KRISHAK SAMACHAR

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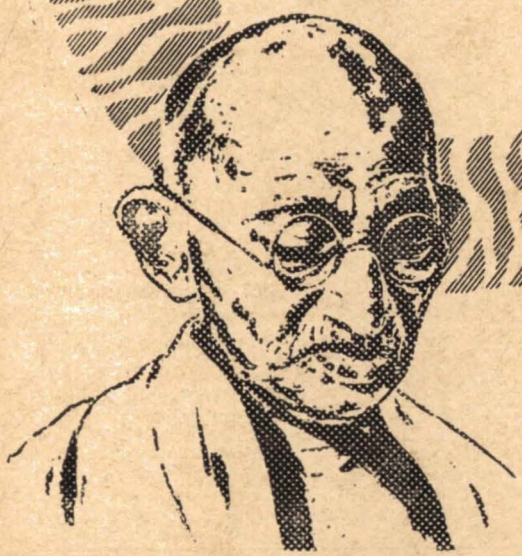
Soya Bean on Indian Soil

'India's people should have by reason of its extent and variety of climate, a most liberal supply of fruits, vegetables and milk . . .

For retaining health, fresh fruits and fresh vegetables should form the main part of our diet.'

Gandhiji who said this added that experts should suggest the list of vegetables and fruits which can be easily and cheaply grown in the villages for local consumption.



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WHAT to
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Soya Bean Marches Ahead

(By Earl Leng)

The Soya Bean is a native of eastern Asia but grew to prominence in the United States where it is a major source of vegetable oil and protein food for humans and livestock.

Strangely enough it is almost unknown in many areas of the world where protein is in acutely short supply.

This may not be true for very long. Recent research, especially in India, shows this crop has excellent potential as a hunger fighter in many tropical and sub-tropical areas.

New wheat and rice varieties making up the calorie deficit in much of the world, but in most areas there has been no corresponding improvement in the protein supply.

In India, in fact, the more profitable high-yielding cereal grains are displacing some of the acreage devoted to vegetable legumes (pulses) which traditionally have supplied much of the dietary protein.

The Potential

In the major United States growing areas, soya beans now yield an average of 1.600 to 1.800 pounds of grain per acre, with individual yields often exceeding 2,500 pounds. The modern varieties have over 20 per cent oil content and over 40 per cent protein. Thus, in the U.S., soya bean deliver from 700 to 1,000 pounds of high quality protein per acer.

In contrast, most of the vegetable legumes grown in sub-tropical and tropical areas are not only low yielding, but contain only about 25 per cent protein. The common Indian pulse crops, such as arhar, mung, urad and gram, typically yield 500 to 800 pounds of seed per acre and only 125 to 200 pounds of protein. Though these crops suit the local taste better than soya beans, the contrast in protein production is overwhelming.

Work in India

In 1965 research workers with the University of Illionois, Urbana, Illinois, U.S.A. began intensive soya bean field trials at Pantnagar in northeastern India and at Jabalpur in the central part of the country under the USAID contract. The first year's results were only moderately encouraging ; however, the 1966 trials at Pantnagar resulted in some yields over 3,000 pounds per acre. By 1968, it had been shown that yields up to nearly 4 000 pounds yer acre could be produced both at Pantnagar and at Jabalpur. These outstanding results were achieved with varieties developed by U.S. Dept. of Agriculture plant breeders for the Gulf Coast states of southern U.S. From these results, it is now clear that high yields of soya beans can be obtained in much of India, between latitudes 23° and 30° North, using available germ plasm. Preliminary trials much nearer the equator show that the later varieties will yield fairly well in more southern areas of India.

This and other work make it clear that soya beans can improve the diets for untold millions of people in areas where protein is now in short supply.

Climatic Factors

When grown in temperate regions soya beans are a summer (warm weather) crop. They are usually planted when the soil has become warm, ordinarily just after the maize crop has been put in. They grow rapidly during the warm months and mature in the autumn before frost. In comparison with the maize crop, which takes 150 days or more planting to harvest, soya beans often require less than 130 days.

Day length is the key factor in the development of most soya bean varieties. They are very few varieties which do not show a strong day length response, but most types will flower and mature quickly if grown under conditions where the day length is less than 14 hours, providing that temperatures are also favourable. For example, soya beans grown during winter in Northern India flower and mature at heights of only a few inches. As a result, the crop usually can succeed only where days are long enough in the early part of the growing season to permit the plants to attain a reasonable size before the onset of flowering.

Experience in India, where temperatures in February are high enough for the crop to be sown, shows that the U.S. varieties which do well from June or July planting do not mature properly if planted in February or March. Apparently the increasing day length of April and May does not permit the maturity process to proceed in a normal manner. The plants flower, pods set, and then the plants do not mature.

Thus, it appears that for sub-tropical conditions, the only feasible growing season for most varieties available would involve May or July planting. In much of the Asian and African areas, monsoon conditions prevail and moisture supply then becomes of major concern. In northern and central India, the rains do not begin until mid-June or even early July. Sowing the crop before the onset of the rains is not possible unless ample irrigation facilities are available. As a result, late June or early July sowing turns out to be the most practical. Varieties presently available will mature easily in sub-tropical areas, by October at the latest, and thus the crop is best grown as a rainy season or 'summer' crop.

Variety Selection

For soya beans, as with any crop, there are wide differences in adaptation and performance among varieties. The day length sensitivity of soya beans adds a special consideration to variety choice.

Variety trials in India soon showed that certain U.S. varieties were better adapted than others. The variety Bragg, a Group VII (Gulf Coast) maturity type, performs particularly well in both northern and central India. Surprisingly, the variety Clark 63, a Group IV type

adapted to south-central Illinois, U.S.A. and similar latitudes, has performed better than other 'early' types in the Indian trials, and nearly as well as many later varieties.

Yields obtained in experimental trials in India have been very high compared to yields of the same varieties in experimental plots in the U.S. Also, development and maturity are much more rapid under Indian conditions. Varieties which require 145 days or more from normal planting dates to maturity in northern Florida mature in less than 120 days in northern India and about 105 days in central India near the Tropic of Cancer. This rapid maturity is a highly favourable factor, since it insures that a crop sown in early June to mid-July will mature and can be harvested in plenty of time to be followed by wheat.

In contrast soya bean varieties which had been grown on a very small scale in India for some years and were regarded as adapted, have proved to be lower yielding and much later in maturity than the never types introduced from the U.S. This is not surprising because almost no scientific breeding or improvement had been done with the plant in India, while intensive improvement work has been underway for many years in the U.S. The importance of using the best available varieties is quite clear, and it is most encouraging to find that types now in wide use in the U.S. have characteristics which make them quite well adopted to the growing conditions of an area as far away as India.

Seed bed preparation

Soya beans require a good seedbed, with a reasonably fine texture and not too many clods. They will not tolerate planting in hot, dry soil ; therefore it is necessary to delay planting until moisture is available. In monsoon climate land usually is plowed several times before the onset of the rains, and again after the first monsoon showers. It is important that soya beans be planted in a weed-free seedbed, and preferably in one where the weeds will not get too fast a start. Soya beans do not compete well with grassy weeds in the early stages of their growth, and it is therefore better to let them get a head start on the weeds if this is possible.

Where modern machinery is available, plowing, dicing and harrowing are useful operations in land preparation. My best crop in India was grown on land that has been plowed after a winter crop, let lie during the dry season, then disced and harrowed after the first monsoon showers and planted immediately before the next heavy rain. The crop emerged in four days and was off to a favourable start ahead of the weeds. Cultivation was much easier in these plots than in any other crop of soya beans I saw in India.

Planting techniques

In technologically advanced areas, soya beans are planted with machinery, either with special plates in corn planters, or by drills. The need for cultivation by tractorpowered equipment has pretty well fixed row width at 30 inches or more usually 36 to 40 inches. This is true despite the fact that extensive research shows higher yields narrower rows, so long as the weeds can be controlled properly. Seeding rates usually are about 60 to 70 pounds per acre.

Our experience in India has shown that simple grain drills, or even sowing in furrows behind the "country plow" or by hand, can give satisfactory stand if the seedbed is good and if the beans are planted 1 to 2 inch deep. Deeper planting is likely to produce very poor stands, especially if heavy rains come before the young plants emerge.

Studies of row spacing and plant populations are still in the early stages in India. It appears that a considerable variety of combinations of row and plant spacings can be successful, providing that plant populations are somewhere in the range which will be achieved by planting 60 to 90 pouuds of seed per acre. The highest yield in our trials thus far have been obtained with row. These row widths, though narrower than those used in the U.S. are quite practical in areas where much of the weed control is by hand or animal-power cultivation.

Weed Control

The need for good control of weeds has already been stressed. Soya beans are somewhat usual in that they are very sensitive to early weed competition but become efficient competitors when they reach 2 feet or more in height, particularly in the narrower row spacings we have found practical in India. Growing conditions during the monsoon season are highly favourable for both soya beans and weeds, making good weed control very important during the first 30 days of growth.

Our trials in India thus far indicate that perennial grasses, sedges ("nutgrass"), and some annual grasses are the most serious weed competitors for soya beans. Persistent herbicides, such as Treflan, are of considerable use, but have their limitations in the control of the sedges, in particular. Less resistent herbicides usually are leached out or broken down by the heavy rainfall and do not last long enough to give the needed protection.

Clean cultivation during the early growth stages, especially by hand weeding, has given the highest yields in our trials thus far. Hand weed-

Three Crops a Year

Good Results From Trials

Three crops in a year from the same piece of land can give a total income of Rs. 12,000 per hectare, according to trials conducted at the Indian Agriculture, Research Institute, New Delhi.

Two types of rotations were tried in these experiments. In one rotation, Japanese White variety radish was sown in the first week of Ootober followed by Sonara 64 wheat in mid-December and CSH-1 jowar in mid-June. In the second rotation, Kufri Sindhuri variety of potato was sown in the first week of October followed by Sonara 63 wheat in the first week of January and CSH-1 Jowar in mid-June.

This type of farming solves the weed problem to a large measure, it is reported. Pests and diseases need be checked through a well-planned plant protection schedule.

ing is not usual in India. In fact, a soya bean crop can provide and efficient outlet for available hand labor where it may be the only feasible rainy season crop in many areas which now practice summer fallow.

Where herbicides are used, it is important to follow the recommendations pertinent to the local area. Wide variation in rainful pattern, temperature, and soil type, and the cropping cycle make uniform recommendations impossible.

Insect and Disease Pests

Both in the U.S. and elsewhere, the soya bean is relatively free of serious disease and insect pests. However, there is always the danger that certain areas will be attacked or that new pests will become important.

In out Indian trials, the major disease problem thus far has been a mosaic-like virus, which probably is insect borne. In same areas, hairy caterpillars have presented a threat to the crop. Leafhoppers of various kinds also may be a problem. Some difficulty has been encountered with a stem borer, though it does not appear to cause much yield loss.

As in the case of weed control, local conditions are sufficiently variable that generalized recommendations are hard to make. The most rapidly developing countries like India have an ample supply of agricultural chemical suppliers who are familiar with local conditions and who can supply the materials and equipment needed for pest control. Soya beans in humid, warm areas will in most cases require one or two spraying with a modern insecticide to produce the highest yields.

Harvesting and Threshing

In this day of combine harvesting, it may seem peculiar to speak of harvesting and threshing as two separate operations. However, many areas of the world still employ very simple equipment for harvest. and conduct threshing as a separate operation. This is likely to be true for soya beans in areas such as India.

Soya beans mature by dropping their leaves. This occurs when the plant has reached the appropriate stage of development and is often independent of weather conditions such as temperature or humidity. For this reason, it is important in the sub-tropical climates with heavy rains that soya beans not mature too soon.

When most of the leaves have dropped the soya bean pods quickly dry out and the crop is ready for harvest moisture content should be below 15 per cent and preferably around 12 to 13 per cent. In lieu of a moisture tester, a good criterion is when the beans becomes dry and hard, which signals they are ready to harvest in most sub-tropical areas.

Soya beans shatter (drop from the pods) easily if alternate wetting and drying occurs after maturity or if they are allowed to stand too long once they are ripe. Prompt harvesting is important. Fortunately is most areas where the crop is likely to become adapted the period of ripering falls when other labour requirements are not great.

