെ ഒരു പ്രധാന ഉല്പന്നമായ കാപ്പിക്കുരുവിനു് വില അത്യധികം കുറഞ്ഞു് അവിടത്തെ വൻതോതിലുള്ള കാപ്പികൃഷിവ്യവസായം സ്തംഭനാവസ്ഥയിൽ എത്തിച്ചേരുമെന്നുള്ള നിലയായപ്പോൾ അവിടത്തെ കർഷകർ സംഘടിച്ചു് ഗവർമ്മെണ്ടിന്റെ സഹായസഹകരണത്തോടുകൂടി കാപ്പിക്കു് ഇന്ത്യയിൽതന്നെ ഒരു വൻപിച്ച വിപണിയുണ്ടാക്കുന്നതിനു ചെയ്തിരുന്ന ഭഗീരഥപ്രയത്നം ഇന്ത്യാ ഗവർമ്മെണ്ടിന്റെ ദൃഷ്ടിയിൽ പെടുകയും തൽഫലമായി "ഇന്ത്യാ കാഫി മാർക്കറ്റിംഗ് ആൻഡ് എക്സ്പാൻഷൻ ബോർഡു്" എന്നൊരു സമിതി രൂപവല്ക്കരിക്കുകയും ചെയ്തു. വിപുലമായ തോതിലുള്ള പ്രചരണവേലകൊണ്ടും സാങ്കേതിക ഗവേഷണം മൂലവും കാപ്പി വിളവിന്റെ മേന്മയും വിലയും പ്രതീക്ഷയിൽ കവിഞ്ഞു വർദ്ധിച്ചു.

അതുപോലെ മരച്ചീനിയുടെ പൊടി, റവ മുതലായ ആഹാരസാധനങ്ങളും ഗോതമ്പിനോടു ചേർത്തും മറ്റും രുചികരമായ രീതിയിൽ പാകംചെയ്തു് ഉത്തരേന്ത്യയിലും മറ്റു പ്രവിശ്യകളിലും കാഫിറ്റേറിയ (Cafetaria) മുഖേന പ്രചരണം ചെയ്യാവുന്നതാണു്. ഇതു സംബന്ധിച്ചു് പരീക്ഷണാംശം ഇതെഴുതുന്നതിനു രണ്ടു മാസം മുൻപു് നാഗപ്പൂരിൽ ഒരു സാമ്പത്തിക കോൺഫ്രൻസിൽ പങ്കെടുക്കുന്നതിനു പോയിരുന്നപ്പോൾ നാലഞ്ചു ദിവസത്തേക്കുള്ള നല്ല വെള്ളക്കപ്പയുടെ പൊടി (Tapioca flour) കൂടി കൊണ്ടുപോയിരുന്നു.

കോൺഫ്റൻസിൽ സംബന്ധിച്ചു ഉത്തരേന്ത്യക്കാരും, അമേരിക്കക്കാരുമായ ഇരുപതോളം സുഹൃത്തുക്കൾക്കു മുഴുവൻ ഗോതമ്പുപൊടികൊണ്ടും പകുതി, മൂന്നിലൊന്നു്, നാലിലൊന്നു വീതം ഗോതമ്പുപൊടിയോടുകൂടി കപ്പപ്പൊടി ചേർത്തും നാലു തരത്തിൽ ചപ്പാത്തികളുണ്ടാക്കി അനുപാതം അറിയിക്കാതെ ലഞ്ചു സമയത്തു് ഭക്ഷണത്തിന്റെ കൂടെ കൊടുത്തു. ഏറ്റവും രുചികരം ഏതെന്നറിവാനായി വോട്ടെടുത്തപ്പോൾ ബഹുഭൂരിപക്ഷം വോട്ടു ലഭിച്ചതു് കപ്പപ്പൊടിയും ഗോതമ്പുപൊടിയും സമം ചേർത്തുണ്ടാക്കിയ ചപ്പാത്തിക്കായിരുന്നു.

