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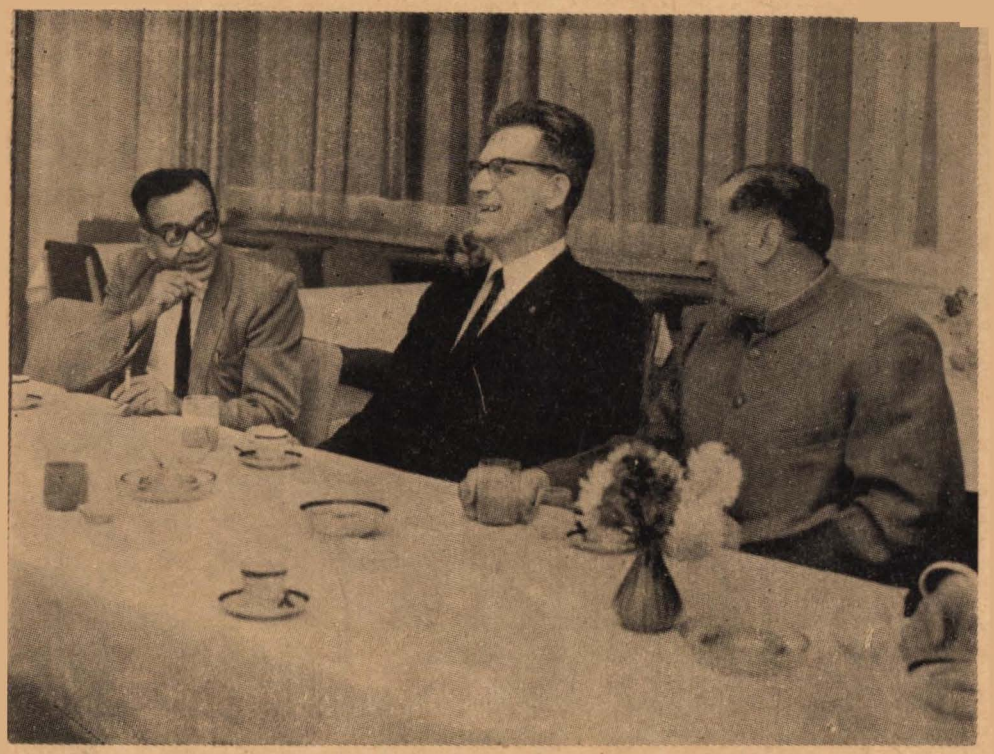
Mechanised Farming Fast Approaching



In Conference with General Secretary Farmer's Mutual Aid Association, G.D.R.

(From left to right) Dr. D. A. Bholay, Secretary Bharat Krishak Samaj Mr. G. Sperling, Secretary General, Farmers' Mutual Aid Association G.D.R. and Shri S. N. Mushran, President Bharat Krishak Samaj.

Protecting Crops Against Frost

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The frost damage is widespread in nature and causes severe losses in terms of economic returns to the farmers. The extent of damage to crops may amount upto 90 per cent or more. In India frosts occur during the month of December and January which is the main crop growing season in the north, and is confined mainly in the Indo-Gangetic plain. Its intensity and frequency both decrease as one moves east or south-wards from the state of Jammu and Kashmir.

What is frost and why it occurs

During nights when air temperature near the ground surface and over the vegetation drops below the freezing point of the water, it causes first water vapour present in the air to be converted into dew, and then to ice crystals which are deposited on the surface of the earth and plant parts. This is known as 'frost'. But in some instances when the dew point of the air mass is below freezing point, ice crystals are formed without dew formamation, and this condition is known as 'black frost'.

Commonly two types of frosts are distinguished depending upon the circumstances in which they are formed. The first type, advection frost or wind frost is caused by a wind below 0°C blowing at a speed in excess of 7 km per hour. This is polar in nature and results from cool high pressure zones of air depending on a number of climatic factors, but latitude and altitude are important ones. It is not limited to night time only, and is difficult to control.

The second type is known as 'radiation frost' and ideal meteorological conditions for its occurrence are high wind velocity in the day time, causing more heat lost from soil surface and plants, in the form of evaporation or evapotranspiration of moisture. The rate of evaporavative and convective energy exchange depend on the temperature gradient between the plant and its environment, the corresponding vapour pressure gradient, and the wind speed over the plant surface. The evaporative loss of heat occures at any time provided that vapour pressure at the crop surface exceeds that of the surrounding air, and even continues in a saturated atmosphere when it is cooler than the crop. The condition when it is followed by a clear, cool, dry and calm or nearly calm atmosphere during night, wind velocity not exceeding 3 km per hour, results in rapid cooling of the earth's surface due to preponderance of the outgoing territorial radiation of wave lengths ranging from 4 to over 50μ. The wavelengths between 8 to 12μ, which result in maximum loss of heat are not absorbed by ozone, carbon dioxide or water vapour present in the atmosphere, and thus allow a free passage. This range is also known as 'atmospheric window'. During a clear frosty night on an average 60k. cal per m^2 per hour heat is lost from vegetation surfaces but the maximum generally does not exceen 76 k. per m^2 per hour. The net loss of heat is only 14 per cent when the sky is casted with low clouds than when it is clear.

The air layers near the earth surface themselves undergo an additional cooling by the exchange of radiation with the cooler upper layers. This results in coldest air temperature at a height of 5 to 10cm. from the ground surface, and thus well known 'inversion of temperature' starts here. The actual temperature attained also depends on the temperatures of the crops and ground surface at sunset when cooling process begins. Frost pockets always tend to form in the low lying condition in the topography, because during calm nights, the cool and heavy air flows downward under the influence of gravity and collects in the low spots or vallies. This type of air movement is known as 'air drainage' similar to water drainage'.

Nature of injury to plants

The amount and nature of the frost damage which occurs below the critical temperature is of paramount importance. The stage of crop growth, degree of hardening, specific and varietal difference, mineral nutrition and moisture stress, all affect the critical temperature. In general more succullent the plant, more is the damage. In spite of these complications, the critical temperatures harmful to some important crops in different developmental phases are given in the table. Among other field crops growing in the winter in North India, sugarcane is the most resistant followed by gram and mustard. Vegetable crops like brinjal and chilles are quite susceptible, but the crops like Brussel's sprout, Kholrabi, Chinese cabbage, and radish are very hardy in this respect.

Physiological effects and causes of injury to plants when exposed to low temperatures and ice formation in plant tissues may be of several types.

(a) **Dessication or dehydration of plant tissues at low temperatures**

This results due to high transpiration rate during the daytime followed by slow absorption of water from soil during night when temperature is low. Sometimes similar injury also occurs, and specially to herbaceous plants, due to frost heaving of the soil causing expansion and surface uplift, which

often tears the roots loose from the soil or in extreme cases may result in breaking them. If the high rates of transpiration continue before the roots are re-established in the soil, the plants may even be dessicated to death.

(b) **Chilling injury**

Chilling injury resulting in death or severe damage in caused to many species, particularly to those which are native to tropics and sub-tropics, by relatively low temperatures above the freezing point of water. The common examples are rice, cotton, groundnut and sudangrass. The plants are most susceptible during flowering and fertilization periods.

(c) **Freezing injury due to ice formation is plant tissues**

Killing or irreparable injury to many plant tissues are caused due to ice formation within them when they are exposed to sufficiently low temperatures. Ice formation in plant tissues may be 'inter cellular i,e. between the cells or 'intra cellular' i.e. within the cells or both depending upon the rate of cooling which is slow or very rapid.

In the former, crystals are formed between the cell and enlarge at the expense of water withdrawn from the adjacent as well as distant cells. The death of the cell may or may not occur depending upon plant hardiness and prevailing temperature. Injury is mostly due to dehydration of protoplasm resulting in coagulation and permeability changes of cell membranes. Pressure developed due to crystal growth and volume expansion also causes direct mechanical deformation of the protoplasm or cell as a whole. During intra cellular ice formation, water crystallization may take place in cytoplasm or in vaccuole or in both or it may form between the cell wall and tonoplasm. Within-cell crystal formation is most destructive to the proloplasmic structure and death of plant cells. Sometimes and especially during rapid thawing, the injury occurs due to permeability differences of cell walls and tonoplasm.

Protection against frost-Heating

Burning of trashes, dried leaves, wood and coal etc. is the oldest practice applied to provide heat and to create smoke canopy over the crops and in the gardens. These were followed in series with oil burners, gas heaters and electric heaters. These measures though applicable in small scale, are not profitable in large scale because huge amount of organic refuse, oil, gas or eleciricity is needed to warm up the air, and especially when duration of cooling is sufficiently long.

Wind Machines

Use of wind blowing machines and equipments, to mix the cool surface air with warm upper one, have been tried in various countries, and various degrees of frost protection have been claimed. But the works conducted in Australia did not approve it. Sometimes wind blowing is combined with heating devices to warm the air. The protection in this method is limited only in the wind-ward direction and damage results in upward direction. This method requires huge construction works and energy to drive wind blowing fans. It is not effective when air temperature decreases below—3°C because the fans have to be stopped from mixing the cool air of the surroundings.

Flooding and Sprinkling

Use of water in frost protection is well advocated method. Water may be applied during frosting by sprinklers or in advance by surface methods. Water has a high heat capacity and releases 80 cal. heat per gm weight as latent heat of freezing at 0°C which is utilized to balance the heat lost by the crops to its surrounding. Surface flooding or furrow irrigation is done, when sufficient water supply is available. Furrow irrigation gives small amount of protection in high frosts, and is less effective than flooding because contact area between water and air is less. Surface flooding, however, causes water logging and leaching of nutrients and is not suitable to most of the vegetable crops and legumes. During the daytime, it also keeps soil temperature low.

Overhead sprinkling has become a common practice in advanced European countries and America. A continuous film of freezing water which drops on the crops, holds the temperature near 0°C due to local release of heat. The rate of precipitation required to maintain the temperature increases with decrease in temperature, increase in wind velocity and decrease in the dew point of the surrounding air. It also increases with the decrease in wettability of leaf surfaces, increase in heights of plants and the critical temperature which varies with the stage of crop development. With frequent rewetting and uniform sprinkling, less amount of water is needed at the minimum rate over the whole area. Apart from the limitations of uniform water distribution, low applications are desired because water logging, leaching of nutrients, and crop breakage from heavy ice loads are possible when large quantities of water are applied. Safe operation time is also important, and in Germany it is recommended to start the sprinkler when wet bulb temperature reaches 0°C, because at lower temperature there is a tendency of small sprinkler nozzles to be clogged with ice. Under tree sprinkling during frost has also been employed in Northern California (U.S.A.) orchards from several years. Sprinkling system of water application, however, has limited use in India because of initial high cost and technical know-how to operate it and to get optimum return.

Planting uphill frost succeptible trees and crops :

It is advisable to plant the frost affected orchard trees and crops uphill theslopes to protect them against the down-ward drainage of the cool air and frost damage. This is of paramount importance for the farmers in the Himalyan Ranges.

Adjust the sowing time

Most of the crop plants and even cereals like wheat, barley, oats, and rye are affected adversely due to frost at their flowering and fertilization stage as it can be seen from the table. In northern India the early varieties of improved high yielding wheats generally come to flowering, if sown on the normal dates, when this region experiences frosts and yields are reduced. Sowing time, therefore, depending upon other climatic factors of the place should

be adjusted in such a way that frost period does not coincide with flowering and fertilization phases of crop plants.

Hardening of plants

Treating the plants, and especially the horticultural crops and vegetables, during their seedling stage for winter hardiness is also one of the measures to safeguard the srops against frost. Hardened plants of cabbage are able to withstand several degrees below the freezing point.

Use of Thatches

Thatching in frost protection scheme is extentively used for tomatoes, squash and other vegetable crops as well as small and newly planted fruit trees. Shields of straw, gunnybags or kraft paper are attached to the arrowed stems on the north side of east west rows leaning over the plants. Thatches act as wind break against cold wind, and during night reduce the radiation loss to the sky. They are more effective against cold wind, and during night reduce the radiation loss to the sky. They are more effective against radiation frost than wind frost.

Selection of the species and varieties of crops

The last but not the least important measure against frost damage is the selection of the species and varieties of the crops plants which are able to endure the freezing injury. Plant breeders are working to evolve the frost resistant varieties of the crop plants in most of the temperate countries of the world.