Soya beans can be cut by hand or by small, animal drawn or power movers, and should be tied into bundles immediately and raised the ground. In most village areas, they would be brought from the field to the home buildings, and ricked or stacked for further drying. They should not be stacked in large stacks or placed where they cannot be exposed to air circulation because the beans will mold in the pods. Actually, it is best to thresh them as soon as they are dry enough.

Combines, of course, are a very efficient harvest tool. Simply wait until the plants are dry enough and set the combine cylinder and sereens to handle beans without cracking them. The straw is returned or disced into soil as it is prepared for next crop.

Threshing of hand harvest beans can be done by suitable threshing machines, by treading with animals, or by hand operations with clubs or flails. I personally have threshed and winnowed quite a few beans by hand. It is slow but quite effective, and no different than the way other pulse crops are usually handled. The remaining straw though course, is fairly good feed for cattle or goats.

Seed Storage

Soya beans present some usual problems particularly when they are to be kept for seed. Unless they are very dry, they will heat and spoil if stored without sufficient air circulation. If they are stored at high temperatures, they quickly lose their viability and will not grow in the next season. If kept for many months their high oil content can lead to rancidity. Thus, they need to be kept in a dry place, as cool as possible, and used or marketed as promptly as feasible.

Thus observations apply chiefly to sub-tropical and tropical areas. In temperate climates, soya beans are harvested in cool weather and stored over the cold winter. Spoilage, rancidity, and reduced germination are not such serious problems.

Clean, mold-free, uncracked beans will keep much better in storage than damaged dirty or moldly seeds. We have observed considerable difficulty in India with seed coat damage, and are working on this problem in the hope of making effective seed storage easier.

Utilization

It would be almost impossible to list the many and varied uses of the soya bean in the U.S., Japan, or Western Europe. The oil is used for a wide variety of edible products and also in paints. The meal is a valued source of protein for animal feeds, many human feeds, and a host of industrial uses. Milk-like drinks, cheese substitutes, soy sauce,

(*Contd. on page 23*)

Balanced Fertilizers for Groundnut

Farmers can get a net income of over Rs. 2,000 per hectare from groundnut if a balanced fertilization with nitrogen, phosphoric acid and potash is done, trials at various centres in Amraoti district in Maharashtra show.

The dose of nitrogen, phosphoric acid and potash applied per hectare was 16.68, 33.37 and 33 37 kilograms respectively. The entire quantity was added as basal dressing.

The crop yielded 2,633 kilograms per hectare.

Control Oilseed Pests

Insect Pests do an extensive damage to crops and oliseed crops are no exception. The oliseed crops are subject to attack by a number of insect pests, such as; (i) mustard saw fly (ii) painted bug (iii) Bihar hairy caterpillar, (iv) mustard aphid (v) red hairy caterpillar, (vi) groundnut leafminer, (vii) groundnut aphid (viii) til sphinx, (ix) leaf and pod caterpillar (x) Sesamum gall fly, (xi) castor semi-looper, (xii) leaf eating caterpillar, (xiii) castor capsule borer and (xiv) safflower aphid. Though we possess no accurate statistics to the final amount of annual loss sustained by the country due to the ravages of insect pests on oilseeds crops, however, even an average loss of 10 per cent would work out to over 670,000 tons.

Mustard Saw Fly (Athalia proxima)

The adult flies are short and thick-bodied and are marked with black and orange colours. These have two pairs of wings which are darkish in colour. Fullgrown caterpillars are about three fourth of an inch in length and have five long stripes on the body. When touched, they have a tendency to curl up and drop on the ground, feigning, as if dead.

Nature of damage:

The larvae feed on the leaves by cutting small holes into the lamina of the leaves and ultimately skeletonize the plants. The damage caused by these in certain years is so serious that resowing becomes necessary. The pest is found throughout India.

Main host plants are mustard, raddish, cabbage, cauliflower and turnip.

Control measures:

The following control measures could be adopted with advantage.

a. Dust 5 per cent BHC at the rate of about 20 kg. per hectare at larval stages of this pest on mustard crop.

b. Alternatively dust 5 per cent malathion at the rate of about 20 kg. per hectare.

2. Painted Bug (bugranda cruciferarum)

The adult bug is 5 to 7 mm. long with black ochraceous colour markings.

Nature of damage:

The nymphs and the adults suck the cell sap from the leaves which subsequently turn yellow and fall off, exposing the plant to bacterial and fungal infestation through the punctures made by these insects. The incidence is sometimes so heavy that seed setting does not form at all. It is a pest of mustard, rape and other cruciferous plants. Many plants like radish, cabbage, cauliflower, etc., are also occasionally affected but sporadically it becomes a serious pest.

Control measures:

The following control measures could be adopted with advantage:

1. Dust 5 per cent BHC at the rate of about 20 kg. per hectare.
2. Alternatively dusting 5 per cent malathion or spraying 0.02 toxaphene at the rate of about 20 kg or 800 liters. per hectare, respectively has been found very effective.

3. Bihar Hairy Caterpillar (Diacrisia obliqua)

The moth is pinkish-buff coloured with a few black dots on the wings. It measures about 32 mm. in length and its wingspan is 38 to 52 mm. Its caterpillar is hairy and 26 to 40 mm. long and yellowish-brown in colour when full-grown.

Nature of damage:

Young larvae skeletonize the surface of the leaf. In slightly advanced stage, the hairy caterpillars feed on foliage and tender parts of the plants. This species is a pest of several agricultural crops including all the oilseed crops, pulses, garden plants broad-leaved weeds, wild trees and shrubs.

Control Measures:

The following control measures could be adopted with advantage.

1. Spray 0.05 per cent thiodan 35 E.C. (endosulfan), i.e. 15 ml. of chemical mixed in 10 liters of water at the rate of 900 liters per hectare at larval stages of this pest.
2. Alternatively spraying 0.02 per cent diazinon or endrin at the rate of about 900 liters per hectare has also been found to give effective control. Do not harvest the crop till two weeks from the date of spraying if endrin is used.
3. Dusting with 5 per cent dipterex at the rate of about 20 kg/HA. has also been found to give effective control.

4. Mustard Aphid (Lipaphis erysimi)

These are tiny, soft-bodied insects about 2 mm. long and whitish green or light green in colour. These are not active but remain stationary engaged in sucking the sap. Generally apterous forms occur, but winged forms are produced at the maturity of the crop.

Nature of damage:

The aphids insert their beaks into the leaf tissue and suck the cell sap. A number of aphids remain on the surfaces of the leaves and their continued feeding leads to general yellowing of leaves and subsequent drying. They excrete a large amount of sugary solution or honey dew which lie on the leaf surface that encourages the growth of black fungus. Its presence in excessive amount interferes with photosynthetic activity of the plant.

Besides mustard, the radish and other cruciferious plants are attacked.

Control Measures:

The following measures could be adopted with advantage:

1. Spray 0.08 per cent malathion 50 E.C. i.e., 16 ml. of the chemical mixed in 10 literes of water at the rate of about 800 litres per hectare.
2. Alternatively spray 0.02 per cent metasystox or ekatin. Do not harvest the crop till two weeks from the date of spraying.

(Contd. on page 21)

BRINJAL—PUSA PURPLE LONG

Brinjal is an important vegetable crop in Delhi area and it gives fruits all the year round by adjusting the time of sowing and planting. "Pusa Purple Long" is a variety of brinjal which gives you a high yield of about 300 maunds (112 quintals) per acre. This is an early bearing variety and fruits can be picked within two months after transplanting. The slender, shining, and deep purple fruits measure 8" to 10" in length and bear in clusters.

Cultural Method

Pulverise the soil thoroughly before planting the seedlings in the field. Incorporte 40 cart loads (20 tons) per acre of well-rotted farm yard manure in the soil.

Sowing and Transplanting

For raising nursery plants, broadcast seed on a throughly prepared seedbed and mix lightly with the soil. Sow six ounces (168 grams) of seed in a seed-bed of one yard (0.9 meter) wide 60 yards (55 meter) long i.e. in 1/80th of an acre, to raise sufficient seedlings for planting an acre. The Pusa Purple Long brinjal can be sown three times in a year.

(1) Sow the seeds in seedbeds during first week of November and transplant the seedlings by early January to get fruits during March to May.

(2) Sow the seeds in February and transplant by the end of March. This would be ready for picking through June to August.

(3) Sow the seeds in the middle of June and transplant by end of March.

This would be ready for picking through June to August.

Sow the seeds in nursery beds and after covering the seed spread a thin layer of leaf mould. Water the nursery beds with rose cans whenever required. When the seedlings have grown to the height of 4 to 5 inches (10 to 12cm) they are ready for transplanting the brinjal seedlings in rows 2 ft. (60 cm) apart and keep a distance of 1½ ft. (45 cm) within each row.

Manuring

In addition to a basal dose of 40 cartloads (20 tons) of farm yard manure apply 4 maunds (38 kg) of ammonium sulphate and 1 maund (38 kg) of muriate of potash per acre during final preparation of land before transplanting.

Give another dose of top dressing with 2 maunds (75 kg) of ammonium sulphate at the time of flowering (i.e.) six weens after transplanting the seedlings. Apply the fertilizer around the plant, work it in by hand hoe and irrigate the crop.

Interculture

Irrigate brinjal crop as and when necessary. Keep on tilling the land with interculture implements for suppression of weeds and aeration of soil.

Harvesting

Pick the fruits before they are fully matured, but allow them to attain good size and colour. They should not lose the gloss and smoothness on the surface.

Plant Protection

Beetles and borers are serious pests on brinjal. The beetles feed on the leaves and the borers feed on the shoot and fruits. The affected leaves, shoots and fruits should be clipped off and the plants sprayed with 0.25 DDT emulsion. For controlling beetles, dust the crop with 5% BHC at the rate of 15 lb. (7 kg.) per acre.

A virus disease known as 'little leaf' causes heavy damage in brinjal crop. Since this disease spreads from plant to plant, the affected plants recognized by multiples of smaller leaves and without regular size flowers and fruits, should be uprooted and burnt. The seeds can be obtained from the Division of Horticulture, Indian Agriculture Research Institute, New Delhi-12. Seeds are also available with the National Seeds Corporation, E-19, South Extension, Ring Road, New Delhi.

FERTILISERS FOR JUTE

Jute yield can be stepped up considerably, if the existing improved varieties are manured well, reports the Jute Agricultural Research Institute, Barrackpore, in West Bengal.

The report recommends adding 4 to 7 tonnes of farmyard manure or compost per hectare. However, in well-manured lands, in rotation with potato, manuring with farmyard manure or compost is not necessary.

For olitorius (tossa) jute about 40 kilograms of nitrogen per hectare is recommended. For capsularis (white jute), the dosage of nitrogen is 60 kilograms per hectare. Nitrogen should be applied as top-dressing in a single dose, but in light soils, split applications in 2 or 3 doses are found better.

Soils poor in phosphates and potash should be given as a basal dressing 20 to 40 kilograms phosphoric acid and 20 to 60 kilograms potash per hectare.

In acid soils, six weeks before sowing, lime at the rate of 0.7 to 1.5 tonnes per hectare should also be added, once in every four years.

Use Sprinklers on Cotton

IS THE FURROW system the only way to irrigate cotton ? Not really. Overhead sprinklers can do the job as well in most cases, and better in some.

In some parts of the world, sprinklers are just to beginning to overcome misconceptions that they aren't for cotton. Some have held to the notion that overhead sprinklers would harm the bolls or cause the cotton plant to shed squares (the bud before it opens to the flower stage). However, tests and farmer experience in Texas, USA, among other places, have shown no difference between sprinkler and furrow irrigation in the number of squares left on the ground. The shedding of bolls is not caused by irrigation method but by lack of soil moisture.

In these years of Texas trials comparing sprinkler and furrow irrigation, no yield differences were noticed that could be attributed to irrigation method.

Because sprinklers apply water more efficiently than furrows, they are well suited to cotton growing areas where supplies of irrigated water are limited. And their ability to apply water at slow rates uniformly over a given area makes them useful on sandy soils with low water holding capacity. They also have an advantage on undulating soils difficult to level.