പ്രധാന അതിഥിയായ ഡോക്ടർ റെജിനോൾഡു് ഹെൽഫ്റിക്കു് (Dr. Reginold Helfrick) താഴെ പറയുന്ന അഭിപ്രായം രേഖപ്പെടുത്തി: "I found No. 2 made with 50% tapioca flour, the best by far. No guestion at all. It rose best by taste test. Tapioca is a perfect food and in addition to its nutritive value, it tastes good in all its forms."

പോഷകാംശത്തെപ്പറ്റിയാണെങ്കിൽ, മൈസൂർ ഫുഡു് ടെക്നോളജി ഇൻസ്റ്റിറ്റ്യൂട്ടിന്റെ പരിശോധനയിൽ അരി, ഗോതമ്പു് മുതലായവയോടൊപ്പം തന്നെ കലോറി (Calories) കപ്പയിൽ അടങ്ങിയിട്ടുള്ളതായും ധാന്യങ്ങളെ അപേക്ഷിച്ചു് ശരീരത്തിനു് അത്യാവശ്യമായിട്ടുള്ള കാൽസിയം (Calcium) ഇതിൽ

വളരെ കൂടുതലുള്ളതായും കണ്ടുപിടിച്ചിരിക്കുന്നു.

സ്റ്റാർച്ച്, ഡെയിഗം, ഡെക്സ്ട്രീൻ (dextrine), ഗ്ലൂക്കോസ്, പവർ ആൽക്കഹോൾ മുതലായ വ്യവസായോല്പന്നങ്ങൾ നിർമ്മിക്കുന്നതിനുള്ള സാദ്ധ്യതകളും ഇതിനുണ്ട്. സ്റ്റാർച്ചും ഡെയിഗായും കൂടിൽവ്യവസായ തോതിൽ ചെയ്യാവുന്നതും, മറ്റുള്ളതെല്ലാം ഗവർമ്മെൻറ് സംരക്ഷണവും കുറെ പ്രോത്സാഹനവും ലഭിച്ചാൽ ഇടത്തരം (Medium scale) വ്യവസായങ്ങളായി വികസിപ്പിക്കാവുന്നതുമാകുന്നു.

അതിനാൽ കർഷകർക്ക് ഉല്പാദനാഭിവൃദ്ധിക്ക് പ്രേരണ നൽകത്തക്ക ഒരു മിനിമം വില കിട്ടുന്നതിനുള്ള ഉറപ്പ്, അമേരിക്കയിലും മറ്റും നടപ്പിലിരിക്കുന്നതുപോലെ ഇവിടെയും ഗവർമ്മെൻറ് കൊടുക്കേണ്ടതാണ്.

മേൽവിവരിച്ച ഉപാധികളും എല്ലാംതന്നെ പ്രവൃത്തിപഥത്തിൽ കൊണ്ടുവരുന്നതിന് സംസ്ഥാന വ്യാപ്തിയുള്ള ഒരു സുശക്ത കാർഷിക സംഘടന അനപേക്ഷണീയമാണെന്നും, കർഷക ജനതയുടെ ഉന്നമനാർത്ഥം ചെയിംബറിന് കഴിഞ്ഞ രണ്ടുമൂന്നു വർഷങ്ങളായി ചെയ്യാൻ സാധിച്ചിട്ടുള്ള വിജയകരമായ സേവനം ഭാരവാഹികളെ പ്രോത്സാഹിപ്പിച്ചിരിക്കുന്ന അവസരത്തിലാണ്, വിവിധ സ്റ്റെയിറ്റുകളിൽ രാഷ്ട്രീയമല്ലാത്ത കർഷക സംഘടന രൂപീകരിച്ച് പ്രവർത്തനം നടത്തേണ്ടതിന്റെ ആവശ്യകത മുന്നിട്ടുകാണിച്ച് സംസ്ഥാന കൃഷിവകുപ്പു മന്ത്രിമാരുടെ അടുത്ത ദിവസങ്ങളിലെ ന്യൂഡൽഹി സമ്മേളനം താഴെപ്പറയുന്ന അഭിപ്രായം രേഖപ്പെടുത്തിയത്.