Frost damages are extensive in nature and so far no one method is available which can be applied on a large scale within the easy approach of the farmers and which may assure cent per cent protection to crops. Most of the methods are costly, and generally adopted, therefore, to safegaurd the cash crops and orchards only. The farmers, however, with the advance warning available about frost occurrence from the meteorological and weather forecast may resort to one or more of the above methods which is within their approach to protect their crops from frost damage and harvest high yields.

TABLE

Resistance of crops to frost in different development phases (Ventskevich, G.Z. 1961 Agrometeorology)

Crops	*Temperature range (minus °C) harmful to plant in the phases of:*					
	Germination		*Flowering*		*fruiting*	
A. Highest resistance to frost		to		to		to
Spring wheat	9	10	1	2	2	4
Oats	8	9	1	2	2	4
Barley	7	8	1	2	2	4
Peas	7	8	2	3	3	4
Lentils	7	8	2	3	2	4
Coriander	8	10	2	3	3	4
Poppies	7	10	2	3	2	3
B. Resistance to frost						
Lupine	6	8	3	4	3	4
Beans	5	6	2	3	3	4
Sunflower	5	6	2	3	2	3
Safflower	4	6	2	3	3	4
White mustard	4	6	2	3	3	4
Linseed	5	7	2	3	2	4
Sugar beets	6	7	2	3	———	
Fodder beets	6	7				
Carrot	6	7				
Turnip	6	7				
C. Medium resistance to frost						
Cabbage	5	7	2	3	6	9
Soyabeans	3	4	2	3	2	3
D. Low resistance to frost						
Corn	2	3	1	2	2	3
Millet	2	3	1	2	2	3
Sudan grass	2	3	1	2	2	3
Sorghum	2	3	1	2	2	3
Potatoss	2	3	1	2	1	2
Rustica tobacco	2	3	——		2	3
E. No resistance to frost						
Castor plant	I	1.5	0.5	1	2	
Cotton	1	2	1	2	2	3
Melons	0.5	1	0.5	1	1	
Rice	0.5	1	0.5	1	0.5	1
Sesamum	0.5	1	0.5	1	—	
Groundnuts	0.5	1	—		—	
Cucumbers	0.5	1	—		—	
Tomatoes	0	1	0	1	0	1
Tobacco	0	1	0	1	0	1

Harnessing Soil Micro-organisms For Increasing Crop Yields

The present strategy for maximising crop production in the country is largely based on exploiting high yielding varieties of crop plants and application of heavy dose of fertilisers. In fact, much of the success of these high-yieiding varieties depends on the availability of fertilisers. As such, fertilisers have a very vital role to play. However, efficacious use of fertilisers is dependent not merely upon correct fertiliser usage but also on the various biological processes going on in the soil. Recognition of this fact prompted investigations in the microbial ecology of beneficial soil micro-organisms and possibilities of effecting a better balance in the population of these organisms which help in increasing nutrient uptake. This has been conclusively proved that soil micro-organisms, if properly harnessed, help increase the yields substantially. It is hoped that in the not very distant future, a farmer would, as a routine measure, use Rhizobium culture or blue-green algae while applying the recommended doses of fertilizer in his fields. These would act as boosters for securing high yields.

Rhizobium cultures.

One of the most important biological processes augmenting soil fertility is the fixation of atmospheric nitrogen. Nature has gifted legumes with a unique mechanism, by which these plants can make use of the atmospheric nitrogen for its growth and development through a symbiosis (in association) with organisms called Rhizobium. Estimated amount of nitrogen fixed from air by these legume bacteria in association with different lagumes is given below

Legume	Nitrogen fixed Kg./ha
Alfalfa	194
Clover	94 to 179
Cowpea	90
Lentil	103
Pea	72
Soyabean	58
Berseem	120
Arhar	140
Groundnut	42

The beneficial effects of including legumes in rotation succeeding cereal crops have been amply demonstrated by experiments conducted in this country and abroad. Experiments conducted at the U.P. Agricultural University with soyobeans have shown an increase in yields by Rhizobium inoculation ranging from 19.61 to 38.11 per cent over uninocul control as also the plots treated with nitrogen at the rate of 100 kilogrames per hectare. Likewise, experiments conducted at the Indian Agricultural Research Institute have shown increased yields varying from 23 to 79 per cent in lucern, soyabean, urad, pea, gram, cowpea and arhar, when inoculated with efficient strains of Rhizobia.

Efficient cultures of Rhizobium are being maintained at Delhi, Pantnagar, Bangalore, Poona, Bombay and the State Departments of Agriculture. Commercial cultures of Rhizobia are available from Bacterial Fertilisers Section, Division of Microbiology, IARI, New Delhi and Field testing Station, Amar Hill, Bombay. Whereas U.P. Agricultural University, Pantnagar supplies Rhizobia culture for soyabean free of cost alongwith the soyabeen seed obtained from the University.

It is also essential to apply adequate amounts of phosphatic fertilisers for getting maximum benefit out of Rhizobial inoculations. If your soil tests indicate deficiency of some of trace elements it is always desirable to supplement these.

Rhizobial culture, as such, opens up quite a new avenue for the utilisation of a vast and cheap source of nitrogen from air which contains about 80,000 tons of gaseous nitrogen over an hectare of soil—virtual floating fortune. The culture costs only about five rupees for treating seeds sufficiently for sowing one hectare. Use of inoculation increases overall protein content appreciably.

Algae inoculation

Whereas Rhizobium makes atmospheric nitrogen available in association with legumes, blue-green algae does the same job independently. In tropics by making better utilisation of solar radiation, these organisms not only fix atmospheric nitrogen but add considerable amount of organic matter to the soil. It it now well known that inoculation with blue-green algae increases paddy yields appreciably.

In recent trials at cultivators' fields at Moradabad in U.P., addition of mixture of blue-green algae with nitrogenous and Phosphatic fertilisers was found to give higher yields than crops supplied with fertilizers alone. The blue-green algae thus tends to enchance the utilisation of fertilisers by crops—thereby contributing towards increased yields. Mass production of blue-green algae is currently undertaken at the I.A.R.I. New Delhi.

Azotobacter and photosynthetic bacterium.

Experiments conducted, using a combination of Azotobacter and another photosynthetic bacterium (Rhodop endomonas Capasulatus) which utilize light energy and is known to take part in fixation of nitrogen, resulted in increase in yields of paddy and wheat. These experiments have opened up possibilities of utilising specific soil micro-organisms which cost so little but play such a vital role for better plant nutrition and higher crop yields.

There is, therefore, imminent need for mass culture production of legume bacteria to treat the seeds of pulses fodder crops. Likewise, multiplication of blue-green algae would be still another step towards attaining higher yields. These are great aids to the farmers and we must arrange to provide in desired quantities. All the same, it should be remembered that microbial inoculants are no substitute for commercial fertilisers but are effective supplements only. Farmers would do well to make judicious use of these.

Weeds Spare Not Even The Under-ground

Groundnut is a crop of great merit. However, the omnipresent weeds do not spare this promising crop as well. These are responsible for substantial reduction in yields. Losses to the extent of 25 to 50 per cent are quite common. The farmers often resort to manual weeding. This undoubtedly does the job effectively, but is costly and painstaking. Sometimes, it is impossible to do weeding for quite some time due to continuous rains.

Mechanical weeding in groundnut is fraught with many hazards as well. As for instance, mechanical weeding at the time of pegging could cause injury to the developing pods. As such, weedicides seem to be the only answer to the problem of weeds in groundnut.

Common weeds of groundnut field :

There are too many weeds that menace groundnut in field. Of these, the important are as under :—

1. **Grasses or narrow leaved weeds :**

This group includes : Brachiaria romosa, Motha (Cyperus iria), Motha (Cyperus rotundus), Makra (Dactelocttenium aegyptacum), Digitaria sanguinalis, Sama (Chinocloacolonum), Sama (Echinocloa crusgalli) Doob (Cynodon), Ramdana (Eragroetis ciliaris) Narkul (Phragmites karka).

2. **Broadleaved weeds :**

These include : Chaulai (Amaranathus viridis), Keena (Commeilma benghalensis), Duddhi (Euphorbia hirta), Hajardana (Phylilanthus niruri), Makoi (Soalnum nigrum).

Chemical methods of weed control

A number of herbicides are now available for control of weeds in groundnut.

Pre-emergence Herbicides

Of the various herbicides available the pre-emergence herbicides have an edge over others in many ways. These are relatively low in cost, convenient to apply, reduce the needed cultivation and kill weeds in their very early stage of growth. The details of some pre-emergence herbicides are given below :

Prometryne :

This selective herbicide controls all the annual grasses and also the broad leaved weeds. The chemical should be applied just after planting the crop when the soil has sufficient moisture. The spray at the rate of 1.5 kg. solution could be prepared by mixing one and a half kilogram of prometryne in 500 to 600 litres of water. This solution would be sufficient to cover a hectare. After application of herbicides, the soil should not be disturbed.

Treflan :

Treflan is one of the relatively new pre-emergence herbicides. It is sprayed before planting on the soil and incorporated well by cross disking. This herbicide primarily controls the annual grasses and broad-leaved weeds. The rate of application is one to two kilograms per hectare in 500 to 600 litres of water.

P C P :

It is more effective on light soils with low organic matter than with the heavier soils. The pre-emergence weedicide controls broad-leaved weeds better than grasses. This should be sprayed before planting. The spray solution can be prepared by mixing 10 Kg. (a.i.) PCP in 600 to 800 litres of water.

This would be sufficient to cover a hectare.

Linuron :

This chemical is also more effective on the light soils with low organic matter than on the heavier soils. It is applied at the rate of two kilograms (a.i.) per hectare in 500 to 600 litres of water. The material is available only as wettable powder for spray application. This is effective in controlling grasses as well as broad leaved weeds.

Post-emergence herbicides :

Of the various pre-emergence, herbicides, the following have been found quite effective :

2.4-DB :

It controls the broad leaved weeds effectively. It is applied when all weeds have come up and have got well developed foliage. The rate is one to two kilograms per hectare in 500 litres of water.

M C P B :

This weedicide has also been found quite effective in controlllng broad leaved weeds in groundnuts. It is also applied at the rate of one to two kilograms (a.i.) per hectare in 500 litres of water.

Other weedicides :

The most important weedicides for effective control of weeds in groundnut have been discussed above. A few other weedicides have been tested and found suitable for control of weeds in groundnuts. The

(*Contd. on page 7*)

ROLE OF NITROGEN IN CROP PRODUCTION

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What attracts the attention of the agriculturist is the capacity of the soil to supply nutrition to plants. Hence the interrelationship between soil-plants would be of great help in crop production. Nitrogen is usually the first of nutrients to be planned for and will likely be the leading nutrient for several years in the developing countries. Nitrate is the normal form in which nitrogen is absorbed by plants, although ammonia and other organic forms can also be utilised. Nitrate nitrogen is present in the soil solution thus readily available. Nitrogen availability is intimately connected with the activities of soil organisms. Nitrogen or organic compound is converted into nitrate by a chain of reactions brought about by organisms.

Protein —→ Intermediate products (Amino acid)—

$\rightarrow NH_3 \rightarrow -NO_2^- \rightarrow -NO_3^-$

The nitrogen requirement of plants is rather high for nitrogen, but unfortunately most of our Indian Soils have low nitrogen content. Hence nitrogen is one of the chief limiting factors in crop production and responsible for low production per hectare.

Following are the nitrogen fertilisers in common use having the different properties with soil.

1. Sodium Nitrate : It has 16% nitrogen which is soluble in water. Nitrate of this fertiliser is not absorbed on the clay fractions of the soil like phosphate ions. Nitrate readily permeates the root zone because of extremely high solubility and is rapidly absorbed by plants and it is not fixed by the soil complex. Since soil has very little adsoption capacity for nitrate ion, the nitrate fertilizer is readily leachable and the quantity of ions leached out depends upon the quantity present in the soil and the amount of the water that percolates. The actively growing plants absorb the nitrate ion quickly for their growth. This is good fertilizer for both top dressing and side dressing. This fertiliser is used on the acid and neutral soils. Sodium nitrate should not be mixed with ammonium sulphate, potassium sulphate, murate of potash and with superphosphate.