Sprinkler Technique

A low application rate, long-set sprinkler system has a high water to plant efficiency of approximately 80 per cent, whereas fast applications have efficiencies of 70 per cent under many conditions. Low application rates can maintain 50 per cent or less of soil saturation, which results in less soil moisture evaporation loss after irrigation. The ability of sprinklers to apply low rates of water over long periods is why they are so well suited to cotton on lighter soils, especially when supplies of irrigation water are limited.

In one series of tests, sprinklers set for 12 hour set on a 10 day coverage schedule operated at only 70 per cent efficiency. Efficiency rose to 60 per cent when the same total water was applied in 24 hour sets over 13 days.

Slow application rates generally apply 0.22 inches per hour on all soil types. A few, extremely heavy soils may require rates as low as 0.1 to 0.15 inches per hour.

Cotton needs a good supply of moisture during the boll setting period until three-fourths of the bolls are mature. In some areas, two irrigations are sufficient to insure good yields. Moderate drought in the early growing period does little harm if cotton gets moisture for development of the bolls already set. In one study, water applied at the time of wilting increased yield of cotton by 86 per cent.

Cotton planted on heavy soils which hold considerable amounts of available soil moisture do not need to be irrigated as early as cotton planted on light soils.

As the cotton plant comes into flowering period, growers need to time irrigations very carefully. At this stage, rate of water use is at a maximum and the plant root system is well developed, enabling it to make complete use of available soil moisture.

Deep Irrigation Unnecessary

However, extremely deep penetration of irrigation water isn't necessary. One test showed that 70 per cent of the water used by cotton came from the top 1 foot of soil, and 90 per cent from the upper 2 feet. It was only toward the end of the session that water was used extensively from the third foot of soil, regardless of the level of soil moisture. About half of the available soil moisture was left in the 3 to 4 foot zone at the end of the growing season, indicating low plant use from that area.

Sprinkler irrigation may cause some blasting and lack of set on flowers that open on the day of sprinkling, but there is a greater set on the days following sprinkling than with other methods.

ISI Specification for Buttermilk Powder

In India Standard Specification prescribing the requirements and the methods of sampling and test for sweet-cream buttermilk powder has been prepared by the Indian Standards Institution (ISI).

Sweet-cream buttermilk powder is largely used in the manufacture of ice-cream, bakery and confectionery products and in the manufacture of other human foods.

The obvious advantages of converting buttermilk powder are economy in transport, ease in handling and preservation of the perishable commodity.

Buttermilk imparts creamy flavour to ice cream. Its strong emulsifying properties are instrumental in developing smooth body and texture and in helping to retard the growth of large ice crystals during ice-cream hardening. This standard which prescribes requirements like moisture, milk solids, fats, acidity, solubility and microbiological limits would help ice-cream and bakery manufacturers in procuring raw materials of suitable quality and dairy plants in manufacturing buttermilk of the desired quality.

The Standard includes provision for certification marking of the product under the ISI Certification Marks Scheme.

"Radiation Wheat" & "XRayed Potatoes"

Russian scientists are now experimenting to develop "Atomic Tomatoes", "Radiation Wheat" and "X Rayed Potatoes". A series of experiments are being conducted by Institute of Cytology and Genetics, the Siberian branch of the U.S.S.R. Academy of Sciences.

"Radiation Wheat"

With the help of Gama Rays the Russian Scientists have been able to produce radiation induced milet 'Novosibirskaya-67'. This "Radiation Wheat" has excellent baking qualities and higher than usual yields. Another important gain has been stronger stalks.

"X Rayed Potatoes"

Similarly Scientists at the Institute have been able to develop a new variety of Potato by bomarding Potato buds with X Rays. X Rayed Potatoes ripen earlier, have a higher starch content, are resistant against a number of fungius diseases and are much more palatable.

New Sugar beet Mutants

It is not always necessary to use nuclear reactor or an X-ray machine to obtain mutants. Scientists have found out that there are many alkaloids which can be used with success. If sprouting seeds of sugar beet and its flower bearing shoots are treated with "Colchicin" an alkaloid, it will produce wonderful effect. It has been proved to be an effective chemical for the controlled reduplication of the chromosome number in plant cells. A new variety of sugar beets has been developed very recently. The nuclei of its cells contain 27 chromosomes instead of 18 ordinary. This variety is known as "Kuban Poly-9".

This new variety has wider and thicker leaves of dark green colour and it yields 15 per cent more sugar per unit areas. This is achieved by increasing the sugar content of beets and increased yields. The processing qualities of the polyhybrid are excellent ; the purity of sugar beet juice is improved, which gives a higher yield of crystaline sugar.

New Variety of Radish

A new variety of radish known as 'Sibirsky—1' has been developed very recently. The radish with four sets of chromosomes is more juicy and has a 50 to 60 per cent higher ascorbic acid contents. Its yield is higher too by fifty per cent. This new variety of radish 'Sibirsky—1' retains succulence for a considerable time.

Pesticides use needs precautions

Pesticides accidents do not happen but they are caused by people who fail to use the chemicals properly. Hence farmers are advised to take safety precautions while using pesticides.

(i) They should first identify their pest carefully before chosing pesticides against it.

(ii) Read the pesticides label carefully and strictly follow all directions and precautions stated therein. Wear respirators and protective clothing where this is recommended.

(iii) Keep unused pesticides containers under lock and key so that children and pets may not reach there.

(iv) Avoid breathing pesticides' dust, mist or vapours.

(v) Do not spill liquid concentrates on your skin.

(vi) Wash your hand immediately after using a pesticide.

(vii) Spray pesticides in the direction in which wind blows.

(viii) Do not allow children to come near fields while spraying pesticides.

(ix) The victims of pesticides accidents must be carefully attended to. Doctor's help should be at once sought. As first aid precautions the victim, be removed in open, artificial respiration be given if need arises and methods for vomiting be adopted if the pesticide has found its way in to the stomoch.

New Wheat Varieties

British Scientists have undertaken a wheat breeding programme hybrid and Semi-dwarf varieties. Hybridisation of these cereals, while giving higher yields also lands to promote better growth, but in case straw can be appreciably shortened it will be possible to apply greater quantities of nitrogen and thus further raise output.

British plant breeders believed that when Semi-dwarf wheats are introduced probably in the middle of 1970 they will need to be precision drilled at a depth of between half an inch and deep sowing has a much more serious effect on their performance than in the case with traditional varieties.

To achieve this and also to carry the traditional seed dressings that are likely to become available, pelleting of the seed may be necssary.

Over 10 Litres Of Milk

Each cow averaged over 6,000 pounds of milk in the eight-month lactation period (about 2,760 litres).

This was an eight-cow experiment conducted by Ruben Caro-Costas and Jose Vicente-Chandler, agronomists with Soil and Water Conservation Research Division of the U.S. Department of Agriculture at the University of Puerto Rico.

The only supplementation the cow received was salt and steamed bone meal. It was a different story for the pastures. They received 500 pounds of 14-4-10 fertilizer per acre every three months.

The experiment shows the great potential for milk production held by well managed grassland in the tropics. There are millions of acres of steep mountain grasslands in the humid tropics that could be utilized this way.

The experiment was carried out about 2,000 feet above sea level, where average monthly temperatures range from 70 to 80 degree F. Annual rainfall is about 65 inches, fairly well distributed throughout the year. The soil is a deep red, acid well-drained Cialitos clay on steep 50 per cent slopes.

Nine, 1-acre pastures were used thr[illegible] each of Pangola, Napier and [illegible] grasses. Soil pH was maintained at about 55 by periodic liming. Per cent protein in the grass foliage averaged 16.8 per cent for Pangola, 18.2 percent for Guinea, and 19.3 percent for Napier.

The cows were on the pastures at all times and could graze at will day and night. The pastures were grazed in rotation.

The eight cows in the experiment averaged 25.2 pounds or 11.5 litres, of milk daily with an averag[illegible] of 3.8 per cent butterfat during the eight month lactation period, at the end of which the cows were still averaging 6.4 litres daily and all were pregnant.

Better than before :

The over all production average of the cows on the intensively managed tropical pasture was 6,064 pounds in the eight months. This compares to 5,064 pound average in their previous 8-month lactation when they had been fed a free choice ration of good quality, fresh out grass, 4 pounds of molasses and 1 pound of 24 per cent protein concentrate per liter of milk produced.

Caro and Vicente believe the high quality of the forage from the well fertilized pasture and the cooler temperature at the pasture site contributed to the higher productivity of cows on the unsupplemented pasture ration.

The cows on Guinea grass averaged 7,133 pounds of milk during the lactation period (13.5 liters daily), compared to 5,538 pounds (10.5 litres daily) for Napier and 5,123 pound (9.7 litres daily) for Pangola grass.

All eight cows maintained rather constant body weights at about 1,150 pounds which is normal for Holsteins in Puerto Rico.

Caro and Vicente state that the cows were obtaining sufficient nutrients from the tropical grass ration for both milk production and maintenance.

On a yearly basis these pastures produced an average of about 6,030 of T.D.N. actually consumed by the cows, and 9,000 pounds of milk yearly.

No doubt about it. Those steep grasslands in the tropics are worth another look.

PREPARING RICE FIELDS

A New Method

Packing soil, instead of puddling, is found good for rice cultivation, according to trials conducted at the Agricultural University, Pantnagar, in U.P.

In this method, the soil is ploughed and harrowed and its moisture maintained to the extent that the soil does not stick to the implement. Fertilizers are also mixed at this time. A two ton road roller is then passed on the field to make the soil compact. A tractor with extra load on the wheels can also be used for compaction. Paddy is then either transplanted or drilled in the field.

Puddling needs much time and labour, whereas packing is easy to carry out.

Dry sowing of cotton to get better yield

Early sowing under dry condition is the key to get better yields from rainfed cotton, trials conducted at different centres in Madhya Pradesh have proved.

Farmers usually sow cotton at the start of monsoon. Due to delayed monsoon in some years, the crop is required to be sown late leading to poor yieids.

In the trials, cotton sown before the onset of monsoon under dry conditions gave better yields than the crop sown late in the season as well as the crop sown, at the start of the monsoon.

FARM NEWS

Agricultural Situation in the Far East & Oceania

Farmers in the Far East had another good year in 1968 as agricultural production gained about 3.5 percent. Weather was both good and bad—much as usual over this wast region. Drought in portions of India affected part of the rice crop as well as the harvest of millets and sorghums, cotton, and peanuts. Rice harvests also suffered from drought in Cambodia, South Vietnam, and the Republic of Korea. But total production in Pakistan, Malaysis, Indonesia, and Ceylon rose sharply.

Increased inputs and improved cultural practices contributed to production gains. Striking examples were the 1968 wheat crops of India and Pakistan, with both harvests up more than 40 percent. For rice, a far more important food crop in Asia than wheat, the new technology is not yet widespread, so the results of progressive methods are not readily discernible in overall production.

The index of total agricultural production in the Far East for 1968 was 133 (1957-59=100), exactly on the long time trendline. The picutre for the food production index is similar. Foodgrains including cereals and pulses, advance at a lesser slope. The index for 1968 was 8 points above the previous year and 3 points above the trendline because of the very large wheat crops in South Asia. Rice has a steeper slope, but production in 1968 was well below trend. Thus, as new technology contributes to food production in the Far East it helps maintain the up trend underway for many years. It has not yet moved production above trend or established a new trend.

Rice production in the Far East totalled 155 million tons, about the same as in 1967. All traditional exporting countries, except Cambodia, had good harvests. Burma, Thailand, and Taiwan have more rice to export in 1969. West Pakistan has a somewhat larger surplus, but East Pakistan needs additional imports. Japan and the Philippines, traditional importers are expected to export in 1969. Among other countries normally importing rice, Indonesia, Malaysia, and Ceylon had crops far above the year before, and imports this year may fall below the levels of 1968. India's foodgrain crop is still uncertain but, with another large wheat harvest in view, rice imports in 1969 will not likely be much larger than the 470,000 tons imported last year. South Vietnam will import less rice in 1969. Only in South Korea, where drought reduced the harvest by 11 percent, are imports expected to be substatially larger than in 1968.

