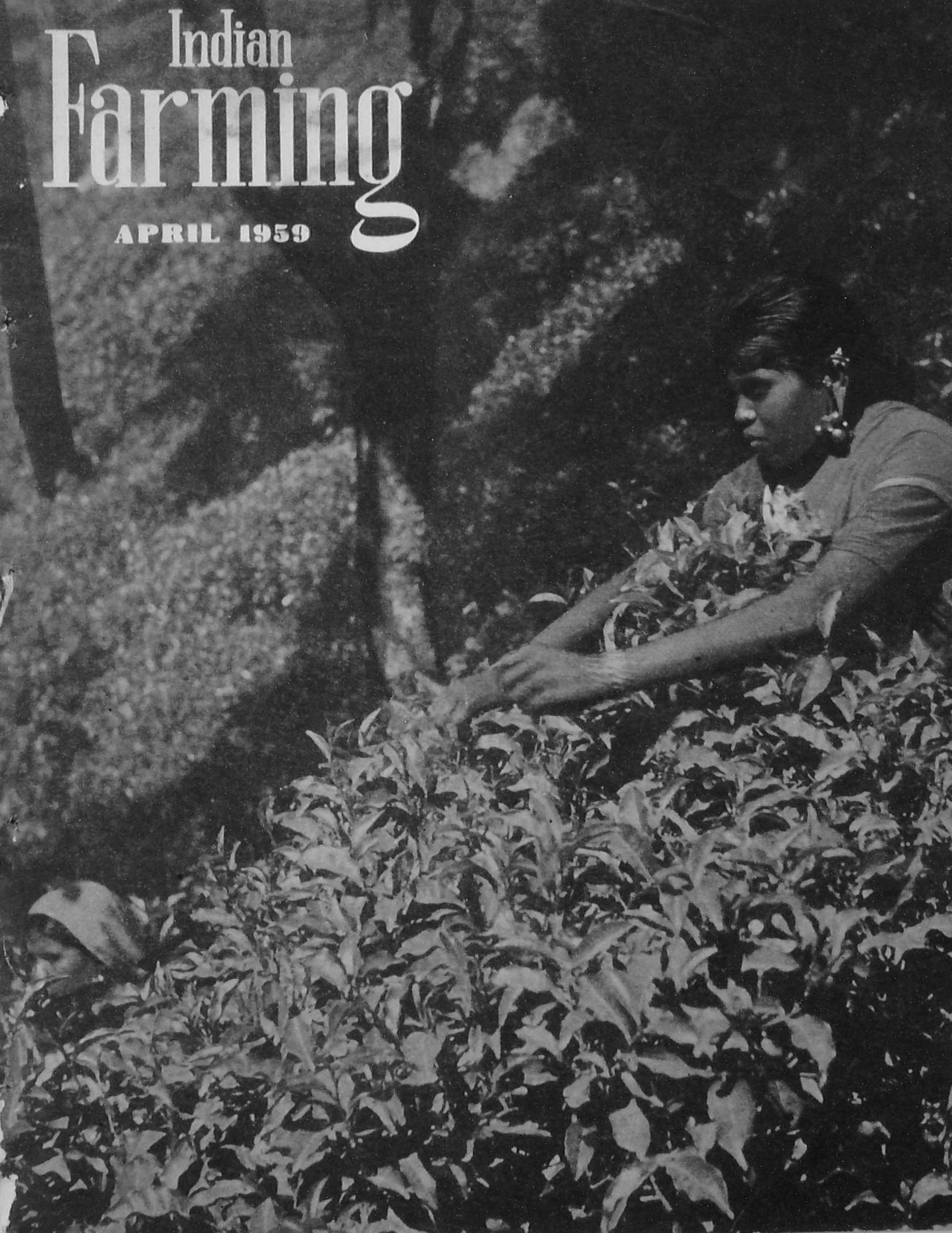
Indian Farming

APRIL 1959



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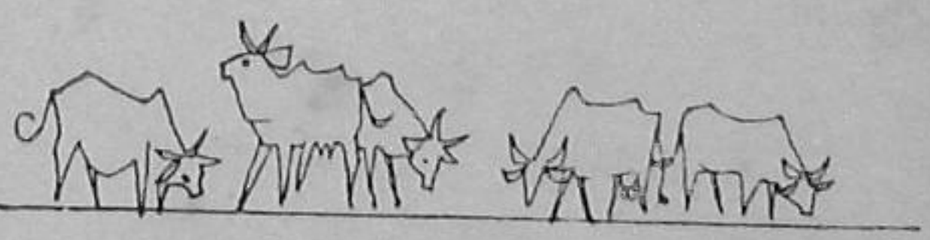

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CALCUTTA MADRAS BOMBAY NEW DELHI

APRIL 1959

Vol. IX No. 1

OUR COVER

Plucking tea on a Kerala plantation. A good standard of plucking gives 98 per cent of saleable tea, as against 93 from a coarse pluck. Two leaves and a bud is the standard practice

Photo by H. K. Gorkha

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Indian Farming

CONTENTS

Editor: **Harkirat Singh**

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THE INDIAN COUNCIL OF AGRICULTURAL RESEARCH

NEW DELHI

DANGER-

Tata-Fison at work!

"Frenzied activity," said Tata, yawning.

"Frantic rush," said Fison, rubbing his eyes. "So many things going on we hardly have time to breathe. What with our Bombay, Calcutta and Cochin factories already producing pesticides furiously. They are producing furiously, old man, aren't they?"

"Believe so," said Tata.

"And another unit at Agra well on the way to completion. You know, we're really going through a period of terrible strain. We'd better take it easy. After all the community needs useful citizens like us," said Fison, shutting both eyes and turning over.

P.S. TATA-FISON FACTORIES *at*
BOMBAY
CALCUTTA
COCHIN, *and now*
AGRA
deliver TATA-FISON products cheaply, quickly and efficiently (yes! efficiently) to all parts of India.

TATA-FISON

a solution for <u>every</u> pest

PREPARING FOR KHARIF

IN the next two months or so, 'kharif' crops would be due to occupy the field. The aim before the farmer this time should be: more production than in the previous 'kharif' season. The objective would not be difficult to achieve if he proceeded according to a well-thought out plan.