2. Anhydrous Ammonia : It has 82 per cent nitrogen. Some crops such as paddy, corn and cotton prefer ammonical form of nitrogen. The ammonia of this fertiliser gets absorbed in the clay and organic matter particles in the base exchange complex and after some time changed into nitrate and then to nitrite. It is better to apply this fertilizer before seeding of crop and 4 to 6 inches deep. There is a loss of 1 to 2% (approx) when this fertiliser is applied with irrigation water, but this process is in practice.

3. Ammonium Sulphate : It has 20.6% nitrogen. This fertiliser is soluble in water and known as acid forming nitrogenous fertiliser. It reacts with soil colloids, replacing calcium from the exchange complex according to following reactions.

$Ca(Colloids) + (NH_4)_2 SO_4 \rightarrow NH_4 (Colloids) + CaSO_4$

The calcium sulphate in the above reaction is soluble and is lost by leaching. By the process of nitrifying of bacteri the ammonium ion is slowly released and converted into nitrate. There is a danger of soil becoming acidic due to application of this fertiliser depends on the total quantity of fertiliser, lime status of soil and the rainfall. In warm weather and aerated condition, the conversion of ammonia to nitrate is rapid. The conversion is more rapid in fertile soil than in infertile soil. This fertiliser is not lost due to leaching because of the absorption of ammonia by soil colloids. This fertiliser can be used both as top dressing and side-dressing having the good storage quality due to ammonia ion which is in reduced form.

4. Ammonium sulphate—Nitrate : It has 26% nitrogen. This is double salt of ammonium sulphate and ammonium nitrate. This is soluble in water and acidic in nature. The leaching of nitrogen does not take place to any appreciable extent as major portion of the nitrogen is absorbed on the calloidal particles. Because this fertiliser

has acidic nature, it can be suitable for alkaline soil.

5. Ammonium Nitrate : It has 33% nitrogen. It is soluble in water by 66% by weight. This fertiliser can be used for both acidic soil and alkaiine soils. This fertiliser is mixed with limestone to form granular calcium nitrate and this calcium ammonium nitrate has half of nitrate nitrogen and the other half as ammonium nitrogen. It has 20.5% nitrogen. From this fertiliser, plant has immediate benefit of nitrate nitrogen and ammonium form of nitrogen provides a steady source of nitrogen which is absorbed by the plant for a longer period.

6. Ammonium chloride : It has 25% nitrogen. This is soluble in water. The ammonium ion enter in the base exchange complex immediately after its application, and chloride ion combines with several bases in the soil, on nitrification, nitrates are produced, which is the form of N chiefly used by most plants on its application to soil, it removes calcium from the soil as Calcium chloride, and thus tends to create residual acidity. This acidic action of ammonium chloride is about the same as that of ammonium sulphate per kilogram of nitrogen used.

7. Calcium cyanamide : It has 21% nitrogen. With acid soils it reacts with acid clay to form acid cyanamide and calcium clay. Acid cyanamide of this reaction first hydrolyses into urea which further turns into ammonium carbonate.

The ammonia liberating absorbed on the colloidal particle and then directly be absorbed by the plants or converted into nitrate nitrogen.

8. Ammonium Phosphate : Mono ammonium phosphate and diammonium phosphate contains 11% nitrogen and 21% nitrogen respectively. There are salts in which both acidic and basic radicals contain essential plant nutrients namely nitrogen and phosphoric acids. On the application to soil of these fertilisers ammonia is absorbed on the surface of colloid as cation and phosphate as an ion. Both these fertilisers are suitable for use on alkali and calcareous soils of their high solubility (89%), residual acidity and the combination of nitrogen and phosphorus.

9. Urea : It has 45% nitrogen, that is higher than any other solid nitrogenous fertiliser. It can be utilised by plant directly. On the application of urea to the soil, it undergoes changes due to biological activity and is converted to ammonium carbonate and then to nitrates. Nitrates and ammonical forms are absorbed and utilised by plants. Urea is converted to ammonical form which is absorbed by soil colloids and slowly released and nitrified to nitrates.

Plants cannot utilise nitrogen as a gas. Hence it should be first combined into stable forms. Several research workers concluded that crops when fertilised with nitrogen have an increased ability to absorb more phosphorus, potassium and calcium, which are essential for plant growth. Cation exchange capacity of plant roots increased with the application of nitrogenous fertilisation and thus makes them more efficient in absorbing other nutrients which are essential for the growth of plants. A final word about the requirement of nitrogen for the crop production is met from the soil available nitrogen and partly by manuring of crops with the above mentioned nitrogenous fertilisers.

Weed Spare Not Even . . .

(*Contd. from page* 5)

farmers could make use of these, in case, those discussed earlier are not readily available. The relevant details about all the weedicides suitable for control of weeds in groundnut are given below :—

Precautions during application of herbicides :

1. The recommended amount of chemicals should be applied.
2. Weighment and calculation of the herbicides must be correct.
3. The spraying equipments should be thoroughly washed before and after the use.
4. There should not be any spraying when wind velocity is high.
5. The drift of the herbicide to the adjoining standing crop should be avoided.

Suitable weedicides for groundnuts

Weedicide	*Rate a.i. kg./ha.*	*Weeds controlled*
Paraquat	0.25 — 0.50	All emerged seedlings
PCP	5 — 20	All emerged seedlings
DNBP	3 — 5	Broad leaved & some grasses
2, 4-D	0.25— 2.0	-do-
2, 4-DB	0.5 — 2.0	-do-
MCPB	0.5 — 2.0	-do-
2, 4-DES	2.0	Germinating weeds
2, 4-DEP	2.0	-do-
Cloramben	1.0 — 2.0	X Broad-leaved annuals, many annual grasses.
Linuron	2.0	Young weed seedlings and other grasses germinating later on.
Ametryne	1 0 — 2.0	-do-
Prometryne	1.0	-do-
Araton	1.0	-do-
Traflan	2.0	Germinating broad-leaved annuals and some grasses ; some effect on perennials.
Diphenamid	2.0 — 4.0	Germinating broad-leaved annuals and some grasses
Vernolate	2.0 — 3.0	-do-

Wheat Farmers Can Go In For Power Threshers

Scores and scores of mechanical threshers are these days humning in the Punjab villages. They are not only lightening the heavy burden of farm work but also quickening the operations of separating grain, drying and storage.

Time was when Punjab too had to depend on bullock feet to trample the sheaves of wheat and winnow the grain by natural breeze. A few years back cipod threshers were introduced which gained popularity among the farmers. But that was not the answer to the threshing problems.

The Agricultural Implements Division of the Punjab Agricultural Department therefore set their sight on power threshers and due to its excellent work in the last three or four years, power threshing there has become the order of the day.

The Agricultural implements Division helped the manufacturers in producing power threshers in several ways. The Division, itself designed the threshers in their workshops and encouraged the local manufacturers, farmers and designers to make improvements. Thc division would test and standarize the machines and the intending manufacturers would be provided with the blueprints.

The Engineering Division also issued certificates on the quality of machines manufactured by private firms and also fixed prices profitable to the manufacturers. Over-pricing of machines was avoided.

The effect of this policy is that the wheat farmers today have some dependable threshers to choose from. Here are three different types of power threshers, the wheat farmers would like to prosess.

The Sower-chaff Cutter Type is perhaps the cheapest in the market. It costs between Rs. 300 to Rs. 400. The machine can handle 1.5 to 2 quintals of wheat grain per hour. It is worked by 4 to 8 H.P. oil engine or electric motor. This machine has no winnowing arrangement. Hence winnowing need be done separately.

The Second type is the Drum Type Power Wheat Thresher. This comes in four different sizes, with a price range of Rs. 600 to 1187. It has a drum with 12 beaters. The winnowing is done by a fan, but sincc there is no bagging arrangement about 5 per cent impurities will remain in the grain.

This thresher is run by a 10 to 15 H.P. electric motor of 15 to 25 H.P. oil engine or a tractor. Its capacity is 2.75 quintals of grains per hour.

A thresher with a higher capacity —about 4 quintals of grains per hour—is also available in the market at a price ranging from 2,000 to 3,000. This is the Portable Power Thresher. It has 12 beaters and one to two suction fans to separate chaff from grain. A grader operated with belt, separates the grain from impurities. An elevator fills the grain in the bag, if needed. It is run on 15 to 25 H.P. electric motor or 25 to 50 H.P. oil engine.

In Punjab, where common threshing floors are found at many places custom threshing with mechanical power is becoming popular. Other wheat growing areas also can emulate Punjab in this respect with profit.

Power threshers are occasionally reported to cause fire accidents on threshing floors. These are mainly due to their use without sufficient precautions being taken.

These fires are caused by the over-heating of unlubricated working parts of the machine which rub against one another or by occasional sparks thrown from the exchausts of the tractor which set fire to bhusa and other dry materials around. The bearings of the machine should be well oiled and wheat stalks getting entangled in the thresher should be removed from time to time. As a further precaution, dry materials should also be kept beyond the range of exhaust gas.

Rajasthan To Process Sugar From Beet

The Governmcnt of Rajasthan is buying a beet-cum-cane sugar diffuser and additional sugar beet processing equipment for its sugar mill in Srigangnagar. The mill thus reequipped will not only incrcase sugar recovery from cane but after the cane season process sugar beet. With this facility it will be possible for the mill to extend its operating season by another fifty to sixty days in the year. This will be the first mill in India to manufacture sugar from sugar beet on a commercial scale.

Diffusers have long been used in Europe and America for the manufacture of sugar from sugar beet. The LT-DDS diffuser which Larsen & Tubro Limited will supply to Sriganganagar will be designed to handle both cane and sugar beet. Such diffusers are already being used by three sugar mills in India for procesing sugar from cane. These mills were earlier employing the traditional milling system. The modified DDS system incorporates milling-cum-diffusion. This system increases the extraction and recovery of sugar.

LT-DDS diffusers are designed to ensure maximum selective extraction. As 100 per cent diffusion of cane is not possible the modified DDS system employs a combination of diffusion and gentle squeezing action of baggassee in the diffuser by helical flghts.

farm news

Manmade Versus Cotton, Wool.

Manmade fibres continue to make inroads on cotton and wool.

Figures prepared by the International Cotton Advisory Committee show manmade fibres are steadily increasing their share of the world textile market.

The percentage of the textile fibre market by manmade fibres rose from 30.1% in 1965 to 32.5% in 1967 and 35.9% in 1968.

World Production, which is closely comparable to consumption rose from 3.3 million tons in 1960 to 5.3 million tons in 1965; 6.1 million tons in 1967; and 7.1 million tons in 1968.

In contrast, cotton's share of the world textile market has been dwindling. In 1960, cotton had 68.3% of the market but this fell to 61.5% in 1965; 59.8% in 1967; and 56.5% in 1968. In some countries the drop in share of the market is even more dramatic. In the United States, for example cotton's share of the U.S. fibre market fell to about 37% of the total.

It is much the same story for wool. Its percentage of the market has declined from 9.9% in 1960 to 7.6% last year.

Since 1960, world consumption of the principal textile fibres—cotton, wool and manmades—has increased by one-third. The total exceeded 20 million tons for the first time in 1968. In 1960, the total was only 15.2 million tons.

World cotton consumption has risen from 10.4 million tons in 1960 to 11.4 million tons in 1968. Wool consumption has remained around 1.5 million tons for the last decade. Manmade fibres production has risen from 3.3 million tons in 1960 to 7.1 million last year.

Australian Wheat Surplus

It is estimated Australia will be holding more than seven million metric tons of wheat by the time the 1969/70 harvest begins.

In addition, it also is estimated the new harvest will be a near-record one of about 14.4. million tons, presuming weather remains favourable. Total acreage this season is estimated at close to 26 million acres, down slightly from last year.

Australian wheat and flour exports in 1968-69 totalled only 5.3 million tons, nearly 1.6 million below the previous season. China (mainland) and Japan are the major Australian wheat customers. Smaller exports combined with the huge 1968/69 crop led to a sharply increased carry-over last July—11.12 million tons, nearly seven million tons more than when the new season began the previous year.

With still another big wheat crop in prospect this season export availabilities are expected to total more than 23 million tons. It is estimated Australia this season will sell five to six million tons of wheat and flour and this, therefore, leaves an anticipated carry-over for July 1970 totalling nearly 18 million tons of wheat.