In 1967 countries of the Far East imported 4.2 million tons of rice and exported 3 million tons. Excluding imports from the United States, most of this trade was intraregional. The 1.2 million ton difference was closely matched by the 1.1 million tons exported by the United States to the region. Last year rice imports fell to 3.5 million tons and exports declined to 2.4 million. The difference was 1.1 million while U.S. exports to the region totalled 1.2 million tons.

Rice import requirements for 1969 in the Far East are up slightly to an estimated 3.7 million tons. The United States may supply as much as in the previous year under concessional terms where imports would not otherwise materialize. Against the remaining 2.5 million tons, expected to be imported under the usual commercial or barter arrangements, the region will have a much larger exportable surplus this year—nearly 3.4 million tons. Reflecting this situation has been a downward pressure on rice export prices over the past several months. This price trend will likely persist, and indications are that exporting countries will carry over larger stocks into the coming year.

Countries of the Far East imported 27.8 million tons of all grains in 1968. This was down about 9 percent from 1967 when large imports were required after 2 poor harvest years in South Asia. Imports of wheat and flour declined to 14.7 million tons; India and Pakistan took less but Taiwan, Korea, and the Philippines took somewhat more. Imports of sorghum also declined as both Japan and India reduced purchase. Imports of corn increased U.S. exports of grain to the Far East totaled 16.9 million tons in 1968, down from more than 18 million tons in each of the 2 previous years. This was 44 percent of all U.S. grain exports.

Japan is the region's largest grain importer. That country took 12.4 million tons in 1968 of which more than half came from the United States. To meet the needs of an expanding livestock industry, Japan is importing increasing quantities of corn, sorghum, and barley. The United States has been a principal supplier, but Japan has bought large quantities from Thailand and South Africa and is attempting to develop still other alternative sources. India, the second largest im-

porter, unloaded, unloaded 6.1 million tons of grains last year. The United States exported 4.9 million tons to India, all under government programs. India receives some grain donated by Canada and Australia. The Republic of Korea, Taiwan, and Hong Kong are beginning to import foodgrains as their livestock programs unfold.

Imports of all grains into the Far East this year may be up a million tons over 1968. Imports of corn into Japan, Taiwan, and South Korea are expected to be larger. Japan may take less sorghum, but India will probably take more. Rice imports into Far Eastern countries may be 200,000 tons higher in 1969. Imports of wheat and flour will be about the same as in 1968.

Exports of all commodities from Far Eastern countries were an estimated $ 24.1 year before. In recent years, about 30 percent of total exports have consisted of food, beverages, and agricultural raw materials. Rubber, tea, rice, sugar, silk jute and coconut products are important agricultural items exported.

The United States provides a market for about one-fourth of the region's total exports. Total U.S. imports from the Far East in 1968 were $6.5 billion, up 30 percent from 1967 ; three-fifths of the total came from Japan. Agricultural imports from the region rose 67 percent to $ 772 million. Agricultural products imported from the Philippines increased at about the same rate and reached $ 316 million. The principal gains in imports from the Philippines were made by coconut products ; sugar imports declined. Imports of rubber from Malaysia increased in 1968 while those from Indonesia declined. Cashew nuts from India rose to $38 million, nearly 4 times the value of tea imported from that country. Imports of tea from Ceylon declined in 1968.

Total merchandise imports by Far Eastern countries rose 10 percent in 1968, reaching an estimated $28.3 billion and maintaining the unfavourable trade balance that has persisted for many years. Food, beverages, and agricultural raw materials accounted for about 30 percent of the imports, fibre and cereals were the leading items.

U.S. exports of farm products to Far East were valued at $ 2.2 billion in 1968, about the same as in 1967. Japan, the leading commercial market for U.S. farm products, took $ 933 million in 1968, a gain of 8 percent. Most of this increase occurred in shipments of corn and soybeans. Agricultural exports to India fell sharply to $ 363 million as shipments of wheat, sorghum, and cotton were cut back. Exports of rice to South Vietnam were reduced while those to Indonesia were increased.

Agricultural Production in Australia recovered from the drought of 1967/68 and set a new record in 1968/69. Harvests of wheat, oats, and rice reached new high levels as did the production of wool, meat and dairy products. Australia sold 2.4 million tons of wheat to mainland China for delivery from February 1969 to March 1970. Further sales in traditional markets are expected and although wheat exports may reach a record 7 million tons, carryover stocks will likely be large. Production in New Zealand increased modestly in 1968/69. Production of meat, wool, and milk increased, but exports of wool and dairy products faced declining prices in the world markets.

India's per capita Production

Per Capita Production of foodgrains in 1967-68 was slightly below the 187 kilograms per person reported in 1960-61 when it reached a record. The daily calorie intake increased in 1968 to a level of almost 2,200 per capita from about 2050 calories in 1966. Rice still accounts for over 30 percent of the Indian calorie intake although the share contributed by wheat has increased sharply.

Production of pulses, potatoes, bananas, Soybeans and decidous fruits increased sharply in 1968, but the output of coffee and castor beans declined.

India's Export Rising

India's total agricultural exports in 1968 levelled somewhat above 616 million dollars recorded in 1967. Tea exports were about the same at 252 million dollars, but exports of pulses and processed food increased sharply. Cotton exports declined slightly and Jute exports were less than half the 1967 level. Larger shipments of cashew nuts, walnuts and mango juice caused a marked rise in the value of horticultural exports. Exports of Tobacco, coffee and spices held at about the 1967 level when modest gains occurred. Exports of peanuts oilcakes were about one fourth higher than in 1967 when 569,000 tons were exported. Exports of hides and skin declined but export sales of shoes and leather products increased.

Per Capita Consumption in Japan

Statistical study reveals that Japan's food needs in the late 1970's and 1980's indicate that per capita consumption of Dairy products, meat, eggs and vegetables will increase significantly while the demand for rice will continue to decrease. Japan is expected to become self sufficient in the production of rice, potatoes, eggs, and vegetables by 1977 but will need to import wheats, soybeans, pulses, oilseeds, dairy products, meat and certain fruits.

Per Capita food consumption in 1966-67 totalled 22797 calories which was 1437 calories 7 years before. Per Capita rice consumption declined 5 percent from the previous year and 11 percent from 1962-63. Consumption of fats and oil has increased from 437,000 tons in 1960-61. Per Capita consumption of fats and oils is now estimated at 8.7 kilograms, fruits and vegetables consumed in 1966-67 totaled 4.3 and 13 million tons respectively and meat 1.3 million tons over twice 1960-61 figure.

Australia establishes New record

The 1968-69 grain production is highlighted by three record crops. wheat, oats and rice harvest was at 220,000 ton level and set a new record for the seventh consecutive season. Average yields approached 7 tons per hectare and are believed to be among the highest in the world.

Burma produces more Rice

Agricultural production in Burma gained slightly in 1968 as the rice crop rose to 8.1 million tons. Production of wheat, sugarcane and sesame seed declined during the past year. Little or no increase occured in the out-turn of pulses, Vegetables, Corn and rubber. Only rice, millets, tobacco and peanuts gained.

General economic condition in Burma declined in 1968. A population growth rate of nearly 2.5 percent per year combined with national production growth rate of less than 2 percent. State wages levels and a rise in retail prices have led to a decline in Burmese level of living.

The increase in rice crop for 1968-69 resulted and expanded IR-8 area. The new varieties contributed 6.25 lac tons while the local ones average yield remained 1.6 tons per hectare.

Ceylone Harvest Good Paddy

Agricultural production in Ceylon gained 10 percent in 1968. The production of rice climbed 17 percent, partly because high yielding varieties were planted on about half the area. Imports of rice dropped to 310,000 tons in 1968 and will likely be less in current year. Exports of tea and rubber remained about the same in 1968, but export of coconut products increased.

Programmes to expaned the use of improved inputs resulted in larger imports of fertilisers, tractors and other farm supplies in the last two years.

The cropped area reached 1.8 million hectares in 1968, about 400,000 hectares more than a decade earlier. Ceylon's rice production increased from 964,000 tons in 1966 to 1,342,000 tons in 1968. Improved farming practices contributed to higher yields in traditional rice growing areas. Corn production jumped from 10,000 tons in 1965 to 17,000 tons in 1968 because more hybrid seed was used in irrigated area.

More Tea & Rubber

Tea production increased from 219,000 tons in 1968 owing to ample rainfall in the latter half of the year.

Rubber production continued upwards in 1968 as more of the recently planted high yielding trees came into production.

New Zealand nearing Self suffiency

New Zealand agricultural output in 1968-69 is only slightly better than in 1967-68. Gains in meat, wool and milk production were less rapid than during the past 5 years.

Early estimates of the 1968-69 wheat crop indicate a record of 430,000 tons which should move New Zealand closer to self sufficiency. Imports of wheat fell from 181,000 tons in 1963-64 to under 50,000 tons in 1967-68. Imports in 1968-69 will be limited to small quantities of speciality wheats.

Pakistan

West Pakistan is now nearer self sufficiency in food than at any time in the last decade. A severe food shortage developed in some urban areas of East Pakistan in early 1969. Population has increased faster than grain production in East Pakistan in the last 5 years. Pakistan's harvest of about 23 million tons of foodgrains in 1968-69 season will be about 1 million tons above the previous record harvest in 1967-68. The rice crop in 1968-69 will be about 13 million tons of mild rice, despite flood damage in East Pakistan while the major crop was growing. Wheat harvest in 1969 is expected to be about 10 percent above the record.

Indo-German Agreement

India and West Germany have signed an agreement for a programme of integrated agricultural development in Almora district of Uttar Pradesh. Under the agreement West Germany will supply fertilizers, Seeds, pesticides, agricultural machinery implements and a team of specialists for potato, fruit and vegetable growing in Almora district.

West Germany will also provide equipment for a soil testing laboratory a repair workshop for agricultural machinery and advance training to Indian experts in West Germany.

India on Protein from Petroleum

A Pilot Plant for manufacture of protein concentrate from crude oil has been commissioned near Baroda. First of its kind in the country, the plant has been set up with the collaboration of French Petroleum Institute. Some Units of the plant have been fabricated in India.

Nuclear Energy for Agro Complexes

The Atomic Energy Commission has undertaken feasibility studies in the Indo-Gangetic plains of Uttar Pradesh and in Kutch-Saurashtra area of Gujarat on the use of Low cost energy from the nuclear power station in the setting up of Agro Industrial complexes. The studies will cover projects for the production of fertilisers and aluminium or de-salination plants, where necessary to irrigate agricultural lands.

ANTHRACNOSE OF MESTA

Control Possible

The disease Anthracnose, accounting for the loss of fibre to the extent of over 50 per cent in mesta (*Hibiscus cannabinus*) can bo controlled by hot water treatment of seed or by fungicidal spraying.

This has been reported by the Directorated of Agriculture, Maharastra State, Poona.

Hot water treatment is done by holding seeds in hot water bath of 52°C for 10 minutes and repidly cooling the seeds afterwards. The seeds used for treatment should previously be soaked in cold water for eight hous.

Spraying the crop with Dodine at the rate of 112 grams in 225 litres water or Zerlate at the rate of 450 grams in 225 littres of water at an interval of 15 days after a fortnight from a germination of the crop, three times in the season also eheeks the disease effectively.

World Agricultural Production Up

COMBINED WORLD agricultural, fishery and forestry production increased in 1968 by about three percent, roughly in line with the average rate of increase over the past 10 years and ahead of a world population growth rate of two percent, according to preliminary estimates of the Food and Agriculture Organization of the United Nations (FAO).

For all developing countries combined the increase in agricultural (excluding fisheries and forestry) production was some two percent and for food production alone about three percent. Their average population growth was at a rate of 2.6 percent a year.

"Output per head of the population increased to a new record level, and most major food importing countries of the region were able to improve their stock position," the report said.

In the Near East and Africa, production was estimated to have risen by only about two percent. For Latin America a fall of two percent was reported on the basis of preliminary figures. The less satisfactory records in these devcloping regions were attributed mainly to bad weather, especially in Latin America.

Among the developing regions, agricultural production in western Europe and Noth America increased about two percent; in Eastern Europe and the Soviet Union by an estimated four percent, and in Oceania, where 1969 output had been reduced by drought, by about 14 percent.

Stagannt Trade

No increase at all was reported in the overall value of trade in agricultural products in 1968. The quantity of commodities trade expanded somewhat, but preliminary data suggest that this was offset by lower average prices.