Ring out the 'rabi' by carefully selecting your wheat seed for use in the next season. Treat it against Earcockle and Loose Smut, and to keep weevils away in storage; protect it from rats. It will not only bring **you** credit but also to your village if you exchange some of your good seed with your less fortunate brethren.

Prepare for the 'kharif' by making up your mind as to the varieties you would grow. Farmers in rain-fed areas of Madhya Pradesh, Bihar and Orissa would do well to use early-maturing paddies which yield high. This will also facilitate double cropping.

A progressive farmer of the Punjab attributes good improvement in his yields to burying his green manure by the combined use of a good furrow-turning plough and the green manure trampler. See if you can follow his example.

A 20 per cent more yield would not be difficult if you line-sow your paddy. Even sowing behind the plough or space-dibbling of sprouted seed in a well-puddled soil is quite beneficial. Contour-sowing of 'jowar' 'bajra', etc., should be adopted in dry areas. Pre-sowing treatment of seed keeps disease at bay.

Most important of all: be in time for every operation, especially sowing, fertilizing, and irrigating—particularly at the crucial stages of the crop. Pests are great thieves of crops. Tackle them as soon as you notice them.

Ensure your requirements of seeds, fertilizers, implements, etc., well in advance. Think of some new labour-saving devices. Deepen the old wells, dig new ones, if necessary, and put tubewells in full working order. Last-minute efforts are always uncertain and risky.

The Government too is all set for an all-out drive for increased production from 'kharif' crops this year. See your local agricultural officer about your difficulties, if any, in carrying out your plans effectively. Regarding finance, it is time you applied for a 'taccavi'. This would ensure that the money is in your hands exactly when you need it.

A good crop of *jowar* and a satisfied Patil

An Experimenter In More Ways Than One

by
W.B. Rahudkar

THE acute scarcity of *jowar kadabi* in Berar and its resultant high price during summer has prompted a small cultivator, Bhagawantrao Patil by name, to do a little bit of experimentation. Shri Patil, who belongs to the village of Tondgaon in Amravati district, is trying to find out a new method of *jowar* cultivation. His aim is to obtain more *kadabi*, both green and dry, from the same crop without reducing the grain yield and, if possible, to get even more grain.

It seems that Patil is well on the way to success. By his method, he has been able to obtain 450 *pallas* of green *kadabi* per acre in addition to the normal yield of grain and dry *kadabi*.

Patil explained to me the details of his method which he tried on two acres during 1958-59, when I visited his farm recently.

He prepared his land for sowing by the usual method. Applied seven cartloads of farmyard manure per acre three weeks before sowing. Mixed the manure thoroughly with the soil. Then applied 112 pounds of ammonium sulphate to the field one week before sowing and mixed it well with the soil.

The field was then marked with the *argada* crossways at 2 feet × 2 feet (*chouphuli*). Sowing was done on 5th July, 1958. Five seeds were sown at each cross an inch deep and in a circular area of about six inches in diameter round the cross. Four pounds of seed were used for an acre.

EXCELLENT GROWTH

Three to five plants grew at each cross. A handful of manure mixture was given round each dibble one month after sowing. The field was intercultivated twice. The weather remained favourable and the growth of the crop was excellent.

When the stems of the *jowar* plants were hard and of the thickness of the thumb, they were cut at the second internode from the ground. This was done on 5th September. "The green *kadabi* thus obtained was relished by the cattle, and they did not waste much of it," Shri Patil told me.

An intercultivation was given to check weed growth and to earth the *jowar* stumps. Each stump gave out three to five shoots.

A manure mixture consisting of a bag of groundnut cake and 56 pounds of urea per acre was applied as a topdressing on 30th September when the crop was one foot high. After this, one more intercultivation was done.

The *jowar* crop after it had given a cutting of green *kadabi*

PLANTS TIED

The *jowar* plants growing at each dibble were tied together to prevent lodging. Short ridges were laid out and an irrigation applied to half the field on 25th November to see whether it benefited the crop. No specific improvement was seen.

The crop was harvested on 26th December. The yield of grain turned out to be 39 maunds per acre; 150 *pallas* of dry *kadabi* were obtained.

"A difficulty that I myself have felt," Patil admitted, "is that weeding and mulching become rather difficult in between the *jowar* plants round the dibble. "Even then I would say that it is a worth-while method," he added.