Australian Wool Output

Australian wool production for 1969/70 is estimated at just under 2,000 million pounds. This would be about three per cent above last season's output and set production level record high. Numbers of sheep on Australian farms have risen to a record high of 176.2 million head, 5.6% more than last year and 3.2% above the previous high set in 1965.

World Rice Market

The world rice market has changed from a sellers' to a select buyers' market 1969, according to rice authorities. This change results from the major increases in total production in 1967 and 1968 and the good 1969 crop indications. Importers can be expected to be much more discriminating as to quality, detailed specifications and delivery dates. However, rice authorities indicate there is no massive world surplus of rice in sight.

According to a U.S. Department of Agriculture assessment, by 1980 it is expected that the world rice situation will have adjusted from the recent pattern of relatively high prices and scarce supplies to one of generally adequate exportable supplies and significantly lower prices—lower both in absolute terms and in relation to wheat, which is the nearest substitute.

A significant increase in rice production is expected in many of the importing countries, although depressed producer prices in the developing countries may curtail production increases.

Among the developing nations, export from Thailand, China (Mainland), Formosa and the United Arab Republic are expected to drop from the levels of the late 1960's. Burma is expected to improve on its recent exports and South Vietnam should become a significant rice exporter once more. Indonesia likely will continue to be a significant rice importer although its import volume is expected to drop off subsequently from the later 1960's.

South Korea probably will continue to be a major rice importer, faced as it is with continued difficulties increaing in production and a rapidly rising population. Both Ceylon and Malaysia will import less rice. India, however, is expected to increase its import needs, and Pakistan, despite large increases in output, may well find it difficult to maintain its net export levels of the late 1960's.

Australia Expands Storage

Australia has launched a program expansion for grain storage. More bulk grain storage facilities are badly needed to take care of the country's growing stocks of grain. The single-

silo buildings will have a capacity of 14 million bushels and are to be built at 22 locations.

When completed, the extra storage will increase Australia's capacity of the bulk grain silo system to more than 80 million bushels.

U.S. Farm Exports Fall

United States farm exports fell for the second year in a row in fiscal year 1969.

Agricultural exports from the U.S. during the fiscal year are estimated at $ 5,700 million, down $ 600 million from the previous year. Substantial declines occurred in exports of cotton, wheat, feedgrains, rice and vegetable oils. There were export increases, however, in meats, hides and skins, dairy products, fruits, vegetables, soyabeans and unmanufactured tobacco.

Exports of animal products during fiscal year 1969 were 18% higher than in previous year with substantial gains in meats, hides and skins, and dairy products. Smaller gains were scored by lard and poultry meat and the export value of tallow was down slightly.

German Grain Surplus

West Germany is making arrangements to store surplus grain in a number of other countries. Storage facilities within Germany are jammed with recent bumber crops. Grain currently is being stored as far away as Sicily. Recent storage agreements also have been made with Switzerland and Belgium, and Germany is hoping to conclude an agreement for grain storage in Denmark.

At the end of the 1968/69 crop year, German stocks were at an all-time high. On top of this, German farmers have just harvested an unofficially estimated 18.7 million metric ton crop of grain.

Big Taiwan Rice Crop

Taiwan farmers have brought in a bumber rice crop this fall. The harvest is larger than anticipated and experts are forcasting a large second rice crop. An estimated 314,640 hectares were planted for the first crop, up moderately over last year. However, while total output is up, quality is reported to be down because of heavy rains.

The big Taiwan rice crops may have brought about troublesome surpluses for the country. Before the first crop harvest, supplies reportedly were 413, 000 tons more than double the normal carry-over. Rice export prospects are not good and this is further concerning the Taiwan Government in its rice surplus situation.

U.S. Farmers Earn More

In the first half of this year, farmers in the United States had cash receipts totalling just under $ 20,000 million.

This is a record high for a one-half year period and is 8.5% above the same period in 1968. At the same time, however, farm expenses rose sharply, although slightly less than gross income.

The net income position of U.S. farmers in the first six months of 1969 is estimated at a little more than $ 15,500 million, up just under $1,000 million, for the same period of the pervious year. Receipts from livestock and livestock products were up substantially. Crop prices were lower in the period, but the volume was up with the result that farmers netted a higher income. Butter, egg, and broiler prices were increased, bringing farmers more money.

Japan Cheese Imports

The Japanese are importing more cheese. In the first half of the year, imports totalled 13,128 metric tons of natural cheese. This compares with 11,144 tons in the same period last year. The main suppliers to Japan were Australia, Norway New Zealand and the Netherlands.

Cheese consumption is almost entirely in the form of processed cheese and is increasing steadily. It is expected to reach 40,000 to 45,000 tons this year. Total imports this year are likely to reach 30,000 tons more than last year.

Tomorrows Farm Co-ops

Agricultural cooperatives of tomorrow will have to provide and coordinate a more complex network of services than in the past in order to meet their members' increasing need for qualified advice in economic planning, farm production and off farm activities.

With regard to the primary structure of agricultural co-operatives, there is a number of clear trends in most developed countries directing future adjustment with regard to size and scope of activity. "The farmers need for co-operative action will increase with his adoption of rapidly improving techniques in farm production."

In addition to procurement credit and requisites and marketing, agricultural co-operatives will be required to provide well integrated, market-oriented advisory services and co ordinate such services provided by Government and other external agencies in order to meet the farmers' need to have these services provided through as few channels as possible. "In order to meet this challenge more effectively as well as increasing overhead costs, agricultural co-operatives will diversify their activities into new fields. Another reason for this trend toward multi-purpose societies at the primary level is also the desire to pool resources which are scarce at local and regional levels."

Purely economic factors of business efficiency must govern this development and when a full horizontal integration is not feasible, it is important that the fullest co-operation among agricultural co-operatives be sought.

"For economic efficiency and bargaining strength, primary agricultural co-operatives of tomorrow will have to be of considerable size; be based on regional rather than local units."

New wave of co-operation in production in many countries. Indeed, there is a drift from local unity among farmers toward a more functional one, based on common professional interest, lines of specialization, etc. In several countries, among them France, the U.K. and Japan, various forms of producer groups are effectively integrated into the co-operative structure, with the dual aim of assisting farmers in improving efficiency on their farm and enabling them to make better economic use of the services provided by the agricultural co-operatives.

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More Animal Protein Through Poultry Products

B. Panda, Ph.D. Central Food
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In the years to come, you may find poultry meat and eggs on your table in a variety of attractive forms—egg powder, cured meat, chicken sausages. Far from being regarded as luxury foods, chicken products will be consumed as a matter of routine, when the spadework that is being done to expand the poultry industry shows results.

From being a source of pin-money to the housewife, poultry keeping has become a profitable industry. Apart from this, production of eggs and poultry meat could help greatly in fighting malnutrition.

Poultry birds have a shorter life cycle and are much more prolific than larger livestock. It is comparatively easy to increase their output rapidly, they yield the best variety of meat within 10 to 12 weeks, and eggs within 24 weeks, and they can acclimatise to a wide range of climatic conditions and high altitudes. The land and capital investment required to start a poultry enterprise is modest. Investigations carried out at several places in the country have indicated that an initial investment of Rs. 15 per layer will fetch a net profit of Rs. 9 to Rs. 12 a year and an initial investment of Rs. 1.50 per broiler will bring a net return of 80 to 90 paise within three months.

By proper mangement, poultry birds could be highly efficient converters of feed into foods of high protein and energy value for human consumption. And in this, young animals are more efficient, and broilers are at the top. Several of the industrial by-products such as rice polishings, rice bran, wheat bran, leaf meats, slaughter house waste, silkworm pupae, sal seed meal and fishery wastes, etc, which are not directly used as human food can be gainfully employed as poultry feed. No other source of high-efficiency animal protein can be increased as rapidly as eggs and poultry meat. Also, one must consider the inedible waste products which are converted by poultry into highly nutritious concentrated animal proteins.

Advantages of Poultry

Poultry products offer special advantages to consumers. Eggs are a rich source, not only of highly digestible animal protein, but also of the right kind of fats necessary for good health. Weight for weight, an egg contains almost the same amount of animal protein as pork and poultry meat, about three-quarters that of beef and two-thirds that of whole milk cheese.

Eggs are used in various ways and for various purposes. Besides their common use as table eggs, hatching eggs, frozen, dried and stored shell eggs, they are also utilized for medicinal purposes and also in leather, paints, dyes, photography, printing and cosmetics industries.

Of late, to assist this industry, scientists have been giving considerable attention to the processing and preservation of poultry and poultry products. A technique has been developed whereby eggs can be preserved in good condition for about four weeks at room temperature for 12 weeks at 55°F and for 10 days at 100°F.

The know-how for making high quality egg powder has also been standardized. Good quality egg powder has successfully been manufactured in the country on commercial scale to meet defence as well as civilian needs. The industry should find this development of great help in utilising the surplus eggs in glut season. Also, at the C.F.T.R.I., we have suceeeded in evolving a formulation of detergent and senitizer mixture for cleaning dirty eggs for their better preservation and marketing.

Best Buy

Poultry birds provide fresh meat in a convenient form. Considering only the edible portion of the meat (Eliminating the bone, gristle, fat or loss in cooking) chicken is by far the best buy. Mostly, poultry contain sufficient fat to provide tenderness and palatability, yet their calorie content is lower than the other meats. Compared to any other meat, chicken meat is higher in linoleic acid content which along with other polyunsaturated fatty acids is considered to be good for health. Thus, the nutrient value of poultry ranks high among popular meats.

As pointed out in the FAO report of 1965, the consumption of animal protein in India is only 6.4 gm per day, which is the lowest in the World. The necessity for putting the broiler processing industry on a sound footing cannot, therefore, be over-emphasized.

C—235
A Gram That Beats Blight

A new variety of gram that resists blight has been recommended for cultivation this season by the Punjab Agricultural University, Ludhiana.

The variety is C-235.

It is reported that this variety withstood blight in the research station at Gurdaspur when gram-blight took a heavy toll in the area during 1967-68.

C-235 is also a heavy yielder, its average yield being 529 kg. per acre against 402 kg. of C-1234 and 393 kg. of Pb. 7, the other two improved varieties.

Besides broiler processing canning of unserviceable birds may be taken up. Mature birds yielding higher amount of meat than young chicken are suitable for canning. Hens after 20 months of age become uneconomic and can be canned with advantage. Good-quality canned chicken meat and other poultry products can be exported profitably to other countries.

Besides canning, meat from the old hens, roosters and from culled birds has been utilisd in manufacturing chicken sausage. Communited chicken meat obtained from such birds could be used at 50 per cent level blended with vegetables and seasoned with spices and then filled in the animal casing to make sausages. Such a product helps in stretching out animal protein supply to a larger group of people and has favourable market throughout the year.

Another product—chicken essence—has a good market in India. It is prepared out of the minced meat of healthy young chicken by partial hydrolysis along with the boiled water extract and concentrated under vacuum.

Curing

The potential market and consumption of poultry meat in India and other countries of Asia and Africa are limited by the lack of adequate refrigeration or other means of preserving the product for the time necessary in normal distribution. Curing, or combinations of curing and dehydration, offer promises of an economical method of stabilization that will provide a product adaptable to native food formulations and methods of cookery. Since poultry meat can be produced very efficiently from grains and has wide range of acceptance among diverse races and religious groups, it is a desirable kind of meat for this development. Cured meats can be expected to lend themselves to incorporation into the highly seasoned foods characteristic of some Asiatic regions. The fact that curing has not been applied to poultry so far is probably a carry-over from past years when poultry meat was a luxury food and quite expensive in comparison with other meats.

Development of suitable curing processes could conceivably expand outlets in India for de-boned poultry meat which will appear in increasing amounts as a product from surplus backs and necks, and for fowls which often sell at distress prices.

To increase the supply of more animal protein, plans for poultry in the Fourth Five Year Plan include (a) increase of egg production to 11,500 million per year ; (b) increase of annual egg production per layer from the present 60 to 100 ; (c) setting up of 200 intensive egg and poultry production and marketing centres ; (d) building of eight cold storage plants for holding eggs during periods of surpluses ; (e) establishment of poultry dressing and freezing plants ; and (f) provision of six refrigerated railway cars and two refrigerated trucks for each State.