This failure of the value of world agricultural trade to increase in 1968 appears particularly significant if viewed against the some what longer term trend: for the world as a whole the value of agricultural exports has now remained virtually unchanged for four years. For all regions but three (western and eastern Europe and the Near East) its level in 1968 was lower than in 1964. In sharp contrast, the value of world trade as a whole has since 1964 grown at a rate of some eight percent a year.

Although the estimates point to some small improvement in 1968 in farm exports of the developing countries—in 1967 they had actually fallen by about four percent—the longer term impact of the stagnating export earnings has been greatest on these countries, because of their heavy reliance on agricultural exports for foreign exchange.

In discussing the factors behind this stagnation, the report points out that the phenomenon is not new, but rather an accentuation of past tendencies. Principal causes include saturation levels of consumption of many products in importing countries, agricultural price supports and protectionism, and competition by synthetic products.

In contrast to agricultural products proper, forest products fully shared the growth in world trade in 1968. Exports increased by more than 13 percent despite slower growth in imports by Japan, the leading importer of tropical forest products. Export earnings from forest products for the developing countries rose by 20 percent and were also substantially higher for developed regions.

Exports of fishery products rose by one percent in 1968 Japan and Peru, the world's leading fish producing and exporting countries substantially increased their export shipments and earnings. Canada replaced Norway as the third largest fish exporter in terms of value.

The report also reviews the developments in fertilizer use, food prices, and development assistance, and discussed the medium term production outlook for cereals.

CIGAR-WRAPPER TOBACCO

Experimental Results

Results on varietal, manurial and spacing trials of cigar-wrapper tobacco have been reported by the Wrapper and Hooka Tobacco Research Station, Dinhatta in West Bengal.

Of the two varieties tried Dixie Shade was found better than Sumatra.

Increasing the dose of nitrogen from 75 to 125 kilograms per hectare increased the total yield as well as the yields of first-grade leaf of Dixie Shade grown under shade. When Dixie Shade was grown in the open also the yield was more at the higher dose of nitrogen.

A spacing of 90cm × 45cm was found better than the closer spacing of 60cm × 45cm and a wider spacing of 90cm × 60cm for 'Dixie Shade'.

Store Those Fruits And Vegetables

Come winter and we have a bounty of delicious fruits and vegetables. And once the winter is past, we start feeling the pinch for them.

Very often a good deal of the fruits and vegetables is wasted. The idea of keeping away a part of the bounty for the rainy day has not struck many of us so far. Indeed all the surplus vegetables and fruits can be carried over, provided they are preserved in time.

The Marketing Branch of the Directorate of Agriculture, West Bengal, is currently popularising the technique of fruit and vegetable dehydration. They are recommending some easy-to-do methods which all rural housewives can follow. This will, in turn, help them tide over the lean period of vegetable scarcity.

The method is simple the drying of fresh and mature fruits and vegetables. Done correctly, their taste will not be greatly changed, nor their food value.

You can dry fruits and vegetables by any of the three means:— sun drying, oven drying or mechanical drying.

Whatever the means you employ there are a few basic rules to be followed. The fruit or vegetable you want to store should be clean, so also the equipment you use and the drying place. For preserving, choose the best quality fruits and vegetables. See that the fruits are fully developed, ripe but firm and in ready-to-eat stage. Vegetables should be mature but tender and juicy.

If the vegetables and fruits are obtained from your backyard, better pluck them early in the morning. This helps keep their freshness and flavour longer. If you have to buy them from the market, go marketing early in the morning. And try to dry all fruits and vegetables thus collected within six hours.

A few vegetables and fruits are dried whole but many of them have to be peeled, sliced or cured. Use a stainless steel knife for the purpose.

Most vegetables have to be sliced $\frac{1}{8}$ to $\frac{1}{4}$ inch thin. Thin slices dry fast and this would mean more flavour retained.

To check the fruits and vegetable slices getting discoloured, dip them in a weak salt solution (3 table-spoonfuls in one litre of water).

Before they are taken for drying the vegetables should be treated with sulphur.

Blanching is done this way. After washing, peeling and slicing vegetables, put them in boiling water for some time, varying from two to eight minutes. While in water vegetable pieces should be stirred to keep them from sticking to the pan or to each other. The water in the pan should be twice the quantity of the vegetables. Blanching can also be done by steaming the vegetables by suspending them in live steam over vigorously boiling water.

After boiling, shift them on to trays for drying. A tray with holes in the bottom ensures quick and thorough drying. A wooden frame at least four inches off the ground with wire netting as the bottom and mosquito curtain as the cover will be the best.

Now the sulphuring of fruits. A small quantity of about 2.5 grams of sulphur will be needed for every 10 kilos of fruits. Keep the fruits on wooden trays. The sulphur should be put in a tin can lighted and kept under the tray in a small closed room or better still in a box. While removing the trays, don't breathe the fumes as they are poisonous. The fruits should be exposed to the fumes from half to one hour. A word of caution here. Only use wooden trays and not any metal trays for sulphuring.

After blanching and sulphuring, the vegetables and fruits are now ready for drying. The cheapest and time honoured method of drying is sun drying. Spread the fruits and vegetables evenly on trays in a thin layer in the sun. Always begin drying in the morning so that most of the moistures is removed during the first day itself. Turn them every two hours on the first day and twice thereafter. Just before sun-set, bring in the trays and turn the fruits and vegetables. The time for complete drying will take between two to five days, depending upon the fruits and vegetables.

Oven drying is done by spreading fruits and vegetables on trays or plates in a single layer and kept on a hot oven. The heat is to be kept at 140° to 150° F. Trays should be kept for 5 minutes on the oven and taken out in a draft (under a fan) and kept for cooling for 15 minutes. Again the tray is kept on the oven. This is repeated till the food is dried enough. Oven drying is the best for quick drying but needs constant care.

Mechanical drying needs special machinery which is out of reach for an ordinary housewife. But in case the whole community is interested the machinery can be procured through the help of government or private agencies.

After drying, the fruits and vegetables should be kept in moisture proof and clean containers. Once in a while keep dehydrated fruits and vegetables in the sun for a while.

This is all you have to do to preserve the fruits and vegetables that are surplus in winter.

Before using preserved foods, soak them in as much water as they can absorb, not more not less. You will now see them spring back to their freshness. While cooking use less water to start with and go on adding water as needed. Green and leafy vegetables will not even need soaking before cooking.

Dehydrated fruits and vegetables are next only to fresh ones yet they are the best buy when fresh vegetables are scarce in the market.

Recent Trends in the Control of Potato Pests

by K. K. NIRULA
Central Potato Research Institute, Simla

The important potato pests are aphids, Myzus persicae (Sulz). Macrosiphun euphorbiae (Thos). Alphis nasurtii Kitb and Aphis gossypii Glov., tuber moth, pthorimaea operculella Zeller, cutworms, Agrotis Spp wireworms, Agriotis spp., white grubs, Anamola spp., mites, Tetranychus spp. and the Colorado potato beetle, Leptinotarsa decemlineata (say) (not present in Indo-Pakistan sub continent) amongst the anthropods, and golden nematode, Heterodera, rostochiensis woll., and the root knot nematodes Meloidogyne spp., belonging to the class Nematoda.

Besides sucking sap. cutting shoots, defoliating the plants, deforming and tunnelling the tubers, some like apids also spread the virus diseases. The overall damage to the crop may be as much as 50 per cent.

The traditional methods employed for the control of these methods are cultural, biological and insecticidal.

Cultural practices that are of value in controlling these pests are planting crops early to escape the incidence of pest attack as with aphids, tuber moth and root knot namatodes; harvesting early for saving the tubers from cutworms white grubs and tuber moth; heating soil and tubers to kill the pests as in case of root-knot nematodes; crop rotation for Golden nomatodes, wireworms and white grubs; and trap cropping for controlling root knot nematode infestation.

Though biological method of control can be effective in pest control, it had only limited application in potato so far. However, some success has been obtained in the control of tuber moth with parasites like Capidosama Koehleri, Orgilus sp., Apanteles spp., and Agathis unicolor in India and Cypress.

Ever since the discovery of DDT, chemical method of pest control, has been most successful and consequently used very extensively. Potato aphids are controlled with DDT in U.K., and with orgnophosphates in Europe, U.S.A., Canada and India. Tuber moth was effectively controlled with DDT till late fifties, thereafter with malathion and telodrin. For cutworms wireworms and whitegrubs, heptachlor and aldrin give good control. Nematodas are controlled with DD, EDB and DBCP.

The extensive use of pesticides has brought forward several problems like development of resistance in the pests, destruction of beneficial parasites and predators, effects on fish and wild like, toxic residues in the soil, and above all hazards to consumers. It raised a great hue and cry and several high power committees to examine these problems were set up in countries like U.K. and U.S.A. Since it would not be possible to do away with the use of chemicals in pest control, the ideal approach would appear to be an integrated control involving a combination of several methods chosen scientifically. These could include the well established, as well as some new and elegant approaches, such as the sterile male technique, sex hearomones used as attractants and environmental manipulations. The possibilities of adapting these techniques for potato are to be explored.

Though resistance breeding has been used quite extensively against disease in the potato, it has had only very limited application against pests. Screening of wild species of Solanum has shown sources of resistance against several important pests such as the Leptinotarsa decemlinesta, Myzus persicae, Empoasca fabae, Hetrodera rostochiensis and Meloidogyne incognita. Since the new potato varities that are released invariably possess good amounts of resistance against several viral and fungal disease, and since gene transfer from wild species does not appear to be difficult in the potato, it would appear that resistance to pests could be super-imposed on these varieties with minimum effort.

DEATHS FROM IRON

Pigs sometimes die from iron administered either orally or by injections. A Swedish scientist indicates this will occur if the sow is deficient in vitamin E, which causes her young pigs to become sensitive to iron administration. T.J. Cunha, head of animal science at the University of Florida, Gainesville, Florida, U S.A., says this is a new development that is showing up in Australia, the U.S. and some other countries.

To swine producers experiencing these baby pig deaths, he recommends, adding vitamin E to the sow ration at 5 to 10 mg. per pound of the ration.

According to Cunha, only some of the pigs die. Peak mortality occurs about 12 hours after iron administration. Cunha adds that the need for vitamin E is increased if selenium is deficient in the ration.

Farmers' Credit Needs and Farm Financing by Banks

In the history of Indian agriculture, capital requirement has never been as high as it is today. Introduction of high yielding varieties has created a new problem of high demand for credit. Limited supply of credit by the present creditstructure of cooperative societies alone may not be able to keep pace with the increasing capital needs of the commercial farmers. Hence a multi-agency approach becomes a logical corollary.

The main objectives are to analyse :

(1) various credit needs of the farmers

(2) problems of commercial banks in their new venture of financing the farmers and

(3) Ways of assisting farmers by the commercial banks.

Farmers Credit Needs

Farmers need credit of different types and for different purposes as detailed below :—

Seasonal Credit :— At the time of sowing farmers need credit to buy seeds, fertilizers, insecticides, pesticides, and to hire labour needed on the farm. Depending on the type of crop to be grown, this kind of credit is required for six to twelve months. Credit is also needed for marketing the produce when it is ready for sale. For example, farmers need credit for purchasing fertiliser, seed, insecticides and pesticides in the month of May and June for Kharif crops and in the month of September and October for Rabi crops. They would need credit for marketing the Kharif produce in the months of September to December. Similarly this credit would be required during February and May when Rabi crops are harvested. Credit for marketing the produce will help the farmers in selling the crops when the prices are favourable and the money thus borrowed from the banks may be used for meeting the family requirement till the produce is finally sold.

Medium-Term Credit :—

This type of credit is required to buy tractor, irrigation equipments, seed-drill, thresher, spraying machines and other farm equipments and live-stock. This required for a period longer than 18 months and is repayable within 6 years or less.

Long-Term Credit :—

Farmers need Long term credit for diffierent purposes such as making permanent improvements on the farm, reclaiming and levelling the land, buying additional farm land, making irrigation channels and constructing cattle shed and godown. Such similar credit needs are usually for a period of 6 to 15 years.