Patil spraying his orange trees with the home-made sprayer

AN EXPERIMENTER

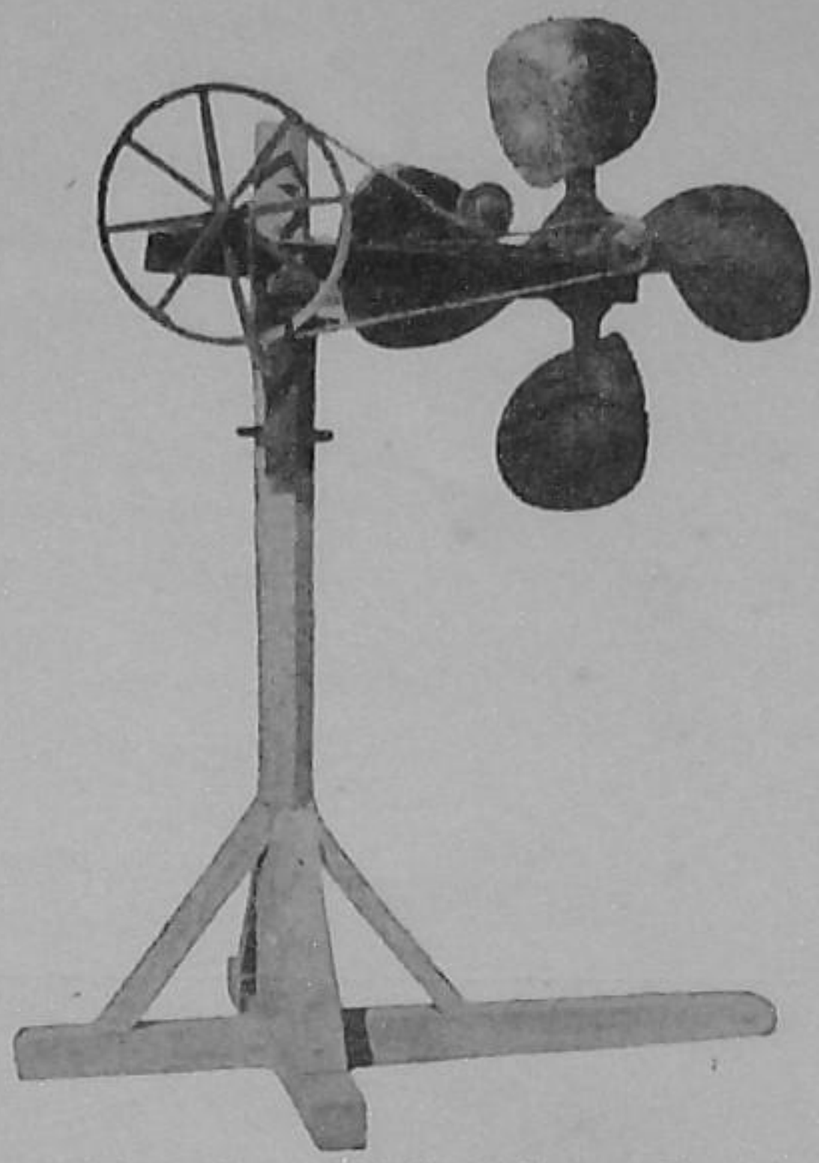
Patil is an experimenter in more ways than one. He has made an insecticide sprayer from scrap. He always uses this home-made sprayer for spraying his crops and garden trees. This sprayer can hold two gallons of the spray and cost only Rs. 30 to make.

His well also is worth seeing. The water supply from this well being in adequate, Patil dug another well at about four feet from it. These two wells he connected by an underwater tunnel, covered the new well with a concrete slab, and spread soil over it. He is now raising crops on this spot.

No waiting for the breeze

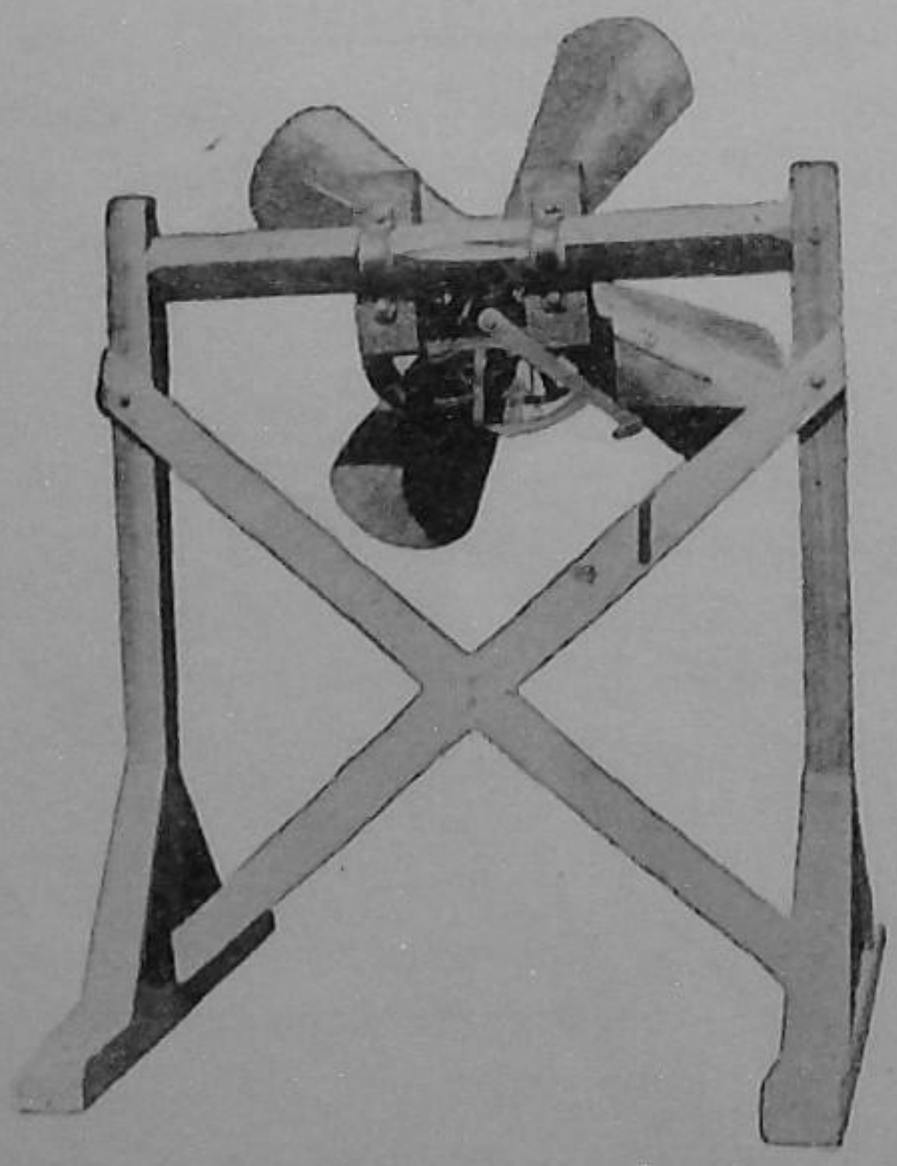
If You Own a Winnowing Fan

by
Shiv Dayal *and* **J.S. Manku**
Indian Agricultural Research Institute
New Delhi



Driven by a V-belt pulley, and quite cheap, is the Bihar fan

FOR separating *bhusa* from the grain, the farmer generally depends on the natural breeze. The threshed grain is held aloft and then dropped gradually; the *bhusa* is blown away by the breeze, while the grain falls on the ground.