"There was general agreement at the conference that farmers in different states should be united on the lines of associations existing for other activities for making their voice felt with regard to agricultural production without in any way giving such organisation a political colour."

ഭാഗ്യവശാൽ, ന്യൂഡൽഹി സമ്മേളനത്തിൽ പ്രഖ്യാപിതമായിരിക്കുന്ന ആശയങ്ങളും ആദർശങ്ങളും ഉൾക്കൊള്ളുന്നതും, കർഷക താല്പര്യങ്ങളെ മുൻനിർത്തി കുറെക്കാലമായി അഖിലഭാരത അടിസ്ഥാനത്തിൽ പ്രവർത്തനം നടത്തിക്കൊണ്ടിരിക്കുന്നതുമായ സംസ്ഥാന വ്യാപകമായ തിരുക്കൊച്ചി ചെയിംബർ ഓഫ് അഗ്രികൾച്ചർ നമുക്ക് നിലവിലുണ്ടല്ലൊ. കാർഷികാഭിവൃദ്ധിക്ക് ഏറ്റവും അത്യാവശ്യമായി, വിളവു ജാമൃത്തിന്മേൽ കുറഞ്ഞ പലിശക്ക് വിത്തും, വളം, കൃഷിയായുധങ്ങളും മുതലായവയും അതിന്നാവശ്യമുള്ള പണവും കർഷകന് ഒരു സഹകരണ ഏപ്പെക്സ് ബാങ്ക് (Apex Co-operative Bank) മുഖേന ലഭിക്കുന്നതിനും, പ്രധാന ഭക്ഷ്യോല്പന്നമായ നെല്ലിനും മരച്ചീനിക്കും ഉല്പാദനം എത്രതന്നെ വർദ്ധിച്ചാലും ഒരു മിനിമം നിശ്ചിത വില കർഷകനു ലഭിക്കുന്നതിനും പര്യാപ്തമായ നടപടികളും ചെയിംബർ എടുത്തുകൊണ്ടിരിക്കുകയാണ്.

ചെറുതോതിൽ അങ്ങുമിങ്ങുമായി ചില പ്രാദേശികാവശ്യങ്ങളെ പൂരിപ്പിച്ച് അപ്പോഴപ്പോൾ രൂപീകൃതമായിട്ടുള്ള സംഘടനകളെല്ലാം ചെയിംബറിൽ ഉൾക്കൊള്ളിച്ചുകൊണ്ട് ഓരോ ഗ്രാമപഞ്ചായത്തിന്റേയും പരിധിയിൽ ചെയിംബറിന്റെ ഓരോ ശാഖ സംഘടിപ്പിക്കുന്നതു രാജ്യത്തൊട്ടുക്കെ എൺപതു ശതമാനത്തോളം ജനസംഖ്യ വരുന്നതായ കർഷകരുടെ സമ്പൂർണ്ണമുഖമായ അഭ്യുദയത്തിനും, പൊതുജനക്ഷേമാർത്ഥം സേവനം ചെയ്യുന്നതിന് ഗവർമ്മെൻറിനാൽ നിയുക്തരായിട്ടുള്ള കൃഷി, സഹകരണം, പൊതുജനാരോഗ്യം മുതലായ വിവിധ വകുപ്പുകളുമായി സഹകരിച്ച് ഫലപ്രദമായ സേവനം അനുഷ്ഠിക്കുന്നതിനും തൽഫലമായി തൊഴിൽരാഹിത്യം കാര്യമായി പരിഹരിക്കുന്നതിനും സഹായകമായിരിക്കുമെന്ന് പ്രത്യേകം പറയേണ്ടതില്ലല്ലൊ.