World Farm News

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Price Incentives *vs* Development

While the importance of winning the confidence of peasant population normally resistant to change has often been stressed, the desirablity of improving their living conditions is rarely one of the most immediate concerns of Governments of developing nations.

They have repeatedly been advised by FOA and other international organisations of the critical importance of adquate incentives to induce farmers to participate unreservedly in the development process. This message, however, is generally overshadowed by other more pressing considerations. All information available shows that, as a general rule, farm prices are arbitarily fixed, without serious margins taken by marketing boards, co-operatives, etc. The end result is that the farmer gets what is left, an amount that bears no relation to what he had been led to expect from his membership in a co-operative. In his disappointment he learns that middlemen have been paying more, "in certain cases as much as three times the official price", said an African expert.

These short-sighted attitudes towards those without whom there would be no production all defeat the very purpose of agricultural development policies designed to step up production. They seem to indicate the implicit, traditional lack of concern for the rural populations continuing to previal.

This is most unfortunate from a human and socialogical standpoint. But what is still worse is that circumstances just described lead to neglecting the basic principles of economic development. Assuredly, this is why FOA's Director-General has been insisting that agricultural development must be conceived as part of over-all economic development plans and that one of its objectives should be to raise the purchasing power of farmers. In countries where agriculture is the occupation of an overwhelming majority of the population and where farmers are to a large extent under-employed, it stands to reason that the first requirement is to raise standards of living according to standards of productivity. This does not lead only to renewed efforts to produce more, it also builds up the purchasing power and standards of consumption of a high percentage of the population.

Age Factor Counts Much In Bulls' Castration

CASTRATION, we all know is the method of, making a male unfit for reproduction. However, why is it necessary : The benefical effects of castration in cattle are many. The three most important advantages are as under :—

(i) Induces obedience : Castrated animals are docile, less violent and carry out orders obediently.

(ii) Checks indiscriminate breeding : The success of all the scientific breeding schemes depends solely on the basis that all the bull calves are castrated by the time they are mature.

(iii) Tames easily : It is far easier to tame and train a bullock than a bull. Unlike the bull, the attention of the bullock is not diverted in presence of a cow in heat.

The male reproductory organs of the bull are the two testicles, situated in the scrotal sac. The scrotum hangs between the two hind legs. The male germ cells (sperms) are produced in the testicles. The sperms after being produced in the testicles, mature in the epididymis, which is situated along and is adherent to the testicles. During copulation, the sperms travel from the epididymis, through vas deferens and penis. Apart from production of sperms, the testicles secrete the male hormones. The male sex hormones are necessary for the development of the maleness. These are also responsible for the massiveness of the body growth of the bull, development of the humps, its virility and strength.

Right age for castration :

Age of the bull calf is an important factor in castration. Castration of the bull calves in early age retards their growth and vigour. The early castrated animals are very prone to retention of urine due to obstruction in their urinary passage caused by concretions or stone formation (urethral calculi). Thus, castration at an early stage, before the bull calves are mature, is harmful and should not be practised. Likewise, late castration, i.e. at the age of three to four years, is equally bad. The bull calves attain maturity at about two years. The age between one-and a half to two years is ideal for castration. If the bull calves are not castrated at this age, these would be responsible for indiscriminate and uncontrolled breeding. It this happens, then all our breeding programmes, such as natural and artificial upgrading schemes, and Key-Village Scheme etc. would be at stake. If we have to prevent indiscriminate breeding, which is a must for all the breeding plans, all the bull calves must be castrated at one and a half to two years of age. Many farmers, however, are not prepared to get their calves castrated at this age. Some of the reasons, for which they do not castrate their bull calves before three-and-a half years of age are as under :

(i) animals may be less vigorous and strong ;

(ii) hump development may be less ; and

(iii) animals may not be as virulent.

These fears, unfortunately, are not ill-founded but have a substance. Such situations do arise and for the success of any breeding programme, these have to be obviated.

All the same, we have to ensure that the vigour and growth of the calf is not impaired any way. We have, as such, to look for newer methods of castration.

As sexual maturity does not coincide with the skeletal maturity and full bodily growth, all those methods of castration, namely.

(i) Burdizzo's method, where the spermatic cord is crushed ; and

(ii) open method, removal of the testicles, where male sex hormones are prevented to be formed in the castrated animals, are not to be recommended. Methods, in which these hormones continue to be formed in the testicles, but still the castrates are incapable to impregnate the cow are the only solutions. These methods are : (a) vasectomy and (b) caudectomy, involving removal of the tail of the epididymis. The latter method is to be recommended, since technically it is relatively simpler than the former.

The caudectomy operation is very simple and takes hardly fifteen minutes. The procedure prevents the passage of sperns but does not prevent either their production or secretion of male hormones. This procedure, thus does not hamper the body-growth, vigour and strength of the animal. The animal operated by this procedure, however, may behave like bulls and may create trouble in the presence of a cow in heat. In order to prevent this undesirable trait, the operated animals can be castrated again at the age of three and a half to four years of age by one of the presently available methods, namely, (i) Burdizzo, or (ii) removal of testicles. The resort to these methods at that age would not have any deleterious effect on the animals since by then these would have already fully developed bodily and otherwise.

Thus caudectomy seems to be the only effective answer to this ticklish problem.

Foliar Spray for Wheat

Unirrigated and late sown wheat will respond well to foliar fertilization, experiments at Indian Agricultural Research Institute, New Delhi, indicate.

For foliar application by high volume sprayers or mist blowers, it is recommended, urea at the rate of three kilograms be dissolved in 100 litres of water. Six hundred litres of spray solution will be enough for one hectare of crop.

The spraying should be done 45 to 50 days after the crop is sown.

NEW RESEARCHES

Air Condition "Potato Crop"

Research with potatoes in Iowa, U.S.A. shows yield increase from using irrigation sprinkelrs to "air condition" the crop. It is explained that during very high temperatures plants lose water faster than their roots can absorb it from soil. When air around the plants is filled with moisture from irrigation mist, the plants are kept cool and their respiration rates lowered, enabling roots to maintain adequate water intake.

Urea and Wheat

Agronomists in Australia have found that wheat yields were higher where urea was top dressed immediately before seeding than when top dressed either immediately after or two weeks after.

They also found that urea mixed with wheat seed delayed and reduced wheat germination.

Kapok Concentrate Good Feed

Kapok (silk cotton) seed makes a good concentrate feed for livestocks.

Trials conducted at Indian Veterinary Institute show that up to 40 per cent of the concentrate can be supplied through kapok seed. It has more protein than linseed, cotton seed or surson seed. It has almost the same energy value as soya bean or cotton seed.

High Protein Bread

Bread made from wheat flour is sufficient in protein for persons who eat it in combination with other high protein foods such as meat, milk and egg, but bread will not meet protein requirement of those who totally depend upon wheat as their protein source.

Scientists at the Hard Winter Wheat Quality laboratory at Kansas State University, Mahattan, Kansas, USA have found out a way to double the protein content and triple the nutritional value of bread and other baked products made from wheat flour. They can do it inexpensively while maintaining the taste appeal, loaf volume consistency and freshness.

The secret of this new bread lies in the addition of glycolipids, either natural or synthetic to wheat flour that is enriched with plant and animal protein including soya flour, edible yeast, fish flour and others. Glycolipids may be loosely described as compounds containing two parts, a carbohydrate (such as sugar) and a lipid (like an oil).

The tests revealed that relatively low levels of 3 to 6 per cent lysine rich protein supplements such as soya flour would impair bread quality if glycolipids are not present. However, by adding glycolipids the scientists were able to produce bread high in nutritional quality and acceptable to consumers. Tests also showed that even 16 percent of soya flour could be used to enrich wheat if glycolipids were added. The amount of soya flour supplement more than tripled the nutritionary important amino acids in the bread.

The seeds of Briza spicta, a member of the grass family common in southern European countries are an exellent source of glycolipids. Other rich sources of glycolipids include the lipids of red clover, lucern and algae.

I.S.I. STANDARDISES

Chicken Essence

A Draft Indian Standard prescribing requirements and methods of sampling and test for chicken essence has been prepared by the Indian Standard Institution.

The demand for chicken essence is increasing considerably both from the civilian population and from the defence personnel. This standard is being formulated in order to ensure that the production of chicken essence is up to a quality level that is acceptable to the consumers and feasible for the manufacturers.

Chicken essence is prepared from out of healthy young chicken by partial hydrolysis along with the boiled water extract and concentrated under vacuum. The concentrated extract is further sterilized and the fat, if any, is removed. The concentrate is again processed and clarified to meet the prescribed requirements of nitrogen, total solids, etc. The required sweetening and flavouring agents are added and the product is packed in 10 ml hermetically sealed ampoules.

Tapioca Starch

Indian Standards Institution has published the First Revision of an Indian Standard specification for Edible Tapioca Starch (ISI ; 1319-1969) which prescribes the requirements and the methods of sampling and test for edible tapioca starch.

Tapioca starch, also known as cassava starch and manioc starch, is obtained from the tubers of tapioca.

Tapioca starch is used for edible purposes chiefly in the manufacture of sago (SABOODANA), in the making of puddings, biscuits, confectionery, custard powder, baking powder and in the preparation of pharmaceutical products. It is also used for a variety of industrial purposes like sizing of textiles, paper makings, manufacture of cosmetics and adhesives.

This standard was first published in 1968. This revision incorporates a number of important modifications, namely, (a) the limit for moisture content has been reduced from 13.0 percent to 12·5% ; (b) the limit of total ash has been relaxed from 0.4 percent to 0.50 percent; and (c) additional requirements of starch, protein, sulphur dioxide and cold water solubles have been included. Apart from these, there are modifications of less importance.

Dry Salted Shark

Indian Standards Institution has published an Indian Standard specification for Dry-Salted Shark (IS ; 5199-1969) which prescribes the requirements and methods of sampling and test for dry-salted shark.

Successful Cooperative Farming in G. D. R.

By SHRI BALRAM JAKHAR
(Leader of the Indian Farmers' Delegation to G.D.R.)

Today we in India are passing through a new phase in Agriculture called the green revolution, meaning thereby the break-through in Agricultural production. The times and methods have changed but Still there are so many questions waiting to be solved and answered. The Indian farmer has yet to plod so many long miles before he reaches the advanced stages where his counterparts in advanced and enlightened countries, have already reached and are still marching ahead with a steady pace, and I had the good fortune to visit such a country, The German Democratic Republic, as leader of the Indian Farmers' delegation sponsored by the Farmers' Forum of India at the Invitation of the East German Farmer's mutual Aid association called (V.D.G.B.)

There in G.D.R., I saw the answers to our problems. It was a practical laboratory for us. The German Farmer had experimented and after so many hurdles had succeeded in formulating a way thereby attaining the desired results in Agriculture.

In 1945 the present G.D.R. represented the exact replica of India's today's problems. There were big estates and poor peasantry, not much of education and no mechanization, whatever farm equipment they had was lost during the war or was wilfully destroyed by the Nazis. Hence they had to start from scrap.

Land reform was introduced and the maximum individual holding was fixed at 100 hectares i.e. 250 acres. The land above this limit was expropriated and pooled and finally given to landless but some portion was also put under state farms. Uptill 1952, old pattern of Agriculture continued but it was being seriously considered and ways and means devised so as to usher in a new era, new policies and new Techniques. All these discussions focussed on one important problem, an issue that would turn the farmer's life upside down. Farmers faced the question :

"Are we going to pool together our fields or are we going to continue farming our land individually ? what was the choice? The answer was simple, the farmer's own fields were much too small for modern Tractors, combines, Potato harvester etc., and which single farmer could afford these machines on his own?"

Thus the co-operative movement was born and it was practically 16 years ago., The example of the first Co-op. the higher yields at lower costs, the shortening of working hours and the easing of physical labour. The advantages of the use of machinery on large fields convinced farmers and made them discard many erroneous views and doubts.

By 1960 all G.D.R. farmers were members of Agricultural production Co-opeatives. This great social transformation proceded without anyone losing his livelihood or losing his proprietory rights on his land and everyone's income was steadily increasing.

There are three different kinds of Co-op. (L.P.G.S.) in the G.D.R. The farmers themselves decide in which type they are going to join.