To give it a good rotation speed, the Bombay fan has gears

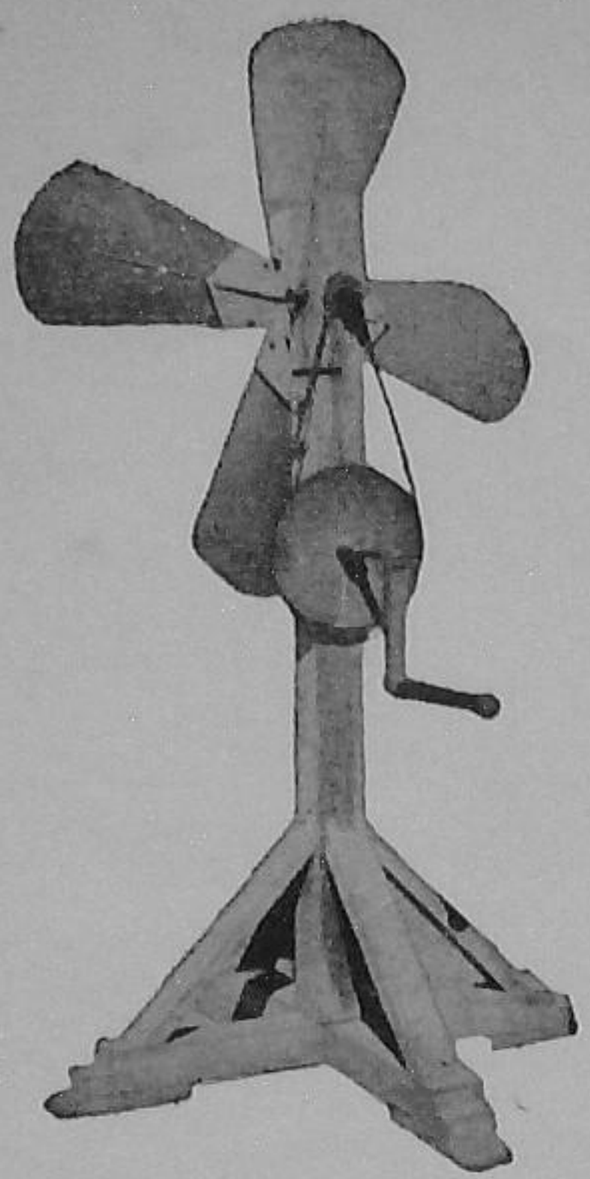
But the difficulty arises when there is no breeze for days together. As a result, the threshed grain has to be left in the field exposed to damage by rain, dust and rats, and pilferage. It is here that a winnowing fan proves useful. It can create an artificial breeze for the operation.

Various types of winnowing fans have been developed in the country, most of which are manually operated. For a higher rotation speed of the fan-blades, devices like single or double reduction gears, sprockets, chains and V-belt pulleys have been used. Choose your fan from the following.

GEARED BOMBAY FAN

This is a four-blade fan. It is driven through double reduction gears. The gear ratio between the handle-shaft and the blade-shaft is 17:2. The rotation speed of the blades is 8½ times that of the handle. The length of the handle is one foot.

This fan can be worked at 310 revolutions per minute. The velocity of the breeze at four, six and eight feet from the blades is 530, 509 and 483 feet per minute, respectively. The price of this fan without the wooden stand is about Rs. 125.



Simple to make, the I.A.R.I. fan works with a chain wheel and sprocket

The fan is very simple in construction. The handle-shaft and the blade-shaft are fixed on a single, vertical pole provided with foot-rests at the bottom. The tension of the driving chain is adjustable. It can easily be worked at 300 revolutions per minute. The velocity of the breeze at four, six and eight feet from the blades is 972, 910 and 658 feet per minute, respectively. The fan costs about Rs. 65.

V-BELT DRIVE BIHAR FAN

This is a four-blade fan. The diameter of the blades is 37 inches. The drive is through a single-reduction V-belt pulley. The ratio of driving to the driven pulley is 5 : 1, so each turn of the handle gives five revolutions. Adjustment of the belt tension is by means of a jockey pulley.

The fan can be operated at 210 revolutions per minute. The velocity of the breeze at four, six and eight feet from the blades is 457, 432 and 348 feet per minute, respectively. The price of this fan without the stand and the V-belt is about Rs. 50.

A rope instead of the V-belt can also be used, but that may not be economical because the life of the rope will be very short.

DOUBLE-SPROCKET PUNJAB FAN

This is a three-blade fan. The diameter of the blades is 50 inches. It is driven by pedals through double-reduction cycle sprockets and free wheels. A saddle is provided, on which the operator can sit and work the fan in the same way as he would a bicycle.

The gear ratio between the pedal-shaft and the blade-shaft is 64 : 9, so each turn of the pedal-shaft gives $7\frac{1}{9}$ revolutions. On an average, this fan can be worked at 320 revolutions per minute, giving a wind velocity of 680, 630 and 220 feet per minute at four, six and eight feet from the blades. The price of this fan is about Rs. 150.

I. A. R. I. FAN

This four-blade fan has been designed at the Indian Agricultural Research Institute, New Delhi. The diameter of the blades is four feet. The drive is through a single-reduction chain wheel and sprocket. The gear ratio is 6 : 1, so each turn of the handle gives six revolutions.

A comfortable seat for the operator is an exclusive feature of the Punjab fan

An Easy Way to Get Excellent Coconut Seedlings

by

K. Satyabalan

Central Coconut Research Station

Kasaragod

A natural cross dwarf palm yields a large number of fruits

In growth vigour, a true dwarf seedling (*right*) **stands no comparison with a natural cross dwarf one** (*left*)

SIMPLY by planting some good dwarf coconut palms among the elite palms of the tall variety, the farmer can get excellent coconut seedlings. The natural dwarf hybrids thus obtained yield better, and have superior copra with a higher percentage of oil compared to the true dwarf palm.

The tall variety of coconut is extensively cultivated. It is long-lived and hardy, yielding copra, oil and fibre of good quality. It begins to bear within six to eight years of planting, the average annual yield per tree ranging from 30 to 100 nuts; the copra content per nut is about five ounces and the percentage of oil in the copra about 72.