നിങ്ങൾ ചോദിക്കുക

(ഈ പംക്തികളിൽ മണ്ണ്, കൃഷി, വളങ്ങളുടെ ഉപയോഗക്രമം ഇവയെ കുറിച്ചുള്ള പൊതുജനങ്ങളുടെ സംശയങ്ങൾക്ക് ഞങ്ങളുടെ കാർഷികവിദഗ്ധൻ മറുപടി നല്കുന്നതാണ്)

ചോദ്യം 114.

'സംശ്ലേഷിച്ചെടുക്കുന്ന കണ്ടുവളം' എന്നു പറഞ്ഞാൽ അതിന്റെ അർത്ഥമെന്താണ്?

ഉത്തരം.

ചപ്പുചവറുകളും കാലിവളവും തമ്മിലുള്ള കൂട്ടിനാണ് സാധാരണ 'കണ്ടുവളം' എന്നു പറയുന്നത്. കണ്ടുവളത്തിലുള്ള കാലികളുടെ ഛാണകം, മൂത്രം മുതലായവയിൽനിന്ന് വിമോചിതമാകുന്ന പാക്യജനകം, ഭോവഹം എന്നിവയുടെ സാന്നിദ്ധ്യംമൂലം ബാക്ടീരിയായുടെ പ്രവർത്തനം സുഗമമാവുകയും, ചപ്പുചവറുകളുടെ വിയോജനക്രിയ പെട്ടെന്ന് സംഭവിക്കയും ചെയ്യുന്നു. വേഗത്തിലുള്ള വിയോജനം നടക്കണമെങ്കിൽ, ബാക്ടീരിയായ്ക്കു മേല്പറഞ്ഞ പാക്യജനകം, ഭോവഹം ഇവ സുലഭമായി ലഭിക്കേണ്ടതാണ്. നേരെമറിച്ച് ചപ്പുചവറുകൾ മാത്രമേ ഉള്ളുവെങ്കിൽ, ബാക്ടീരിയായുടെ പ്രവർത്തനത്തിന് ആവശ്യമായ പാക്യജനകം തുടങ്ങിയ ഉപാധികൾ ലഭ്യമല്ലാതെ വരികയും, വർജ്ജിത സസൃങ്ങളെ വളമായി രൂപാന്തരപ്പെടുത്താൻ അസാധ്യമായി വീക്കയും ചെയ്യും. ഈ പ്രയാസം പരിഹരിക്കുന്നതിനുള്ള ഒരു മാർഗ്ഗം ബ്രിട്ടനിലെ റൊതാംസ്റ്റഡിലെ പരീക്ഷണകേന്ദ്രാധികൃതർ ഇപ്പോൾ കണ്ടുപിടിച്ചിട്ടുണ്ട്. ഈ നൂതന പദ്ധതിയനുസരിച്ച്, ആദ്യമായിട്ട് 'ആഡ്കൊ' (Adco) എന്ന പേരായ ഒരു തരം ബാക്ടീരിയായുടെ ഭോജനവസ്തുവിനെ, ചപ്പുചവറുകളുമായി കൂട്ടിക്കലർത്തുന്നു. ഇങ്ങനെ കലർത്തുന്ന 'ആഡ്കൊ'യുടെ തൂക്കം, ചവറിന്റെ തൂക്കത്തിന്റെ ആറു ശതമാനമായിരിക്കണം. ഇങ്ങനെ കൂട്ടിക്കലർത്തിയ ചവറുകൂനകം ഇടയ്ക്കിടയ്ക്ക് വെള്ളമൊഴിച്ചു നനച്ചുകൊണ്ട് ഏതാനും മാസം കിടന്നഴുകുവാൻ അനുവദിക്കണം. അതിനുശേഷം നോക്കിയാൽ കറുത്തുപൊടിഞ്ഞ ഒന്നാംതരം ഒരു വളമായിട്ട് അതു മാറിയിരിക്കുന്നതു കാണാം. ഇപ്രകാരം ലഭിക്കുന്ന വളത്തിനാണ് സംശ്ലേഷിച്ചെടുക്കുന്ന കണ്ടുവളം എന്നു പറയുന്നത്. ബാക്ടീരിയായുടെ പ്രവർത്തനത്തിന് സഹായിയായിത്തീർന്ന 'ആഡ്കൊ' വളരൂപീകരണത്തിനുശേഷം, അതിനെ കൂടുതൽ ധന്യമാക്കുന്നതിനുവേണ്ടിയും പ്രയോജനപ്പെടുന്നുണ്ട്.