TYPE I

Joint utilization of the land organisation of Coop. stock farming.

TYPE II

Joint utilization of land, pasture land, Co-op. ownership of implements machinery and drought animal, gradual organization of Co-op stock farming.

TYPE II

Joint utilization of the land, pastureland and woods, Co-op. ownership of implements, machinery and drought animals, Co-op. stock farming.

The farmers began to tackle the various problems and started by electing the best as leaders for management committee and also set up times for tasks such as cropping, marketing, gardening, machinery and the like. The supreme authority vested with General Membership. It is this membership which appoints the above said teams and committees and also an auditing committee which controls the running of the Co-operative, the observation of rules and regulations, the statute and the co-operatives international regulations as well as the implementation of the decisions of the general body. There is close co-operation in joint work discussions of all team members. Model work norms which are deteremind by the scientific institutes are the sole basis for a fair assessment of the work performed. This work norm is called the work unit and this work unit is the yardstick for the work performed, which is credited to the co-operative farmer's account. This method of assessment simplifies as to the value of different kinds of work (as to the degree of difficulty, special knowledge required, physical efforts and the amount of responsibility). All this can be brought to a common denominator. The value of work unit is always determind by each co-operative according to its own income. The share of the individual member in the income of the Co-op. varies according to the number of work unit. Every member is also alloted a small plot for his personal keeping and this adds to his income which he gets as the payment for his work unit and the share of the land brought in by him to the co-operative.

The farmers have no worry as to

the disposal of their crop, because the Govt. guarantee them fixed price. The yield of the Co-op. has steadily increased and the income of these has multiplied nearly 14-fold. The income of each member had tripled in a decade. The farms machines, tractors, combines and buildings are worth millions of marks. The former petty farmers in a decade have so to speak become millionaires. For an example here are some figures from the District of Liepzig comparing 1960 yields with those of 1968.

	1960	*1968*
Beef per hectare	67 Kg.	105 Kg.
Pork ,, ,,	144 Kg.	203.5 Kg.
Milk ,, ,,	947 Kg.	10269 Kg.
Per lacation per cow	2005 Kg.	3395
Eggs. Per hd.	431	610
Cereals	3280 Kg.	3980 Kg.
Potatoes	19800 Kg.	20100 Kg.

In addition to this yield, there has been reduction in man hours by 50%.

There are also horticultural co-operatives specializing in the production of flowers and vegetables. These co-ops. have hot houses for winter crops and they are very efficiently and economically run.

To help these co-operatives, there exist trading corporations. These trading corporations handle fertilizers, seeds, small machines, winding ropes, coal and insecticides. They have also put up drying plants for fodder, are running agro-chemical centres. Such one corporation is at Schepplin. It serves 37,000 people. It handles banking for the co-operatives and other peoples living in this area. It has a savings account of 12 million marks. It also undertakes insecticide sprays and spreads manure and fertilizers on co-op. farms. The success of these corporations was an eye opener. The entire area under crops gave a healthy and bouyant look. One could easily assess the living standard of the men working on these crops.

The entire streamlining of the Agricultural process has paved the way for these co-ops. to augur in a new era of super co-ops. Now four or five co-ops. join hands together and plan and execute their cropping pattern, thereby making optimum use of farm machinery and reducing the cost to the minimum. There are bigger and higher targets to be achieved by this joint effort.

The basic principle behind all this co-operative effort is voluntariness. After taking into account the prevalent conditions in India it will be safe to say that there is no other way out for the impasse we are facing in modernizing our agriculture except co-operative farming. It in G.D.R. a ceiling of 259 acres is considered to be a tabletennis farm, then what shall we call our farms of 30 acres. The fragmentation of land in small individual holdings breeds more of poverty and ignorance, which we already enjoy enough. If the indian farmer has to be brought up to the 20th century level then it is imperative that the writing on the wall as shown by the G.D.R. farmer be read and copied. The average farm worker gets in G.D.R. an yearly income of at least Rs. 16,000. He enjoys a five day working week just as any industrial worker has fifteen-days paid holidays and old age pension assured, free education for his children and free medical care for his family.

It is high time, nay a crying need of the hour that our Govt. realises that the first step for the prosperity of the farmer is to persuade and offer incentives and facilities to join co-ops. It will lead to modern mechanised farming. Like G.D.R. our Govt. has to provide easy loans for the purchase of farm machinery which is also the duty of the Govt. to make available. It is of interest to note that the interest on farm loans in G.D.R. is $1\frac{1}{2}$ to 2%.

It will be commendable if the Govt. starts some pilot project for coop. farming where fully trained, experienced and sincere co-op workers are put in charge. Some trained persons can be had from G.D.R. to make it a success and if we can show the real way then the success is assured.

Homage to Dr. Panjabrao Deshmukh

Krishak Samachar pays Homage to Late Dr. Panjabrao Deshmukh, the founder President of Bharat Krishak Samaj on his 71st birthday anniversary which falls on 27th December, 1969.

BEWARE OF INSECT ENEMIES OF CASTOR

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Castor, an important oilseed crop is grown over an area of 1.3 million acres producing annually 1.5 lakhs tons of seeds in the Indian Union. Andhra Pradesh, Maharashtra and Mysore account for 90% of the area and about 82% of the production of castor. The oil extracted from the seed is used for medicinal, lighting, lubricating and industrial purposes. The cake is used as manure, plant stalks as fuel or thatching material or for preparing paper pulp and leaves as feed to eri silk worm larvae. This crop is ravaged by a number of insect pests, of which the important ones are dealt with below.

Castor Semi-Looper (*Achoes janata* L. Noctuidae: Lepidoptera): It is a very destructive pest of castor in India. The full grown caterpillars measure 55-60 m.m. in length and occurs in a wide variety of colour pattern, but are mostly greyish brown having white spots on the head and a humplike structure on the posterior part of the body. The first pair of prolegs are reduced and as such is a semilooper. The adult moths are stout with smoky grey or brown fore wings. The hind wings are dark with a white band in the middle with 3-4 white spots near the lower border. Besides castor, it feeds on rose, pomegranate, grape fruit, citrus, Zizyphus, *Euphorbia* Sp. *Bauhinia* Sp, sapium, Albizzea and *Ficus bengalensis* (Kundu et al 1966). The young caterpillars nibble the epidermis of the leaves, while the second and third instar larvae completely defoliate the plants leaving only the veins. The most striking feature of this pest is that the adults cause damage to citrus fruits by puncturing them. The attack on main crop sown in June-July is both from the perennial Castor and also from the emerging moths from the diapaused pupae after the receipt of first monsoon showers. Female generally lays greenish brown eggs singly during night on the leaves. Freshly laid egg measures about 0.9 m.m. in diameter having convex upper and concave lower surface. The newly hatched Caterpillar is yellowish green with light brown head and thorax and measures 3.5 m.m. in length. Egg period varies from 2-5 days. The caterpillars become full grown after five moults within a period of 12-15 days and generally descend down to the ground for pupation either in the soil or amidst fallen leaves. Pupal period varies from 10-25 days. Single generation from egg to adult takes 23-25 days. 5-6 genrations are completed. After the last picking of castor capsules in March-April, it is found in few numbers on the perennial castor and is a source of reinfestation to the new crop. Control measures: (i) Collection and destruction of the pest in early stage of infestation (ii) Spray 2% parathion or 0.1% Sevin (Vitthal and Saroja 1968).

Shoot and Capsule Borer (*Dichocrosis punc:iferalis*. Pyralidae: Lepidoptera): It is a serious pest of castor and is met in almost all the states of the country. The catterpillars are yellowish brown with reddish head and bear dark tubercles with setae. Adult moth is yellowish having abdomen with series of black dots at each side. Both pair of wings are yellowish with black dots. Besides castor, it has been noted on turmeric, ginger, cardomom, guava, peaches and mango flowers (Ayyar 1940). The pest appears in the late stage of the crop and bores the stems and capsules, thus reduces the yield considerably. 82-100% incidence has been reported on varieties possessing either very compact or slightly compact penicles with more of male flowers (Sulochana Bai et al 1968). The external indications of the pest are the existence of frassy matter at the bored shoots and the webbed condition of the seed capsules covered with dark excrementaceous matter. Several seeds are found webbed together in this manner. Eggs are laid on the plants. The hatching out catterpillars bore the shoots and capsules and pupate in silken cocoons either inside the burrowed stem or the web or even inside the hollowed out seed capsule. The pest is active from September to March and passes through three generations. Control measures: Spray 0.05% Parathion at an interval of 21 days commencing from the time of formation of inflorescence.

Bihar Hairy Caterpillar (*Diacrisia Obliqua* W. Arctiidae: Lepidoptera): This is an important pest of castor, but also attacks variety of crops like vegetables, other oilseeds, Soyabean, Cowpea, Sunhemp, beet root, sweet-potato and potato. The caterpillars are covered with hairs and spines. The adult moth is robust with yellowish wings bearing black spots on them. The caterpillars are foliage feeders. They feed gregareously and defoliate the plants. The damage is seen more in areas receiving heavy rainfall (Singh 1968). The female lays 400-1030 eggs in clusters of 10-12 on the stem and axil of the leaves. The caterpillars hatch out from the eggs within a week, feed voraciously on the leaves, become full grown within a period of 3 weeks, descend down to the ground and pupate in silken and hairy cocoons in the soil. The moths emerge after 10 days. The pest hibernates from November to February. Single generation takes about a month's time and as many as eight generations are completed in a year. Control measures: (i) Hand Collection and destruction of egg masses and caterpillars. The pest is kept under check in nature by certain biotic factors like parasites, *Trichogramma* Spp. and *Apanteles Obliqua* parasitising upto 40% larvae of the pest (ii) Dust the crop with 10% BHC or Sevin.

Tussock Moth *Notolophus posticus* W. Lymantridae: Lepidoptera): It is a specific pest of castor particularly in South India. Caterpillars are yellowish in colour, first four abdominal segments bear dorsally fringed yellowish hairs or tussock hence the name 'tussock moth' to the pest. Adult moth possesses

reduced wings. The caterpillars feed on the leaves to such an extent that only the mid ribs are left. Single caterpillar during its larval period consumes 216.2—270.2 Sq. cm. leaf area (Abu Bucker 1967). Mating occurs soon after emergence of adults. Female lays 109-656 eggs covered with brownish hairs on various parts of the plant. Eggs are milky white when fresh, turn to creamy and finally become bluish at the time of hatching. Egg period is 7 days. There is sex differentiation in the larval stage of this insect, the caterpillars which moult four times give rise to males and those moulting five times give rise to females. Larval period varies from 16-19 days. The full grown caterpillar pupates in translucent waterproof Cocoon inside the leaf folds or on the twigs. Pupal period varies from 4-7 days. The sexes can even be distinguished in pupal and adult stages as there is sexual dimorphism. Single life cycle from egg to adult takes 27-33 days and the pest passes through several overlapping generations in a year. Control measures: Dust the crop with 5-10% BHC. The rate of insecticide will vary according to the height of the crop.

Jassid (*Emposca flavescens* F. Jassidae: Hemiptera): This has been recorded from Bihar, Madras, Assam and Madhya Pradesh. These are small greenish bugs with wedge shaped body, congregating mostly on the lower surface of the leaves and can be easily recognised by their diagonal walking. They also infest tea. Both the nymphs and adults suck the sap from the tender shoots and devitalise them. Excessive infestation results in etiolation of leaves and subsequent drying and stunted growth of the plant. In case of severe infestation it has been estimated to cause reduction in yield upto 44.3% (Jayaraj 1965). Minute eggs are inserted inside mid ribs and veins in the parenchymatus layer between vascular bundles and the epidermis. Single female lays 20-30 eggs in her life time. Eggs and nymphal periods are 3-5 and 6-7 days respectively. Single generation takes 9-12 days and the pest passes through several overlapping generations in a year. Control measures: (i) Varieties, C-3 Pakistan, R.C. 1098 Baker and K.C. 1096 Coonoor being resistant are recommended for South India by Jayaraj (1965). (ii) Spray 0.02% Dimecron or Endrin or Parathion or dust 2% Parathion.