The dwarf variety is a delicate palm about 15 feet in height and having a life of about 35 years. It begins to bear within three to four years. The average yield is 60 nuts, but bearing is irregular. The nuts are small, ovoid or round in shape and mainly consumed tender. The average copra content is three to four ounces and the oil percentage about 66 to 68. The copra is leathery and not of commercial importance. The variety is susceptible to pests and diseases. It is, therefore, considered uneconomic for growing on a plantation scale and is recommended only for its tender nuts and for ornamental purposes. It has three distinct types producing green, orange and yellow nuts.

The two varieties differ in their mode of pollination. The tall variety is largely cross-pollinated in nature, giving rise to varied progeny, while the dwarf has a high percentage of self-pollination and breeds true to type.

However, it has been found at the Central Coconut Research Station, Kasaragod, that when the two varieties are interplanted, natural crossing between them does occur to some extent. Seedlings obtained from the hybrid nuts of the dwarf palms differ from those of the true dwarf, and are recognized by their reddish petioles and vigorous growth, particularly when the dwarf mother-palm is of the orange or the yellow type. In the case of the orange or yellow dwarfs, such hybrids occur to the extent of about 20 per cent.

Production of good quality seedlings of the tall variety and hybrids from controlled crosses of the tall as the mother and the dwarf as the pollen source are two ways of obtaining good planting material for coconut plantations. But both are highly technical processes. Nature, however, has made it easy for the coconut grower. All he has to do is to sow in a nursery nuts of good dwarf palms of the yellow or the orange type grown amidst tall palms, and look out for vigorous seedlings with reddish petioles.

In Rajasthan

THEY PRACTISE "KHADIN" CULTIVATION

by
D. K. Misra
Soil Conservation Officer (Agronomy)
and
R. B. Das
Junior Research Officer
Desert Afforestation and Soil Conservation Station
Jodhpur

EVEN in the driest zone of western Rajasthan under the most unfavourable conditions, farmers are raising good crops of wheat by following a technique known as *khadin* cultivation. In Jaisalmer district, the average wheat yield is 960 pounds per acre as against the national average of 660 pounds.

Western Rajasthan is a large sandy plain with an outcrop of rocks. The aridity increases as one proceeds north-west from the Aravallis. The climate is characterized by extremes of temperature, frequent droughts and strong desiccating winds. Another serious problem is that of sand drift.

The tract can be divided into three zones:

(*a*) The semi-arid zone including parts of Jodhpur, Churu, Nagaur and Pali, with an annual rainfall of 13 to 15 inches.

(*b*) The arid zone districts of Bikaner, Sri Ganganagar and parts of Nagaur and Jodhpur, with a rainfall of eight to ten inches.

(*c*) The desert zone of Jaisalmer, Barmer and the western part of Jodhpur district, which has the lowest annual rainfall of less than eight inches.

The soils of the area are mainly deposits by the wind of disintegrated rocks usually rich in minerals. They are practically sandy and extremely poor in organic matter, and contain a high percentage of rocks of alkaline and salty nature.

CROPPING PRACTICES

The nature and extent of cropping vary considerably in the three zones. Due to the adverse climatic conditions, only 31.85 per cent of the total land is under cultivation. The per-acre yields are very poor: 98 pounds of *bajra*, 115 pounds of *jowar*, 266 pounds of maize, 295 pounds of gram, 77 pounds of sesamum and 92 pounds of cotton.

In the semi-arid zone, agriculture is the mainstay of the people. Both *rabi* and *kharif* crops are grown. The *kharif* crops are sown after giving a few scratchings on the soil with the *desi* plough; *bajra* seed is then broadcast. During the *rabi* season, wheat, barley, mustard, gram and chillies are grown. A wheat crop is taken if irrigation is available. Generally, wells are the source of water supply.

In the arid zone, the people depend partly on the grazing industry and partly on agriculture. So far as the *rabi* crops are concerned, they are grown where the water-table is not very low and the soil is suitable.

In the desert zone, rearing of sheep and cattle and cattle-grazing are the main occupations. Cropping is most uncertain and undependable. For example, the farmers are able to take only one good *kharif* crop in five years. The *rabi* crops in this zone are restricted to small pockets of land which have been developed as *khadins* (contour bunds). These pockets usually lie in the low-lying areas which are either river flood-outs

A typical *khadin* near Jaisalmer. Wheat is sown as soon as the bed dries up

or small lakes and start drying up soon after the rainy season is over. Wheat has been grown under these dry land conditions since long by the local farmers. The rainfall being very little, the farmers of the region try to conserve all available moisture and make the best use of it.

KHADIN CULTIVATION

In Jaisalmer district, which has 10,960 acres of cultivated land, about 1,525 acres under wheat are thus cultivated. The four important *khadin* areas in this district are: Bhuj with 600 acres, Lakhina with 325 acres, Masurdi with 30 acres, and Lankla with 300 acres.