Table I shows the percentage of farmers reporting need for seasonal credit. Expenses for hired labour and fertilisers were 92 in each case. In case of medium-term credit 86, 8, 79 and 39 per cent farmers wanted loans for buying tubewell, pumpset, tractor and implements respectively. Sixteen percent farmers reported long term need for levelling the farm land.

TABLE—I—Purpose-wise Classification of Credit Needs

	Seosonal Credit for		*Medium Term Credit for*				*Long Term*
	Hired labour	*Fertiliser.*	*Pump set*	*Tube-well*	*Tractor*	*Agri. Implements*	*credit for land improvement.*
Percentage of farmers requiring credit	92	92	8	86	79	38	16

Problems of Commercial Banks :

(1) The present administrative staff of the commercial banks may not be sufficient for maintaining direct and close contacts with the thousands of cultivators getting loan from the banks.

(2) Banks do not have technical staff trained in production and marketing aspects of farming. Due to this drawback, three prerequisites for advancing loans are not fulfilled. These prerequisites are :—

i. Returns from loan to the farmers and his capacity to benefit from the borrowed fund.

ii. Farmers repayment capacity and his ability to generate sufficient capital for repaying loan within the stipulated time and,

iii. Farmers risk-bearing ability.

This situation obviously creates difficulties for the bank in assessing the farmers' credit needs.

Ways of assisting the Farmers.

(i) For seeds, fertilisers, feed etc. the commercial banks can provide credit to the farmers.

(ii) Banks may advance laons to the farmers for buying implements and machinery. They may also help the farmers in mechanising their farms by providing funds and technical service to them. Establishment of service stations by the banks with provisions for giving equipments and machinery on hire would greatly help the small farmers who may not be "credit worthy", to get such loans from the Bank for buying these equipments and machinery.

(iii) To help farmers in the efficient marketing of their farm produce, banks may help them by constructing godowns, cold storage and warehouses within reach of the farmers. As soon as the crop is ready farmers may bring their produce to the "Bank warehouse" and in turn the bank may advance some percentage of the value of the produce to the farmer. The farmer may sell his produce in the market when the prices are favourable and final adjustments may be with the bank.

(*Contd. on page 23*)

Struggle ▪ Against ▪ Insects ▪

Insects are man's principal rivals in the consumption of plant products. There is evidence to back the opinion that more than 200 plant diseases are spread by insects. Some 150 plant diseases are caused by viruses, at least 25 by parasite fungi, some 15 by bacteria, and others by protozoa.

Plant technicians are familiar with the characteristics of all the plagues, including the time of year when they become active, and are armed with the knowledge of what to do to cope with them.

Plant doctors must concern themselves with many aspects of the various crops grown, beginning with the preparation of the land for planting. They must know about soil aeration, moisture, suitable conditions for planting, quality of seed used, the type of crop previously grown—in short, ecology in general.

How Plant Disease is Fought at Present

While the application of pesticides is one of the most widely used methods in combating vermin that attack plants, entomologists and other scientists also make use of biological control. This consists in breeding and utilizing insects, birds and other animals which prey on undesirable insects.

In the Soviet Union, methods for the proliferation of insects have been applied for the last 30 years. Another method being employed in the USSR consists in the application of ento-bacterine-3, a biological preparation that is effective against harmful insects.

One of the most recent discoveries is that of Czechoslovakian scientist Karel Slama, who was successful in developing synthetically a compound which is similar to the youth hormone with an egg-killing potency 1,000 times that of the natural hormone.

Male insects treated with the artificial youth hormone become sterile, and this sterility is transmitted to the female in the mating process. The resulting eggs laid by the female are sterile, and when the female mates with other males she also sterilizes them.

US entomologists have produced "living insecticides" in capsules. The experimental use of these products—which contain diseases fatal only to insects—proved successful and controlled up to 90 present of the offenders.

Another success scored by US entomologists has been the application of "artificial light" to harmful insects so as to arouse them from the state of dormancy known as diapuse, the period when the insect's biological rhythm responds to the lengthening of spring days. Thus, the insects emerge into hostile environment, where they die as a result of cold weather and a lack of leaves where they might find protection from low temperatures.

Developments in Agricultural Field

Of the five state agricultural farms to be set up with gift machinery worth about Rs. 31 lakhs from the Soviet Union, the farms in Orissa, Haryana, Punjab and Mysore have started functioning. The machinery for the fifth farm to be set up in Kerala is expected to come in 1970

x x x

The Punjab Agricultural University has released a new high yielding cotton strain G-27, which is capable of yielding about 33 per cent more out-turn. According to the East India Cotton Association, the new strain is export-worth. G-27 can replace 231-R, the existing variety which is now being cultivated in Punjab and Haryana. On an average, it yields 12 quintals of 'kapas' per hectare against the nine quintals of 231-R.

x x x

The Government of India have earmarked over Rs. 80 lakhs to boost cotton production through package programme in the first year of the Fourth Plan for which a production target of 64 lakh bales has been set. The area under cotton will remain at around 8 million hectares expecting for a small increase in some of the irrigated regions of Rajasthan, Maharashtra, Andhra Pradesh and Mysore.

* * *

According to a recent finding of the IARI, a spray of diluted sugar solution improved the growth of plants. Experiments of the Institute have proved that yields of pea and wheat can be raised by 40 per cent through this method.

* * *

The Union Agriculture Ministry has devised the various agro-Industries corporations and the State Governments to give high priority to promoting "Custom Service" for agricultural machinery (hiring facilities in respect of costly items of machinery) over the next few years. The suggestion has been made to achieve a fuller utilization of the available agricultural machinery which is in short supply compared to the fast rising demand in the wake of the high yielding varieties and multiple cropping programmes

* * *

It is proposed to develop the National Dairy Research Institute, Karnal into a full-fledged university during the 4th plan. The Government of India have allocated Rs. 1.62 crores for the development of the Institute during the plan period.

Protein From Groundnut

SPECIALISTS at the Central Food Technological Research Institute (CFTRI). Mysore, have developed a process of extracting 90 per cent pure protein from groundnut.

Termed protein isolate, the compound is used in the preparation of high protein foods and pharmaceutical products.

According to Dr. M. R. Chandrasekhar, chairman of protein technology discipline at CFTRI, protein isolate also can replace imported skim milk powder in toned milk and icecream, helping the country to save foreign exchange.

CFTRI also has successfully processed infant food based on edible groundnut flour Experimental trials on children in hospitals in Vellore (Tamil Nadu) and Mysore have proved satisfactory from the nutritional viewpoint, officials said.

In recent years, CFTRI has given high priority to make high grade edible protein foods from oilseeds like groundnut, sesame and mustard. The U.S. Government has supported these efforts.

In a recent interview, Dr. Chandrasekhar stressed the urgent need for research on vegetable protein, since milk is in short supply in the country.

He noted that the Multi purpose Food (MPF) developed in 1967 at the Mysore institute is a combination of groundnut meal and Bengal gram, enriched with vitamins and minerals.

MPF is now widely used in the mid-day meals programme in schools as a food supplement.

Lac-Tone is another food based on groundnut protein developed at CFTRI. Considered a good substitute for fresh milk, Lac-Tone is now under trial production at the state-owned Bangalore dairy. It is also on the production schedule of the Madras Dairy and Milk Project at Madhavaram.

In a related project, Dr. N. Subramanian, a senior scientist at CFTRI, is engaged in research on sesame oilseed and *guar dal,* which are rich sources of protein.

"The food protein obtained from sesame is edible and nutritious. But the important consideration is that the cost factor involved in the process is so low that it could prove a boon to the lower income groups," a CFTRI official stressed.

Protein-rich foods

As a result of experimentation and research, using edible quality groundnut cake left over after the extraction of oil, a number of protein-rich foods such as baby foods, weaning foods, multi-purpose food, paushtik atta, high protein biscuits and tapioca macaroni have been developed at the Central Food Technological Research Institute, Mysore.

These foods are rich sources of protein, essential vitamins and minerals and can supplement the average diet to a very large extent for correcting protein deficiency.

Multi-Purpose Food

Multi-purpose food is a rich protein supplement consisting of 75 per cent of specially prepared low fat groundnut flour and 25 per cent of roasted Bengal gram flour and fortified with essential minerals and vitamins A,B Complex and D. It is available in three forms.

A small quantity of this high protein food—about 50 grams per adult—taken daily as a supplement to the normal diet, should adequately satisfy protein, vitamin and mineral requirements of the body and should eradicate protein malnutrition in the country.

Enriched Flours

Paushtik atta containing upto 10 per cent of groundnut flour in combination with wheat flour, can be used in the preparation of chapptis, puries, parathas, etc. Groundnut flour can also be used in combination with tapioca and wheat for the preparation of tapioca rice and other macaroni products.

If this potential source is fully explored, there is a possibility of obtaining for human consumption additional protein rich material to the extent of about two million tonnes per annum for eradication of protein malnutrition in the country.

FOLIAR APPLICATION ON TOMATO ADVANTAGEOUS

An extra yield of 5.6 tonnes of tomatoes per hectare is what the farmers can expect if part of the fertilizer are sprayed on the crop instead of applying the entire quantity in the soil.

This is the finding of the trials conducted at the Indian Agricultural Research Institute, New Delhi.

In the experiment, urea and superphosphate were used for supplying nitrogen and phosphoric acid. Half the quantity of nitrogen (60 Kg,) and phosphoric 30 Kg.) per hectare were appliad to the soil. The other half was used to spray the crop.

Siz sprayings were done at five days intervals starting from 35 days after transplanting.

PRESERVE SWEET POTATO

Like food grains, sweet potato can also be preserved for long if ground into flour, experiments have provided.

Here is how it is done. Fresh tuberes are washed free of all dirt and the skin scraped off. The white kernel is then shredded on an ordinary shredding plate.

As the shredded material turns black on exposure to air, it is better to collect the shreds undcr water. A pinch of sodium hydrosulphate added to the water helps improve the colour of the final product. The shrods are then squeezed free of water and sun-dried for days

New Researches

High Protein Barley Discovered

Discoverp of a barley high in lysine and protein has been jointly announced by the U.S. Department of Agriculture and the Swedish Seed Association, Svalof, Sweden.

The amount of the amino acid lysine in the protein, as well as the total protein, in a variety now called Hiproly are reported to be 20 to 30 per cent higher than that of a commonly grown barley varieties. In addition, methionine, another limiting amino acid, is higher.

Plant breeders think this discovery would open the way for breeding barley with greatly increased food value.

It is also hoped that the increase may perhaps be comparable to that being developed in corn by use of germ plasma containing the opaque —2 gene.

Lysine is one of the 20 amino acids that compose the protein of all plants and animals, and it is the amino acid usually in shortest supply in cereal gains.

The enhanced lysine content now possible would be especially important for meeting of needs of people in many parts of the world whose diets lack animal protein.

Worldwide search for Fire-resistant plants

A worldwide search is being made for plants that will not burn rapidly. Promising fire-resistant plants from around the world are being tested at the soil Conservation Service Plant Materials Centre at Pleasanton, California, and other locations in the U.S.A.

Each plant's flammability and the other factors that influence the burning quality are tested.

From more than 200 species tested so far, the U.S. Scientists hope to find well adapted plants that will produce small slow burning growth to carpet fuel breaks, heal fire scarred watersheds, reduce fire hazards around developments, and improve wildlife habitats.

Dramatic Increase in yield on Sandy Soil—through use of Asphalt

Dramatic increase in yields of a variety of vegetable crops has been recorded in sandy soils. This could be possible by laying asphalt underground which created an artificial barrier and helped retain moisture.

The underground paving involves the combination of some principles of farm ploughing and high-way building. A powerful tractor is used to draw a hollow, wedge-shaped plough and a tank from which hot asphalt is pumped into the plough. When the plough is lowered into position two feet below the ground, hot asphalt is sprayed in the soil from holes on the bottom of the plough. This newly designed plough cuts through the soil like a knife without disturbing or removing the soil above it.

New Farm Aids to Boost Crop Yields

The first organic chemical weed killer called 2, 4, 8, 10 was introduced in the United States 25 years ago. Today, farmers can choose from more than 500 pesticides and about 25 growth regulators.

Some of the new chemicals will do things never dreamt possible a few years ago. These will generally be safe to use but the user will have to be cautious and well trained. Here are some of the newer types of organic chemicals.