കുന്നുകാലികൾ ഇല്ലാത്തവർക്കും, കാലിവളം ലഭിക്കുവാൻ വൈഷമ്യമുള്ളവർക്കും, അടുക്കളത്തോട്ടങ്ങളുടെ ആവശ്യത്തിനു പ്രത്യേകിച്ചും, ഈ വിധത്തിലുള്ള കമ്പോസ്റ്റുവളനിർമ്മാണം വളരെ ഉപകരിക്കുന്നതാണു്.

ചോദ്യം 115.

കുമ്മായത്തിനു മണ്ണിനോടുള്ള കൃത്യവ്യങ്ങൾ എന്തെല്ലാമാണു്? കുമ്മായം ഉപയോഗിക്കേണ്ട രീതി എങ്ങനെയാണു്?

ഉത്തരം.

പ്രധാനമായിട്ടു് കുമ്മായം താഴെപറയുന്ന പ്രയോജനങ്ങളാണു് നിവർത്തിക്കുന്നതു്.

(1) ജൈവവസ്തുക്കളുടെ വിയോജനം ത്വരിപ്പിക്കുകയും, മണ്ണിനു് അത്യന്താപേക്ഷിതമായ ക്ലേദം ഉല്പാദിപ്പിക്കുകയും ചെയ്യുന്നു.

(2) സസ്യങ്ങൾക്കു് ക്ഷണനേന ലഭ്യമാകത്തക്കവണ്ണം ലേയരൂപത്തിൽ നൈട്രേറ്റു് ലവണങ്ങളെ ഉല്പാദിപ്പിക്കുന്നു.

(3) പയർ വർഗ്ഗങ്ങൾക്കു് അന്തരീക്ഷത്തിൽനിന്നു് പാകൃജനകം ആവാഹിച്ചെടുത്തു് വേരുകളിൽ സംഭരിക്കുന്നതിനു സഹായിക്കുന്നു.

(4) മണ്ണിനുള്ള പുളിരസം നീക്കികളയുന്നു. ആവശ്യമായ തോതിൽ കുമ്മായമുണ്ടെങ്കിൽ അതു മണ്ണിനെ അമ്ലബാധയിൽനിന്നു പരിരക്ഷിക്കും.

(5) പ്രായേണ അലേയരൂപത്തിലുള്ള ഇരുമ്പിന്റെ അംശങ്ങൾ ചെടികൾക്കു ലഭിക്കുന്നതിനാവശ്യമായ സഹായം ചെയ്യുന്നു.

(6) പൊട്ടാഷ് ചെടികൾക്കു ലഭിക്കുന്നതിനും, കുമ്മായം വേണ്ട സഹായം ചെയ്യുന്നുണ്ടു്.

(7) കട്ടിപിടിച്ച കളിമണ്ണിനെ ഉടച്ചുപൊടിക്കുന്നു.

(8) ചിതറികിടക്കുന്ന മൺതരികളെ ഒന്നിച്ചുചേർക്കുന്നു.

മേല്പറഞ്ഞ വസ്തുതകളിൽനിന്നു്, കുമ്മായം, മണ്ണിന്റെ ഫലപുഷ്ടിക്കു് അപരിത്യാജ്യമായ ഒരു ഘടകമാണെന്നു് സിദ്ധിക്കുന്നു. മണ്ണിന്റെ ശരിയായുള്ള പരിപാലനത്തിനു് ഇടവിട്ടുള്ള കുമ്മായം ചേർക്കൽ അത്യന്താപേക്ഷിതമാണു്.