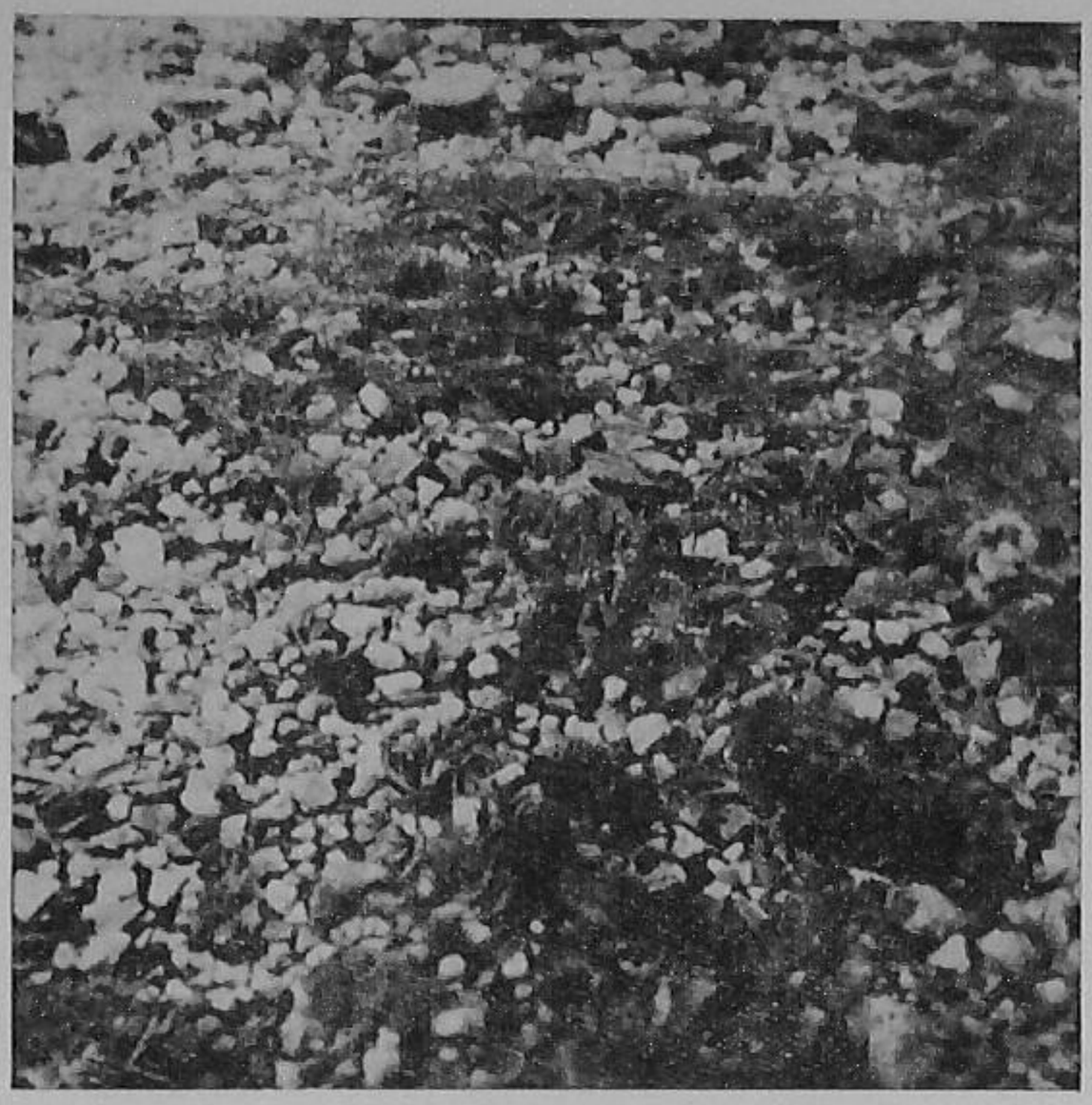
A contour bund is prepared to accumulate all the available water. Usually, such land has a gentle slope spread over a good acreage. A special feature of this low-lying area is that silt washed down from the neighbouring waste lands has got deposited over it. The contour bunds help retain water and the silt.

The *khadin* soils have a higher percentage of salts, also washed in with the water accumulating from all around. The salts are able to hold the moisture which is drawn upon by the crops during periods of drought.

The land is fit for cultivation from the middle of September to the middle of October. During this period, the soil is worked up with a *desi* plough four to six times. This brings some moisture on the top which helps the seed germinate. No manure is applied to the wheat fields.

The local seed strains known as *Bajraia* and *Ratia*, are used, which are small in size and quite hardy. These have somewhat shrivelled grains. The seed is sown behind the plough at 40 seers per acre. The sowing is normally done in October. Generally, no interculturing, top-dressing with fertilizer, weeding or hoeing is done.

Even when the plants are only six to nine inches high, rats are a great menace to the crop. The local orthodox people, however, neither themselves carry out nor allow any anti-rat operations. White ants sometimes attack the crop severely.



Pebbles now cover the soil on which once grass grew

Alpine pastures are losing their proverbial glory

Our Urgent Need: Proper Attention to Natural Pastures

by

P.C. Nanda
Grassland Survey Officer
Indian Council of Agricultural Research

TO maintain the soil and animals in good condition, the vegetation must be managed properly. Of the vegetation, natural forages are the most important, both from the point of view of soil conservation and economic feeding of livestock. Nearly 7/8th of the herbivorous animal population of India subsists on natural forages. Therefore, natural grasslands are very important to the national economy.

By destroying vegetation in the hills and the plains through fitful cultivation, excessive felling of forests and, on top of all, uncontrolled grazing, we are creating vast problems for the country. They are :

(*a*) Deterioration of the alpine pastures, once considered to be a paradise for animal-rearing and even now the basic source of fodder for four months for most of the sheep, goat and horse population of the country.

(*b*) Gradual destruction of the fine forest areas particularly in the Shiwaliks and the outer, middle and the inner Himalayas, resulting in land-slips and floods in the plains causing havoc to land and people.