Leaf Eating Caterpillar (*Prodenia litura* F. Noctuidae: Lepidoptera): It is a potent pest of castor especially in South India. The caterpillars are stout, smooth, pale greenish brown with yellow stripes down the back and along the sides of the body. The adult moth is stout bodied with four wings pale grey to dark brown having wavy white markings and whitish shining bluish hind wings. It also invades ground-nut, tobacco, tomato, cauliflower, cabbage, banana, colocasia, peas, lucerne and agathi. The caterpillars are voracious nocturnal feeders and if overlooked number of them will defoliate the whole field in one night (Ayyar 1940). 350-400 Eggs are laid in clusters of 50-100 on the leaves, covered with buff-coloured hairs derived from the body of the female moth 2-3 days after emergence. The eggs hatch after 3-4 days into small blackish-green caterpillars which live gregariously for a short time before dispersing, moult four times and become full grown within a period of 20-25 days. Pupation occurs in earthen cells in the soil. Pupal period varies from 6-10 days. The whole life cycle occupies 29-39 days. Control measures: Spray 0.05% of Parathion or dust 5-10% BHC or 2% Parathion.

White Fly (*Trialeurodes ricini* M. Aleurodidae: Hemiptera): This has been recorded as a persistent pest of castor in Bihar, Maharashtra, Gujrat, Andhra Pradesh and Madras. The nymphs are greenish, dorsoventrally flattened, scale like covered with waxy material with fringed outer margin. The adult is a tiny bug measuring about one m.m. in length, white wings with powdery deposits, yellow body and pale white legs and antennae. Nymphs and adults suck the sap from the leaves by remaining concealed on the undersurface of the leaves due to which plant looks sickly. Single infested leaf harbours hundreds of these tiny creatures. The female lays shining white long eggs in small clusters or scattered about on the under surface of tender leaves. The eggs hatch within a day or two, start sucking the sap and pupate (Pseudopupal stage). The adults emerge after few days. Several overlapping generations are completed in a year. Control measures: In nature the pest is kept under check by the predaceous spiders, coccinellid larvae and beetles, chalcid parasites and a black fungi (ii) Spray 0.05% parathion or 0.3% Diazinon.

Mite (*Tetranychus telarius* L. Tetranychidae: Acarina): It is a minor pest but sometimes assumes the status of a major pest. They are minute reddish creatures with an oval or elongated body having eight legs, congregating on the under surface of the leaves inside silken webs. Besides castor, it attacks jute, tea, cotton, tomato, bhindi, rose pumpkins, chrysanthemum and brinjal. Both nymphs and adults suck the sap with cheliceral stylets by penetrating the leaf tissues. The attacked leaves loose their healthy green colour, turn grey, become yellowish and drop down. The infestation occurs more in the fields receiving more of nitrogen, less of potash, with slightly acidic pH. Mating occurs soon after shedding of last larval skin and lasts for 1-2 minutes. They reproduce both sexually and asexually (Lal 1964). The eggs are laid in clusters on the lower surface of leaves near the punctures and are protected by silken webbing constructed by the female. The newly hatched protonymphs undergo three quiescent stages and two nymphal stages before becoming adult mites. Single mite lays 96 eggs within a period of 16.8 days. Single life cycle requires 6-10 days. As many as 41 generations are completed in a year (Nagarajan 1966). The pest is active throughout the year, but adults of the pest have been reported to aestivate during summer months in the cracks and crevices of the stubbles and crop residues in the field. Population of mite reaches at its peak during February-March and declines during May-June. The pest spreads from plant to plant by crawling. Wind also helps in their dispersal even upto a distance of 200ft. because of lighter body weight. Control measures: Spray the plants with 0.03% Thiodon* or Diazinon or Morocide.

Job Opportunities For Jobless Agricultural Technicians

T. C. Roy

How to provide employment to the steadily growing population of technically trained youth of the country is a problem that is raking many a a thoughtful mind today.

Though in recent years there has been some increase in the employment potential under the Government, the gap between the number of technicians turned out every year and the number of vacant jobs is widening. The industrial growth has also not been, to the extent desired, able to absorb the trained technicians coming out of various institutions in the country.

During the preceding plan periods the number of such institutions have considerably gone up without corresponding increase in the job opportunity either in the public sector or in the private sector.

As a result, a sizable mass of young technicians are feeling frustrated today without gainful employment. Such a situation is hardly conducive to any sustained progress.

What then is the way out ? Can any country, which is yet to be fully developed allow such a huge wastage of human material technically trained ?

The obvious answer is to think of a way out in the best interests of the country.

Technical Hand

A technically trained man is one who can do the technical job himself with a certain degree of efficiency. He is better equipped with knowledge and skill of the subject than an untrained man. A motor mechanic, for example, is competent to find out the defects in a motor and knows how to set it right himself. He may take a helper but certainly does not depend on his knowledge to get the work done. A doctor for that matter is capable of taking the charge of a patient the moment he comes out of the institution after training. A civil engineer can set up a concern and start his construction business the moment he finishes his training. As a matter of fact, this is the advantage of technical education for which we pay so dearly.

Why Hanker After Jobs ?

Why should the young men trained in scientific agriculture or animal husbandry or in mechanical engineering rely wholly for salaried jobs alone either in the public or in the private sector ? A youth trained in agricultural sciences knows the theories and practices of scientific agriculture better than one who is not so trained.

With ths advances in agricultural production these days through technological means, farming has become a very paying proposition. Certainly many of the young men so trained have some agricultural land. This is borne out by the statement given by the prospective students at the time of admission to the agricultural course. Quite a good number of such students after successful completion of their course can return to land profitably without seeking paltry jobs.

With introduction of mechanization in farming, young men need not be aftraid of dirtying their hands much. Financial loans are also freely available these days.

Such a course of action has an added advantage in promoting agricultural development in the country, as neither the paid Government agents are as numerous as any Extension Programme would require, nor the extension workers can serve as teaching agents as effectively as the trained technicians working on their fields to the neighbouring farmers. Their way of thinking and method of farming can infuse new inspiration for better farming to others in the line and can thus keep the agricultural progress unimpeded.

Landless Technicians

Maybe that quite a few agricultural technicians coming out of colleges are not fortunate to possess enough land for farming. Even such landless technicians can set up private practices in rural areas on various fields of agricultural technology without relying on salaried jobs.

With the introduction of high-yielding varieties programme a number of opportunities have opened up to such technicians for setting up private practices. So long as farming is a paying proposition, cultivators will not mind paying for any good service rendered to them. One can choose to be a seed-breeder, raiser of a nursery or an advisor on intensive cropping practices, on orchard raising on plant protection, irrigation practices, storage etc, etc.

New Avenues

Some singly or jointly can undertake ploughing the land on customs basis with tractors, undertake large scale harvesting and threshing of different crops with machine, provide plant protection services, undertake irrigations of the fields with pumps and so on. Even tractors, sprayers, dusters, seed-drillers, seed-cum-fertiliser drills and water pumps can be given on hire to the farmers.

Many of the progressive farmers these days are going in for farm mechanisation for efficient and quick service. Agricultural engineers or even mechanical engineers can set up small concerns for fabricating improved machines or machine parts, storage bins, handtool, etc. and providing servicing and repair facilities of machines to the progressive farmers. The facility provided by the agricultural Extension agents is hardly adequate to meet the growing needs of all farmers. There is thus no fear of want of demand for such things and services.

Help Your Animal During Retained Placenta

RETAINED PLACENTA could occasionally be a serious hazard. It needs immediate expert attention. There are many pre-disposing factors for this condition. Let us first understand what, after all, this condition is.

In the womb of the mother, the growing fetus remains wrapped up in membrane-like tissues which are collectively known as 'placenta'. The placenta, which performs vital functions during the fetal life, is normally expelled out of the womb soon after the birth of the young one. In cows and buffaloes, the placenta generally falls out automatically within two to eight hours after calving. If the placenta is retained longer than 8—12 hours after calving, the condition is regarded as abnormal and is usually known as 'retained placenta".

Pre-disposing factors

The condition of retained placenta is quite common in cattle. One can usully expect retained placenta, if the calf is born before or after the expected time. This condition is also generally associated with the birth of twins and painful or slow calvings. Animals suffering from infectious diseases like brucellosis and tuberculosis usually also suffer from retained placenta. Lack of balanced nutrition, adequate sunlight and proper exercise during pregnancy can also be pre-disposing factors for retained placenta. Other factors may also be involved, as for instance, the deficiency of the pregnancy hormone-progesterone. The deficiency of this hormone may either directly cause retained placenta or indirectly cause it by predisposing the pregnant animal to early calving.

One should not get worried, if the placenta does not appear or fall down within two to eight hours after a normal calving. In fact, in retained placenta the time factor is not so important as the appetite, milk flow, appearance, temperature and the like. One should carefully observe the animal and note the changes in the general condition, appearance, appetite, temperature, respiration, milk flow, and chewing of the cud, etc. If the placenta is not expelled fully within 48 hours after calving or if the animal shows reduced appetite, depressed appearnce, high temperature and decreased milk flow, a competent veterinarian must be consulted.

What to do

Before the veterinary aid becomes available, one should wait with patience and keep the cow under close observation in a separate clean and dry room, having plenty of air and sunlight. Let the animal take rest on a dry, clean and soft bedding. Feed her with green grasses, wheat bran, gur and sugarcane leaves, etc. Give her warm water to drink and, if possible, also give her light exercise. If the placenta hangs too long from the cow and drags on the floor, the portion below the hock points should be cut off with the help of clean scissors boiled in clean water for 20 minutes. Do not let the hanging placenta and the external genital organs get soiled. Neither pull the hanging placenta nor tie a brick or a stick to it. Prevent the cow or other animal from eating placenta. Never allow any unauthorised person to remove the retained placenta, as it may do more harm than good.

Never purchase an animal with the history of retained placenta. The pregnant animals should be fed with good diet rich in proteins and minerals. Proper arrangements for adequate sunlight, fresh air and light exercise are essential. Never transport animals during advanced pregnancy. The animals, which are about to calve, should be removed to a separate calving pen which should be kept clean and dry. At the time of calving, strict sanitary conditions should be maintained around the animal.

Retained placenta does not usually pose a serious problem as about 75—80 per cent of cattle with retained placenta show no marked illness and require little treatment. However about 20—25 per cent cases may exhibit moderate to severe illness where retained placenta may be associated with or complicated by massitis, metritis, perimetritis, septic metritis and peritonitis, etc. Negligence in cases may result in sterility or even death. It is always better to consult the veterinarian at the earliest so that he may help you and your cattle well in time.

PUSA SEEDER

Automatic Seed Drilling Device

An automatic seed drilling device, called Pusa Seeder, suitable for sowing several crops has been produced by the Indian Agricultural Research Institute, New Delhi.

The seeder can automatically sow seeds at desired rates and can be attached to implements already available with the farmers like country ploughs and cultivators. The maximum number of rows it can sow are four.

The device which is light weighs 10 kilograms and costs only Rs. 75

"Mexican Wheat Can be Sown Upto January" Says Lal Singh

Shri Lal Singh, life member of Bharat Kirshak Samaj, says in his report that Mexican Wheat can be sown upto first week of January with good resuls. His report together with result of observations is given as under for the benefit of the readers.

In the rabi of 1968-69, a trial on the late sowing of wheat was conducted at Baradari Farm with different varieties. The sowing was done on 4-1-1969, 14-1-1969 and 24-1-1969 For 4-1-1969 sowing the area of each plot was 1/125 of an acre while for both the subsequent sowings, the area of each plot was 1/160 of an acre. At each sowing variety was the same for the three sowings. Fertilisers were used at the rate of N 60 Kg., P_2O_5 32 Kg. & K_2O 22 Kg. per acre, the dose generally used for wheat at this farm. Irrigation was given when required. In all five irrigations were given.

The result of the trial calculated on one acre basis is given below in Quintals.

Variety	*4-1-69 Sowing*			*14-1-69 sowing*			*24-1-69 sowing*		
	I	*II*	*Average*	*I*	*II*	*Average*	*I*	*II*	*Average*
1. Sona Kalyan	17.68	13.43	15.55	×	×	×	11.68	9.92	10.80
2. Sonalika	20.08	×	20.80	10.00	11.44	10.72	11.84	8.96	10.40
3. Choti Larma	13.86	13.43	13.64	9.28	10.52	9.90	8.80	6.56	7.68
4. P.V.—18	19.78	20.31	20.04	13.44	12.96	13.20	11.04	13.44	12.24
5. Sonac-64	15.66	16.18	15.92	10.41	9.23	9.82	9.76	9.92	9.84

From the above it is apparent that :

(a) Mexican wheats can be sown up to the first week of January with good results.