കാർഷികരംഗത്തു് പുരോഗമനം പ്രാപിച്ചിട്ടുള്ള അമേരിക്ക, ബ്രിട്ടൻ തുടങ്ങിയ രാജ്യങ്ങളിലെ കർഷകർ അധികപക്ഷം, മൂന്നു വർഷത്തിലൊരിക്കൽ കുമ്മായം മണ്ണിൽ ചേർക്കാറുണ്ടു്. ഏക്കറിനു് 1 ടൺ ചുണ്ണാമ്പോ, 2 ടൺ കാൽഷ്യം കാർബണേറോ ഒരു പ്രാവശ്യം ചേർക്കുന്നതാണു്. നിലം തരിശായി കിടക്കുമ്പോൾ, കുമ്മായമോ, ചോക്കുപൊടിയോ ക്ലിനകട്ടിയിട്ടിട്ടു്, പിന്നീടു് ഒരേ ഘനത്തിൽ അതു നിരത്തിയാൽ മതിയാകും. വിദേശങ്ങളിൽ കുമ്മായം നിരത്തുന്നതിനു് പ്രത്യേകയന്ത്രങ്ങളും ഉപയോഗിച്ചുവരുന്നുണ്ടെന്നുള്ളതും പ്രസ്താവ്യമാണു്.

ചോദ്യം 116.

പ്രതിഫലം നിരന്തരമായി കുറഞ്ഞുകൊണ്ടിരിക്കും എന്നുള്ള പ്രകൃതിനിയമം (Law of Diminishing Returns) കാർഷികരംഗത്തു് എങ്ങനെയാണു് അനുഭവവേദ്യമാകുന്നതു്?

ഉത്തരം.

കൂടുതൽ വളം പ്രയോഗിച്ചാൽ കൂടുതൽ വിളവു് ലഭിക്കുമെന്നുള്ളതു് നമുക്കു ബോദ്ധ്യമുള്ള വസ്തുതയാണു്. ഇങ്ങനെ കൂടുതൽ ലഭിക്കുന്ന വിളവിന്റെ അളവും, നാം കൂടുതലായി ഉപയോഗിക്കുന്ന വളത്തിന്റെ അളവും തമ്മിൽ ഒരു അനുപാതബന്ധമുണ്ടു്. എന്നാൽ ഇതൊരു നിശ്ചി

ത പരിധി മാത്രമെയുള്ളൂ. ആ പരിധിക്കപ്പുറത്തു് നാം ക്ലൃതൽ വളം ചേക്കുന്നവെങ്കിൽ അതിന്റെ ഫലമായി ലഭിക്കുന്ന വിളവിന്റെ അനുപാതം കുറഞ്ഞിരിക്കും. "പ്രതിഫലം നിരന്തരമായി കുറഞ്ഞുകൊണ്ടിരിക്കും" എന്നുള്ള പ്രകൃതിനിയമവും ഇതുതന്നെയാണു് അനുശാസിക്കുന്നതു്. ഇതിന്റെ ഫലമായി ഉല്പാദനത്തോതു വർദ്ധിച്ചിരിക്കുമ്പോൾ ഒരു ടൺ ധാന്യത്തിന്റെ മുതൽമുടക്കു് ഉല്പാദനത്തോതു കുറഞ്ഞിരിക്കുമ്പോൾ ഒരു ടൺ ധാന്യത്തിനു് ആകുന്നതിനേക്കാൾ വളരെ വർദ്ധിച്ചിരിക്കും.