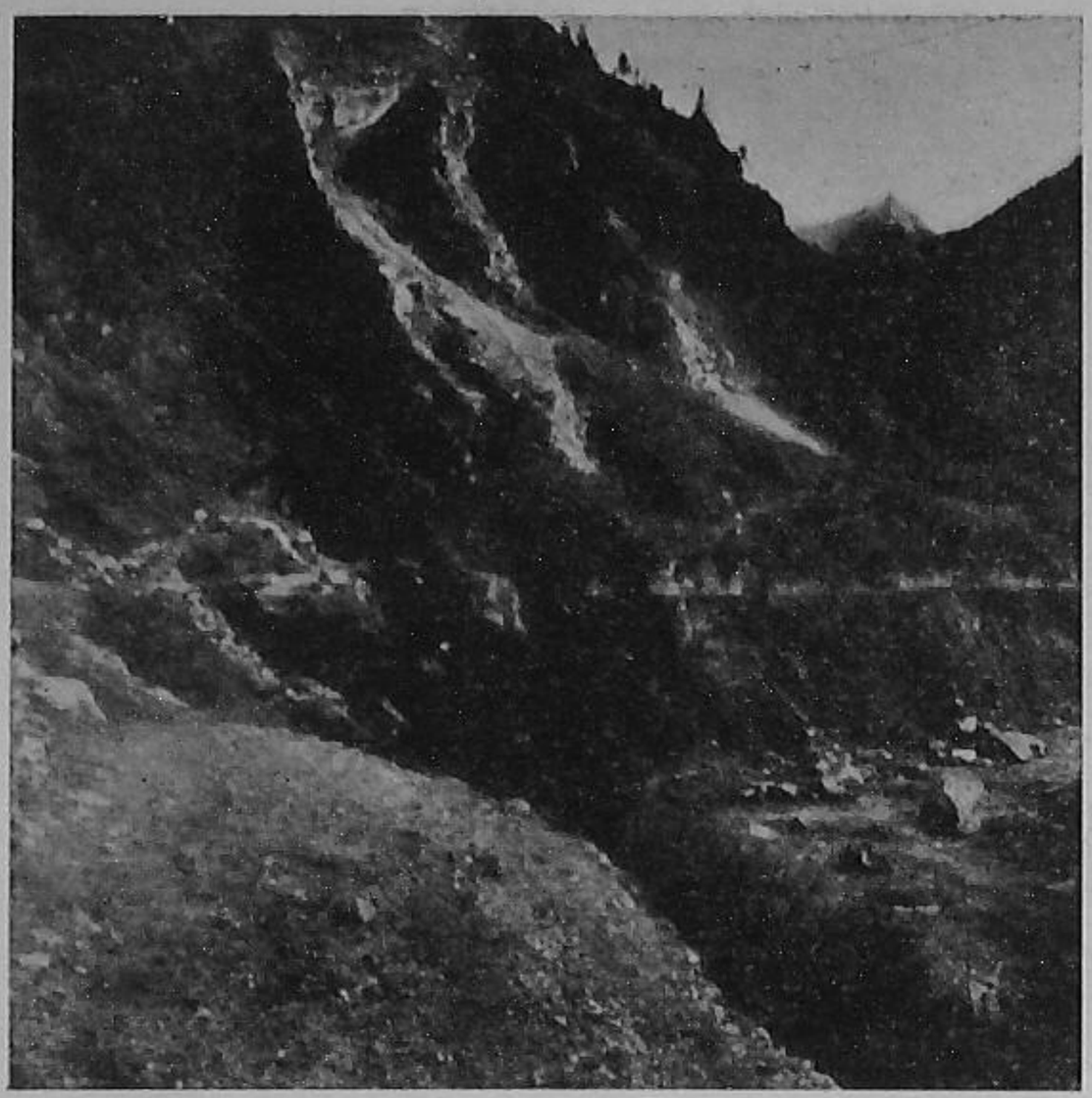
(*c*) Faster silting up of the reservoirs of dams which have been and are being constructed at enormous cost.

(*d*) Formation of fresh ravines in the river-fed plains of the country, rendering fresh fertile fields into unculturable waste lands.

(*e*) Increased aridity in the semi-arid regions of the country converting them into sandy wastes, and helping the desert march over the fertile plains.

A similar state of affairs existed for many centuries in Europe, and accounts of bare slopes on the precipitous mountains and hills in the Alps, Pyrenees, Greece, Macedonia and elsewhere are also available. But continuous determined efforts of the Government, the people and t' e scientists have gradually helped them surmount these problems.

The Indian livestock population of 292 million according to the 1951 census consisted mainly of 155



Many land-slips such as this meet the eye in the inner Himalayas

million cattle, 47.1 million goats, 43.4 million buffaloes, 60,000 mules, about one million donkeys and less than one million camels.

This entire animal population is practically owned by nomadic and semi-nomadic landless graziers and landed *zamindars* who rear it unenclosed and on unmanaged areas. This is the basic cause for the reckless overuse of the areas earmarked for grazing both in the hills and the plains. This has not only ruined the vegetation and the soil but has also harmed the cattle wealth of the country beyond repair.

Ravines are fast devouring fertile land

GRAZING HABITS

Cattle and buffaloes feed on all types of grasses, most leguminous herbs and a few selected shrubs.

Sheep prefer small soft grass and herbs but also browse on bush. Since sheep are close browsers, they often pull out the vegetation by the roots. Goats browse mainly on shrubs and small trees, but eat grass and herbs as well. In fact, goats eat anything green within their reach.

Camels browse mostly on thorny bushes and trees. Nothing is beyond their reach and they eat all the vegetation that grows in the region they are reared in, such as the arid and semi-arid plains of India.

Horses and donkeys and mules being close browsers of grass and herbs, generally pull them out of the soil.

It is apparent that wherever a mixed bovine population exists, nothing remains unexploited but the bare soil. What is needed, therefore, is that:

(*a*) Suitable acreage should be earmarked for grazing purposes throughout the country.

(*b*) These areas should be stocked according to their carrying capacity.

(*c*) Overstocking should be discouraged by imposing heavy taxes on surplus stocks maintained by the people.

(*d*) All the forages available within the forest areas must be preserved in the form of hay and silage rather than allowed to be destroyed by fire and white ants. This preserved forage may be subsidized by the government, if necessary, to make it available to the people at low rates in lieu of their rights of grazing their animals in the forests.

(*e*) All government dairy farms should be provided with vast natural grass areas and encouraged to maintain their stock on natural forages rather than on concentrates and cultivated feeds and thus run uneconomically.

(*f*) More emphasis should be laid on training grassland personnel.