Starvation diets

Several new organic chemicals protect plants from insects in a new way. Insects will not be killed or repelled by a treated plant Instead the insects will take a bite or two and then starve to death

Lodging prevention

A new plant growth regulator, Cycocel, is being used to prevent lodging (falling over) a major problem in wheat, for example. Lodging often occurs when high rates of nitrogen are used on small grains. Yet the nitrogen is essential for top yields. With the new chemicals, farmers are expected to get top yields and keep their crops standing.

Environment adapters

Cycocel has also been found to increase the frost resistance of cabbage. Another chemical, phosfon, improves the salt tolerance of a variety of plants. Other new chemicals reduce the amount of water used by crop plants.

Protein boosters

Recent research indicates small amounts of certain herbicides (weed killers) can increase the protein content of seeds produced by some treated plants. Several new chemicals increase genetic differences. Still others have been used to break seed dormancy.

Pruners, appetizers, others

Several new chemicals have proved useful in pruning trees and brush along roadways and power lines. Other new chemicals show promise for such diverse uses as improving food flavour, preventing "silo fillers disease" controlling internal parasites in farm animals, improving the feed efficiency of farm animals.

Insect and animal repellants, it is hoped would soon be used in abundance on growing plants as well as on food and feed produces in storage. The user of such materials could save millions of rupees worth of grains which are usually destroyed by insects and rats.

Test Tube Tree

There has been still another outstanding achievement in the realm of science. A tree has been developed through tissue culture. The tree is an aspen possessing a triploid set of chromosomes—a peculiarity in itself. The new process could allow trees to be developed in the glasshouse where these can be protected until large enough to feed for themselves.

The tissue culture, it may be noted is a non-sexual, vegetative means of reproduction which has

(*Contd. on page 23*)

How Big Tractors Cut Costs

by DAVID MISKELI

A big tractor works cheaper than a smaller tractor, mainly because it cuts labour costs. That's what detailed cost records of 38 Ohio farmers show. The bigger tractors plow nearly 2½ times more acres an hour, too.

The 38 farmers who kept complete cost and hour records for a year averaged 398 acres of cropland and used more than three tractors per farm. Their figures could help you decide whether to invest the extra $2000 to $3000 that a bigger tractor costs.

All of the farmers had at least one tractor that was four-plow size or bigger. Tractors accounted for one-third of their total machinery investment and average tractor investment per farm was $8247 or $20.37 an acre.

Fixed overhead costs—depreciation, interest, taxes, insurance and housing—accounted for 60% of the $3397 annual tractor cost per farm, with bigger and newer tractors having the highest fixed costs.

Efficiency of use varied—tractor costs ranged from $1.13 to $7.50 an hour depending on size of tractor and hours of use. All 38 farmers used their bigger tractors more than 100 hours a year, but 17 of the smaller tractors logged less than 100 hours.

Cost of the smaller tractors—two-plow size or less—rose to $2.75 an hour when they were used less than 100 hours a year. But when annual use climbed above 300 hours, the cost per hour dropped to 1.13.

For intermediate tractors—three- to four-plow size—costs jumped to $7.50 an hour for less than 100 hours of annual use. When farmers used these tractors more than 500 hours cost dropped to $2.13.

The bigger five- to six-plow tractors cost $5.15 an hour for 300 hours of annual use, but dropped to $3.18 an hour for more than 300 hours.

In general, cost per hour increases with size of tractor but falls as work hours increase. When you compare costs in the 38-farm study on a unit basis of one plow bottom, cost per hour is about the same for all tractors. For example, a small tractor used 300 to 400 hours a year, costs about 75 can hour per plow bottom—the same costs per plow bottom as a bigger tractor used the same number of hours.

So when tractors are used near capacity, hourly unit cost is nearly equal regardless of size. But, the smaller tractor takes more hours to do the job, and labour is critical on many farms

When labour—either hired or unpaid family help—becomes a limiting factor, the bigger tractors widen their advantages, especially if they are kept busy. And as farm size expands, tractor hours usually go up.

The bigger tractor can cut costs on 200 hours of plowing, if you use the tractor for a total of 500 hours a year. Tractor and labour costs for plowing came to $3.63 per acre with a two to three-plow traetor only $2.02 for a five- to six plow tractor.

When labour or time is not a limiting factor, the smaller tracror may have a cost advantage, because you could log more hours on the tractor and cut down the cost per hour without running up labour expense.

Eighty-five per cent of all the tractors on the 38 Ohio farms were used less than 500 hours a year. And less than half of the four—to five and five- to six-plow tractors were used more than 500 hours, including crops, livestock and custom work.

So on a smaller farm with an ample supply of family labor, total labor and tractor costs could be less for the smallar tractor.

But where you are short on labour or hire it at current wage rates you can except bigger tractors and implements working at or near capacity to cut crop producrion costs.

A New Mustard Variety

A new variety of mustard capable of giving higher yield of seeds and oil has been evolved at the Oilseeds Research Station at Patna in Gujrat.

The variety is named Patan Mustard-67. It yields 19 percent more seeds than the local varieties and has 2 percent more oil content.

Nitrogen for Cotton

Experiments at the Agricultural Research Station, Bhavanisagar in Tamilnadu show that MCU-I Cotton grown under irrigation gives profitable returns at higher levels of nitrogen.

The experiment spread over three years shows that at 67.26kg nitrogen per hectare the yields of kapas was around 1,600 kilograms, about 650 kilograms more than when grown without nitrogen thus giving a net profit of Rs. 939.

The nitrogen in the form of ammonium sulphate was topdressed 45 days after sowing at the time of earthing up the crop.

MAHARASHTRA

Jalgaon Samaj Organises Seminar

The Farmers Day and the Seminar was celebrated on 22-10-1969 on Agricultural Research Station, Jalgaon in collaboration with Maharashtra Krishi Vidya Peeth and Zilla Parishad, Jalgoan. About 500 farmers and staff of Agricultural Department and Agricultural Section of the Zilla Parished, attended the function. It was presided by Shri K.M. Patil, President of the Zilla Parishad, Jalgaon. Shri M.A. Anvikar, President, Maharashtra State Krishak Samaj, Shri B.C. Chaudhari, President, Zilla Krishak Samaj, Jalgaon, Oil Seed Specialist to Government Agricultural Development Officer, Zilla Parished M.L.As and M.Ps from the district and other prominent personalities were present.

The President in his address told the importance of growing hybrid crops and high yielding wheat varieties. He also explained the loan system adopted by the Zilla Parishad from this Rabi season to bring more area under Rabi crops.

The President, State Krishak Samaj, gave the detailed information about the working of the Bharat Krishak Samaj, its activities.

A booklet regarding likely question in general along with their replies was printed. Copies of the same were distributed on the occasion. Similarly chart of high yielding wheat varieties, printed by the Bharat Krishak Smaj was also distributed. The Zilla Parishad distributed their booklet on Rabi wheat campaign.

On 23rd October, 1969 the Zila Parishad had also arrangcd Seminar on Fruit cultivation at Dharangaon in Erandol Taluka. It was inaugurated by Shri P.K. Savant, Minister for Agriculture, Maharashtra State. The Horticulturists to Government, the Deputy Director of Agriculture, Assistant Plant Pathologists and other subject specialists were present. The Vice-President, Maharashtra State Krishak Samaj, Secretary and the President, District Krishak Samaj, alongwith other members of the Bharat Krishak Samaj, Secretary and the President, District Krishak Samaj were present.

The questions raised by the cultivators in regard to fruit cultivation were replied by the specialists.

In the morning Minister for Agriculture inaugurated the Factory of Khandes. Pesiticides at Dharagaon. In his speech he told that the Fifth National Agricultural Fair held at Bombay has given the instinct to the Industrialists to go in rural areas and establish factories. This will enable the industrialists to know the difficulties of the cultivators and also have different factories for different products and byproducts.

An exhibition on small scale was also arranged on the occassion. Prizes were given to the best samples of fruits.

Test Code for Agricultural Tractors

A draft Indian Standard Test Code for Agricultural Tractors prescribing various engineering tests which should be carried out at the tractor testing stations under controlled conditions has been prepared by the Indian Standard Institution (ISI). This Code applied to mass produced tractors.

The principal aim of this Code is to enable the manufacturers to check the performance of tractors influenced by design changes, production methods, etc.

This code should be of special advantage to tractor manufacturers for whom design improvement of components through regular testing is an important aspect of their manufacturing programme and replacement of parts with indigenous ones a continuing process of development. This Code would also enable the concerned Government departments to exercise judicious discretion in the import of suitable tractors in the country.

With the increasing use of tractors for mechanizing agricultural operations and manufacture of tractors becoming a major farm equipment industry in India, standardized tests be recognised testing stations have become very necessary. This Code will, therefore, make available to prospective buyers the power output and performance of the tractors against manufacturers claims. These tests, which should be of practical use to both users and manufacturers, would also provide a general identification and description of the tractor and its usual accessories. The draft Test Code has been issued into wide circulation to all interests concerned both within the country and abroad for eliciting technical comments which would be taken into consideration before finalizing the draft as an Indian Standard.

Big Increases in Exotic and Improved Paddy Area

Very good results were achieved during the Kharif compaign in Lucknow Division this year. Not only the area under exotic paddy and the improved varieties of U.P. paddy and maize recorded a big increase and the off take of fertilizers went up the cultivators also evinced keen interest in construction of minor irrigation works and developed considerable additional irrigation potential.

Area under exotic paddy almost doubled and that under improved varieties of U.P. paddy went up by 54,000 acres as compared to last year. The area under exotic paddy which was 44,100 acres last year rose to 77,900 acres as against 1,16,000 acres last year. The area under improved varieties of U.P. maize also recorded almost double increase—from 71,000 acres last year to 1,16,000 acres this year.

CONTROL OILSEED . . .

(*Contd. from page 4*)

Red Hairy Caterpillar (Amsacta moorei)

The months are conspiously white in colour with dark red anterior margin in the forewings. There are a few black spots near the lower margin of the posterior wings. Adult measures about 24 mm. long and wing-span is about 63 mm. Its abdomen is conspicuously light brown with black bands.

Nature of damage:

The caterpillars feed on the leaf and defoliate the plant completely. It is a serious pest in the Kharif season when the plants have grown to some height after sowing.

Thcse caterpillars feed on differrent species of plants like groundnut, Maize jowar, bajra, urid moong, till guar, cucurbits, cotton, san-hemp and all kinds of fodder crops. This polyphagous habit renders them all the more serious.

Control measures:

The following control measures could be adopted with advantage:

1. Spray 0.05 per cent endosulfan i.e., 15 ml. of the insecticide mixed in 10 litres of water at the rate of about 800 litres per hectre.
2. Alternatively dust 5 per cent diperex or 3 per cent parathion at the rate of about 20 kg. per hectare as soon as the infestation is seen in the field.
3. If none of the insecticides metioned above are available, dust 10 per cent BHC at the rate of 20 kg. per hectare.

6. Groundnut Leaf-miner (Stomoptervx-nerteria)

It is a small darkbrown moth with a pale white spot at the front margin of each of the forewings. Its caterpillar is greenish in colour with dark head.

Nature pf damage:

The caterpillar mines the tender leaves. Sometimes it folds and brings together the adjacent leaves and thus sheltered, it feeds leisurely on the leaf tissue. When the crop is severely infested, the leaves become dry and the plant presents an almost withered appearance. The pest infests both the rainfed as well as the irrigated crops.

Main host plant is groundnut but it has been recorded on soybean, red gram and a wild shrub (Psoralea corllifolia),

Control measures:

The following control measures could be adopted with advantage:

1. Spray 0.02 per cent matasystox at the rate of about 800 litres per hectare.
2. Alternative spray 0.02 per cent dimecron or rogor at the same rate as mentioned above and do not harvest the crop till two weeks from the date of spraying even if metasystox has been used.

7. Groundnut Aphid (Aphis labnrni)

These are usually wingless but winged forms also occur. These measure about 2 mm. in length and are darkish green in colour.

Nature of damage:

They suck the vital sap from the plants and in severe cases of infestation, the croy looks withered and blighted. The aphid is also a vector of a serious virus disease known as resette of groundnuts.

Besides groundnut, it has also been reported to infest safflower and niger. The pest has a wide distribution throughout the country.