ലോസു്, ജിൽബർട്ടു് എന്നു രണ്ടാളുകളുടെ പരീക്ഷണത്തിൽ ഒരു റാത്തൽ പാകൃജനകം ഉപയോഗിച്ചപ്പോൾ, 40–50 റാത്തൽ ധാന്യം ക്ലൃതൽ ഉണ്ടായതായി കണ്ടു. എന്നാൽ ഇതിൽനിന്നു് നാം ക്ലൃതലായി ഉപയോഗിക്കുന്ന ഓരോ റാത്തൽ പാകൃജനകത്തിനും ഇതേ തോതിലുള്ള വിളവുവർദ്ധനവുണ്ടാകും എന്നർത്ഥമാക്കേണ്ടതില്ല. ഒരു നിശ്ചിത പരിധിവരെ ഈ തോതിലുള്ള വർദ്ധനയുണ്ടായേക്കാം. എന്നാൽ അതു കഴിഞ്ഞു വിളവുവർദ്ധനവിന്റെ അനുപാതം കുറഞ്ഞുവരികയും, 40–50 റാത്തൽ ക്ലൃതൽ വീളവു ലഭിക്കുന്നതിനു് ഒരു റാത്തലിനു പകരം രണ്ടോ, ക്ലൃതലൊ റാത്തൽ പാകൃജനകം ഉപയോഗിക്കേണ്ടതായി വരികയും ചെയ്യുന്നു. അങ്ങനെ ഉല്പാദനച്ചെലവു് ക്രമേണ വർദ്ധിക്കുന്നു. വിളവുവർദ്ധനത്തോതിന്റെ അനുപാതം കുറയുന്നതിനു മുൻപുള്ള ആ അതൃച്ചനില, മണ്ണിന്റെ സ്വഭാവം, മറ്റു സൌകര്യങ്ങൾ ഇവയെ ആശ്രയിച്ചിരിക്കും. അതുകൊണ്ടു് ഓരോ പ്രദേശത്തിനുമുള്ള ഈ അതൃച്ചനില കണ്ടു പിടിക്കേണ്ടതു് പ്രത്യേക പരീക്ഷണങ്ങൾ നടത്തിയിട്ടുവേണം. സാധാരണയായി ഫലപുഷ്ടിയില്ലാത്ത നിലങ്ങൾക്കു് ക്ലൃതൽ വളപ്രയോഗം ചെയ്താൽ മാത്രമെ ഈ അതൃച്ചനിലയിൽ എത്താൻ സാധിക്കയുള്ളൂ.

മറെറാരു കാര്യംകൂടി ഇവിടെ അനുസ്മരിക്കേണ്ടതായുണ്ടു്. പാകൃജനകം കണക്കിലധികം ചേർത്താൽ കൃഷി നശിച്ചുപോകാനിടയുണ്ടു്. ഇല പുരുണ്ടുപോവുക, അകാലത്തിൽ കതിരുവരിക, കീടബാധ ഉണ്ടാവുക, ഇതൊക്കെ സംഭവിക്കാവുന്നതാണു്. വിളവു് വളരെ കുറഞ്ഞിരിക്കയും ചെയ്യും. ഒന്നോ രണ്ടോ സസ്യാഹാരങ്ങളുടെ സുലഭതയും മറുള്ളവയുടെ ദരിദ്രതയും നിമിത്തമാണു് ഇങ്ങനെ സംഭവിക്കുന്നതു്.

മേല്പറഞ്ഞ കാര്യങ്ങളിൽനിന്നു്, പ്രതിഫലം നിരന്തരമായി കുറഞ്ഞുകൊണ്ടിരിക്കും എന്നുള്ള പ്രകൃതിനിയമം കാർഷികരംഗത്തും ഒരു യാഥാർത്ഥ്യം തന്നെയാണെന്നു സിദ്ധിക്കുന്നു. ഏറ്റവും ആദായകരമായ തോതിലുള്ള വളപ്രയോഗമാത്രകൾ നിർണ്ണയിക്കേണ്ടതു്, പ്രത്യേക സാഹചര്യങ്ങൾ പരിഗണിച്ചും, സൂക്ഷ്മപരീക്ഷണങ്ങൾക്കു ശേഷവും ആയിരിക്കണം.