(b) P.V. 18 gives the highest yield in sowing up to the 4th week of January.

Food And Feed From Algae

Standing waters reflect thr colours of the sky, turning red at dawn and dusk and becoming intensely blue on cloudless summer days. But the green colour is scarcely ever due to the magic of reflection. It is due to the presence in large numbers of plant forms like algae. One of the most important families of algae is known as Chlorococcales. And a marine form of this group is Clorella which is found in India along with many fresh water forms.

Algae figure very low in the scale of plant evolution. But chlorella has figured recently in headlines, linked with the most advanced activity of our technological civilization space research. It appears that this lowly plant form has come in very handy for keeping the air in space vehicles pure on long interplanetary flights. Recent reports by the New York Times News service indicate that the Life Science staff of the Aerojet-General Corporation, California, has developed an apparatus and process for the purpose. The stale air in which the carbon dioxide has been concentrated is fed into a floodlit container containing a mixture of water, nutrient chemicals and Chlorella. The algae utilises the carbon of carbon dioxide in its photosynthesis (manufacture of carbohydrates with the help of the energy of light) and releases oxygen into the space vehicle.

The majority of the Chlorococcales are free-living and planktonic (drifting or floating) mostly in shallow, confined waters. While it may be quite some time before India utilises them for adventures like space flights, there are other uses which can be exploited in the immediate future. Many types of fresh water fish seem to feed directly on these algae. But they seem to be more important as an indirect source of food to fish than as a direct source. Small planktonic animal cules feed on the algae. When it is remembered that planktonic animal cules are very useful items of food for fish, particularly in the early stages of the life history of the latter, the potentialities of artificial feeding of fish and increasing the natural food supplies of nurseries and rearing farms can be realised. It has also been established that several vitamins found in fish can be ultimately traced to these algae.

Investigations on the use of algae as a source of industrial raw materials and food have been receiving lot of attention all over the world during recent years. Regarding the potentialities of Chlorella as industrial raw material, the only one which shows immediate promise is its use as a potential source of chlorophyll for deodorant purposes. But there seem to be greater possibilities of its use as food and feed. All essential amino acids are present in Chlorella. The amino acid index for chlorella is 62, which is more or less the same as in wheat flour, peanut meal, etc. It is a rich source of vitamins A,C, K & B-1. According to one scientist the vitamin B-1 value of young cultures of algae like Chlorella equals that of lemon juice.

In Japan, powdered Chlorella has been used successfully after mixing it with green tea or with noodles made of wheat flour or in chicken soup. Perhaps Chlorella will prove to be more valuable as a food stabiliser than as a complete item of food by itself. It is possible to raise 20 to 30 times more dried Chlorella from one acre of water, one metre deep, than maize from one acre of land.

Because of these potentialities the food value of Chlorella is currently under investigation at the Central Food Technological Research Institute at Mysore. There is also a scheme at the Indian Agricultural Research Insititute, New Delhi, to study the genetic variability of useful algae including Chlorella.

Scientists seek new hybrid cereals

British plant scientists have initiated a big research programme to develop new high-yielding varieties of wheat and barley.

They are known as F-1 hybrids-crossbred varieties that produce 25 per cent more grain than any existing strains.

For the average British farmer it would mean a new dwarf cereal that would produce 750 to 875 kilograms more per hectare than ordinary varieties. For the best producers with a yield of 7.5 tonnes per hectare it could mean an extra 2.5 tonnes.

CYST NEMATODE
A serious wheat disease

Cyst nematode, a serious disease of wheat is reported to cause heavy loss in the wheat-growing areas of Punjab, Haryana and Rajasthan.

The disease appears in small patches in affected fields which gradually increase every year with continuous cultivation of wheat in the same field. The diseased plants become stunted and turn pale, leading to death of plants in some cases.

Crop rotation is the only known remedy. Wheat, oats and barley should not be sown in the infested fields for 3 to 4 years. The alternate crops that can be grown in such fields are bajra during kharif and gram, pea or root crops in rabi.

More □ Life □ for □ Fruits □ and □ Vegetables □

How much vegetables and fruits do we lose every year ?

A recent survey shows that about one-third of them never reach the consumers. They perish, either in storage, or during transportation.

Much of this loss is avoidable, provided the fruits and vegetables are properly preserved.

The Central Food Technological Research Institute, Mysore, after a series of experiments on an inexpensive and widely applicable method of preserving fruits and vegetables have now come out with a wax emulsion to preserve these highly perishable articles of food. The cost of treating 100 oranges, apples or mangoes or 100 pounds of potatoes or bananas will be only about 13 paise. As this emulsion is made from indigenous raw materials, it is within the reach of every one.

Fruits treated with wax emulsion not only last longer, but also took more attractive, thus improving their marketability.

The wax emulsion is prepared by melting microcrystalline paraffin and caranauba wax along with emulsifiers. To reduce the loss of bruised fruits due to fungus attack, a fungicide is also added to the emulsion. It also contains a few plant hormones which help development of an attractive colour in the ripe fruits and delay or hasten their ripening.

The emulsion is made from 500 gram wax blocks now available in the market. The block is dropped in 500 ml. boiling water and dissolved, When the solution is completely cool, 2.5 gallons (about 11 litres) soft cold water is added to it. The emulsion is now ready for use.

The emulsion also comes in tin containers with 12 per cent solids. This has to be diluted with 3 parts of cold soft water before use.

Waxing of fruits can be done either at the orchards or after transport, or even after storage at the marketing centres. At all the stages, waxing reduces the spoilage and increases their marketability. But the fruits waxed just after harvest have the longest storage life.

Method of Waxing

Fruits, intended to be waxed, are sorted, graded and dipped in the diluted wax emulsion for a minute. They are then taken out, drained to remove extra emulsion and arranged in rows to dry under shade, either on a floor plastered with cow dung or on waste nowspapers. Drying takes only 10 to 15 minutes. The fruits should be given two or four turnings while drying.

If hot air blower is used, the blower should be kept at a distance of about 30 Centimetres from the fruits. Its position should be changed from time to time, as otherwise the fruits get 'burn injury'. In case an ordinary fan is used, the fruits should be given one or two turnings while drying. This prevents the emulsion depositing at the base of the fruits.

Each fruit after treatment picks up enough wax emulsion which will not be discernible to the naked eye. The treated fruits can be distinguished only by its gloss and better appearance. The amount of wax left on the fruit being extremely small there is no need to wash it off.

Results of Waxing

The wax emulsion has been tried widely at Mysore. and has also been sent to more than 100 centres in the country for large scale trials on local varieties of fruits and vegetables. They have yielded encouraging results.

Treating fruits and vegetables with wax emulsion will go a long way in overcoming the problem of glut in the market and long distance transportation of the perishables. This will also help feeding the food processing industries for a longer span of time.

Highest Potato Yield

The harvesting of National Demonstration of seed potato plot of Kufri Sinduri variety, located in village Chatia Chorma in the district of Champaran of Bihar State, in the field of a progressive cultivator Shri Braj Kishore Singh was done on March 27, 1969 in the presence of Mr. D. N. Mukerjee, Botanist, Central, Potato Research Institute and Mr. R.P. Dixit an All India Radio representative, Shri D. N. Verma, B.D.O. Pakidyal C.D. Block along with other state agriculture department staff and local farmers.

The yield was found to be 725 maunds per acre which has broken all the previous records of Potato yields of the country.

The farmer, Mr. Braj Kishore Singh is a certified seed producer of National Seeds Corporation, who was extended all possible help by the Regional Unit of Corporation at Patna.

A special recording of the harvesting was done by All India Radio Station, Patna, which was broadcasted in 'Kheti Girhasti' programme.

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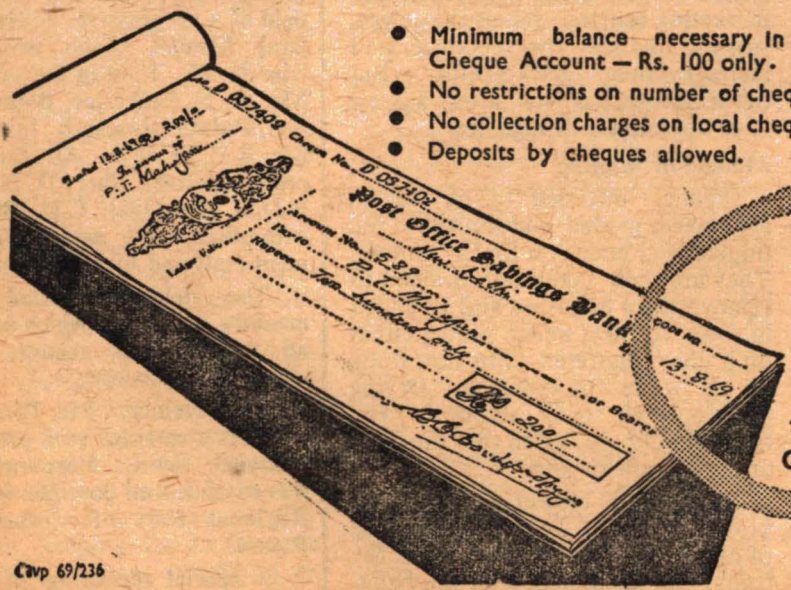

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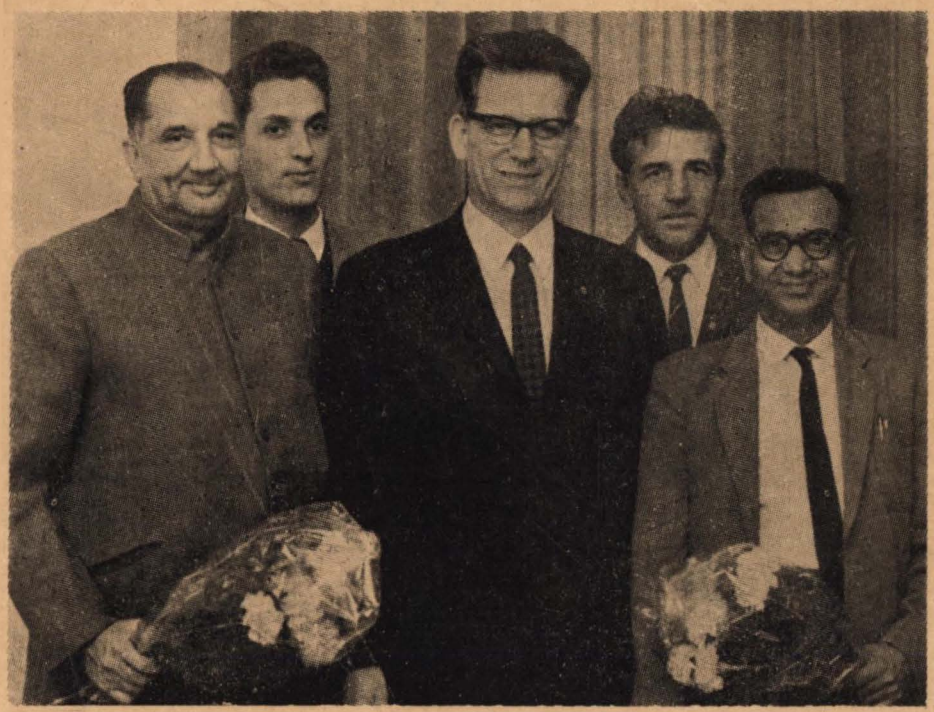

Shri S. N. Mushran, President and Dr. D. A. Bholay, Secretary Bharat Krishak Samaj in G.D.R. with office bearers of Farmers Mutual Aid Association

(From left to right) Shri S. N. Mushran, President Bharat Krishak Samaj, Mr. Fisher, Interpreter. Mr. G. Sperling, Secretary General Farmers' Mutual Aid Association G.D.R. Mr. Winter, Incharge International Programme, Farmers' Mutual Aid Association G D.R. and Dr. D. A. Bholay, Secretary Bharat Krishak Samaj.

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