Control measures:

The following control measures could be adopted with advantage.

1. Spray 0.05 per cent endosulfan, i.e., 15 mt. of thiodan 35 E.C. mixed in 10 lit of water or 0.02 per cent ekatin at the rate of about 800 litres per hectare.
2. Alternative spray 0.08 per cent malathion 50 E.C., i.e., 15 ml. of the insecticide mixed in 10 litres of water at the rate of about 800 litres per hectare.

Til Sphinx (Acherontia styx)

The adult has a dark gray and bluish thorax. The abdomen is yellow with black bands. Its forewings are dark brown with wavy dark stripes. The full-fed larva is 90 mm. long, about with a rough skin. It is light green in colour and has eight yellow stripes on its body.

Nature of damage:

The caterpillar feeds extensively on leaves. The larval stage lasts about two months and throughought this stage it remains herbivorous, devouring the leaves.

The main host plant is sesamum or gingelly and, at times, it is also found infesting kulthi (Dolichos lablab).

Control Measures

The following control measures could be adopted with advantage.

1. Dusting 5 per cent BHC at the rate of about 20 kg. per hectare has been found quite effective during early infestation.
2. Alternatively dusting 5 percent dipterex or 3 per cent parathion at the same rate as mentioned above would ensure effective control. Do not harvest the crop till two weeks from the date of spraying, if parathion has been used.

9. Leaf and Pod Caterpillar (Antigustra catalaunalis)

The moth is ochraceous and measures 8.8 mm. The larva is light green with many black spots bearing hairs, it readily lets itself down with a thread and eventually descends to the soil.

Nature of damage

Caterpillar rolls the leaves of the host plants and bores into the seed pod. They feed on the tender leaves and shelter themselves inside the webs which they construct for themselves. It is a serious pest of sesamum. The pest is believed to be specific to this crop and no alternative host plants have been recorded so far.

Contrl measures

The following control measures could be adopted with advantage :

1. Spray 0.05 per cente endosulfan, *i.e* 15 mm. of thiodin 35 E.C. mixed in 10 litres of water at the rate of about 800 litres per hectare.
2. Alternatively dust 5 per cent BHC at the rate of about 20 kg per hectare.

10. Sesamum gall fly (Aspondylia sesami)

The adult is a small delicate

mosquito like fly, while the larval stage is legless and the larva remains inside the gall.

Nature of damage :

The maggots are found inside the young flower buds and the irritation causes gall formation and interferes with the processes of pod formation. Consequently, the infested buds wither and fall on the ground.

So far the insect has been reported to attack no other food plant except sesamum. The pest has been reported from Bihar, Maharashtra and Madras.

Control Measures

The following control measures could be adopted with advantage :

1. Spray 0.02 per cent metasystox at the rate of about 800 litres per hectare.
2. Alternatively spray 0.02 per cent dimecron or sevin at the same rate, as mentioned above. Do not harvest till two weeds, if metasystox or dimecron has been used.

11. Castor Semilooper (Achaea janata)

The moths are stout and have smoky grey or brown forewings. Their posterior wings are dark with a white band in the middle with three to four spots near the lower border. The newly hatched caterpillar is 5 mm. long and 1/2 mm. broad while full-grown caterpillar is about 50-60 mm. in length.

Nature of damage

The caterpillars eat the leaf, leaving only the ribs on old plants and main stock in young plants. The adults are fruit feeders. The larvae which feeds on the leaves seldom attack the fruits.

Main host is castor but occasionally these have been found to attack rose, pomegranate and Euphorbia.

Control measures

The following control measures could be adopted with advantage :

1. Dusting 10 per cent BHC or DDT at the rate of about 20 kg. per hectare.
2. Alternatively spray 0.05 thiodan or sevin at the rate of about 800 litres per hectare.

12. Castor Capsule Borer (Dichrocrocis punctiferalis)

The moth is small bright yellow in colour with numerous black dots on the body and wings. Its wing span is 18.5 mm. The full-grown caterpillar measures about 25 mm. in length. It is brownish in colour with a pinkish tinge and some spiny warts.

Nature of damage

The caterpillars bore into the shoots and seed capsules and cause extensive damage by eating their internal contents. The presence of the pest can be made out by the presence of black mass of excreta on the capsule.

The castor is the main host but the fruits of guava, stems of turmeric rhizomes and stems of ginger, cardamom are frequently infested by the caterpillar.

Control measures

The following control measures could be adopted with advantage.

1. The infested shoots and seed capsules may be collected and destroyed. This will reduce the degree of infestation. Simultaneously spray 0.02 per cent metasystox at the rate of about 800 litres per hectare.
2. Alternatively spraying 0.02 per cent dimecron or ekatin at the rate of about 1800 litres per hectares has been suggested. Do not harvest the crop two weeks from the date of spraying if metasyotox, dimecron or ekatin has been used.

13: Leaf-eating caterpillar (Perigoea capensis)

The adult is a medium sized and dark brown moth. Its forewings are blackish brown and hind wings are light brown. A full-grown caterpillar measures about 25 mm. in length.

Nature of damage :

During the early stages of the crop, the caterpillars eat the leaves and cause defoliation. When the plants grow more and become hard this infestation decreases. Main host plant is safflower, but it also attacks niger and kakaronda (Blumea balsamifera).

Control measures :

The following control measures could be adopted with advantage :

1. Dust 5 percent BHC at the rate of about 20 kg./per hectare.
2. Alternatively spray 0.05 per cent endosulfan, *i.e.* 15 ml. of thiodan 35 E.C. mixed in 10 litres of water at the rate of about 800 litres per hectare.

14. Safflower aphid (Macrosiphum sonchi)

The species is green and reddish-brown in colour. These are very sluggish insects and remain stationary after inserting their minute beaks in the leaf or tender plant tissues. The adults are soft bodied and oblong in shape. They are mostly wingless but latter in the season at the maturity of the crop, winged adults are formed.

Nature of damage

The aphids suck the cell sap and remain attached on the undersurface of the leaves. Their continued feeding leads to the general yellowing of leaves and subsequent drying They also excrete a large amount of sugary solution which comes to lie on the leaf surface and its presence in excessive amount interferes with the photosynthetic activity of the plant.

Control measures :

The following control measures could be adopted with advantage :

1. Spray 0.05 per cent endosulfan *i.e.* 15 ml. of thiodan 35 E.C. in 10 litres of water at the rate of about 900 litres per hectare.
2. Alternatively spray 0.08 per cent malathion 50 E.C., *i.e.* 15 ml. of the insecticide in 10 litres of water or 0.1 per cent ekatin at the rate of about 900 litres per hectare.

Soyabean Marches . . .

(*Contd. from page 3*)

and many other tasty and high protein foods can be made from whole beans and the important elements in the diet of Far Eastern countries.

In areas such as India, the soya bea is entirely stranger and does not figure prominently in the diet Limited quantities of soya bean oil have been used for margarine and cooking, oil manufacture, and small quantities of the meal are used in the antibiotics industry. Yet this crop is one of the most important potential sources of protein and energy now available. Obviously, uses appear immediately encouraging.

One possible use is incorporation into the unleaved wheat breadth which is the staple item of the diet in northern India. Tests have shown that full fat soy flour can be incorporated into the wheat flour normally used, up to about 20 per cent of the total making an acceptable product which is much higher in protein than the present type. This mixed flour will not keep well, but this is not such a serious problem in India, where it is customary to grind wheat at frequent intervals, and where the whole grain wheat flour also is subject to rapid deterioration in quality.

A simple refinment of processing, developed at the Northern Utilization Laboratory of the U.S. Department of Agriculture at Petoria, Illinois, involves a period of soaking the whole beans in boiling water before they are dried, cracked, winnowed and ground into full-fat flour. This process, which could be carried out with equipment easily available at village level, greatly increases the keeping quality of the soya bean flour, and probably increases its nutritional value.

Several firms are now experimenting with the use of soy protein in the manufacture of dried powder for infant foods. The scarcity of milk in acute shortage and high prices of dried-milk based infant foods. One large firm, the Amul Dairy (Kaira District Cooperative) in Gujarat State, India intends to go into major production of such a product in the near future.

Soy milk is another potentially important use of soya beans. Products of this type already are popular in Hong Kong and other Far Eastern areas, where they are sold in bottles like soft drinks. Soya beans coconut milk, sugar and vanilla can be combined to make a highly acceptable milk-like product. The addition of small amounts of dried milk solids balances the soy milk to a product close to cow's milk in nutritive value. Some of us who have been closely involved with the soya bean research work in India see this as perhaps the crop's most important potential impact on the Indian diets. Facilities are already available for centralized collection and distribution of cow and buffalo milk. With relatively simple modifications, the natural milk supply could be used to provide milk solids. Coconut oil is abundant and relatively cheap, and soya beans can be produced in large quantities if needed. Milk, which is now a scarce item, could become available in virtually unlimited amounts.

The greatest need at present is for the application of industrial know-how to the problem of soyabean utilization in area like India. Many groups interested in this problem of human nutrition are involved in varying degrees. When industry takes up active participation in the solution, great things can happen.

Farmers' Credit Needs . . . . .

(*Contd. from page 15*)

The need for credit for the regular operations from sowing to marketing is also there.

The Commercial bank should create a "Farm Credit" section with the staff trained in various aspects of production and marketing for assessing credit needs of the farmers from time to time. They should create service station facilities in rural areas where farmers may get farm machiney and equipments on hire. This will help small farmers who cannot afford to have their own machinery and equipment.

Net worth (excess of assets over liabilities) and the repaying capacity (residue left after deducting cash expenses, current liabilities and family living expenses from total cash returns) may be taken as criteria for advancing loans by the banks. The emphasis, however, should be on the net worth in case of large farmers and the repaying capacity in case of small farmers since their equity position is comparatively lower.

New Researches

(*Contd. from page 18*)

been earlier employed successfully to produce non-woody plants, such as tobacco, carrots, etc., as also animal tissues.

In this process, a small piece of cambium is removed from a parent plant and incubated in medium containing nutrients and growth regulators. Cells multiply and form a mass of cells called callus. These are subsequently subcultured in a second medium containing cytokinin which directs the differentiation of cells into thc roots and shoots of young tree.

A Fodder Crop for Dry Areas

Johnson grass, resembling Jowar, is found to yield well in arid areas reports the Central Sheep and Wool Research Institute, Malpura in Rajasthan.

During years of moderate rainfall, the yield of green fodder from Johnson grass is reported as 40,000 to 50,000 kilograms per hectare. It is as nutritious as jowar and is liked by all classes of livestock. Johnson grass can be fed to cattle as green fodder or as hay. Excellent silage can also be made from it.

In arid areas, this fodder is grown in the rainy season during July-October.

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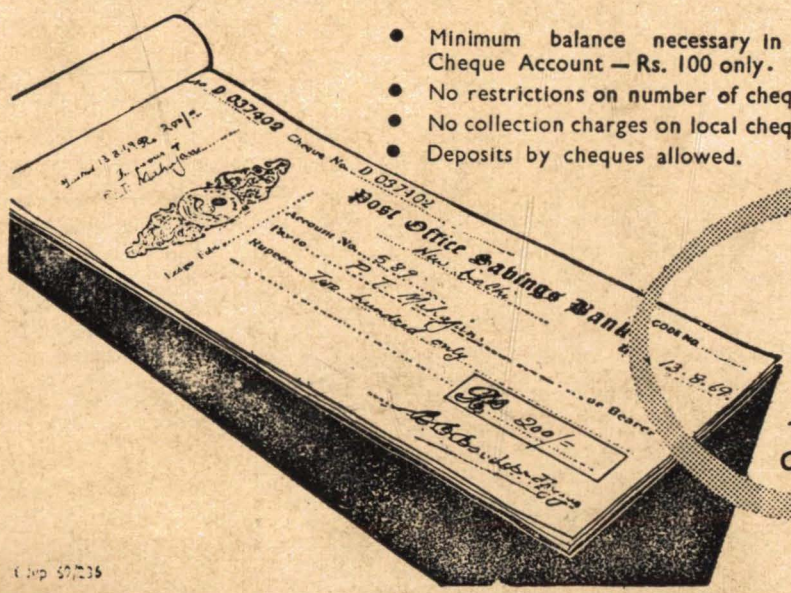

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