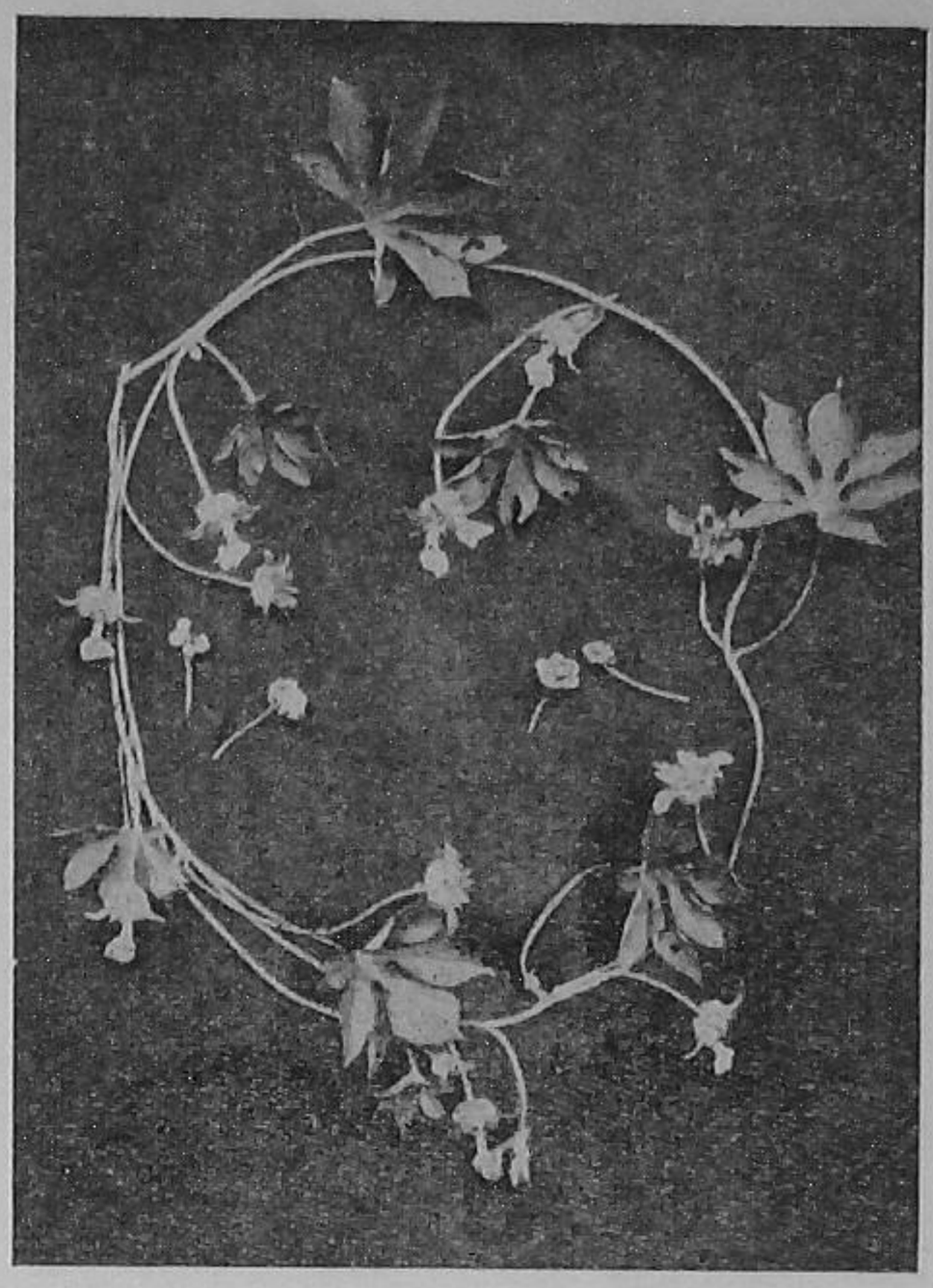
Ghia Bati

IS A NUTRITIOUS CATTLE FEED

by

P.G. Pande

Director
Indian Veterinary Research Institute
Izatnagar



Leaves and flowers of *ghia bati*

IN the western districts of Uttar Pradesh and all over the Punjab, along with *jowar kadbi* (*chari*) farmers feed to their cattle a creeper grass that comes up voluntarily in *jowar* fields. Studies at the U.P. College of Veterinary Science and Animal Husbandry, Mathura, now indicate that this may be the reason for the better quality cattle found in these regions and their higher milk yield, compared to the eastern and mid-zones of Uttar Pradesh where deweeding of *jowar* fields is done. For, *ghia bati*, as the grass is known to the farmers of Braj comprising Mathura, Agra, Aligarh, Bharatpur and Etah, has been discovered as an excellent cattle feed.

In the Mathura trials, it was found that *ghia bati* was readily eaten by cattle. The consumption by a bullock and a sheep was as high as 100 pounds and 56 pounds, respectively.

Although not a legume, its crude protein content on a dry-matter basis is about 21 per cent, which compares favourably with that of the Kudzu vine—acclaimed a wonder cattle feed—and far exceeds that of pasture grasses and cultivated fodders in this country. The protein content of hay prepared from this grass for winter feeding, does come down to four to 13 per cent, but even this is much higher than that of hays of grasses.

A RICH FEED

Like any other herbage, *ghia bati* is rich in calcium, but unlike a legume, it is rich in phosphorus also, with a calcium-phosphorus ratio ideal for the growth and production requirements of animals. Its phosphorus content can easily compare with that of some grains and other concentrates.

Ghia bati came into notice when it was found growing luxuriantly in some virgin and unploughed portions of the herbarium at the Mathura College in 1955. Its vigorous and aggressive growth seemed to have suppressed all other vegetation. Thus, at first sight it appeared to be some toxic weed, and to verify this it was fed to cattle and sheep in varying quantities. The animals, however, readily consumed it and no ill-effects were seen.

CHARACTERISTICS

Ghia bati is a monsoon annual creeper with ample foliage. When growing wild and protected from grazing, it presents a luxuriant growth. It grows on all kinds of land, cultivated or fallow, or strips of land on the wayside, and along the canals and ditches.

As only two cuttings of this grass could be obtained at the College herbarium, it became clear that it cannot stand much grazing. For this reason, it rarely predominates on fallow lands exposed to grazing. In *jowar* fields, it does not grow in a dense mass, but twined around the *jowar* plants.

Its stems are covered with long, spreading hairs. The leaves are rotundate, four to ten inches in

Twining round *jowar* plants

diameter and cut up nearly to the base in seven elliptical or lanceolate entire lobes.

Ghia bati provides abundant fodder for four months and remains green and succulent till the middle of November when no other green fodder is available in the dry western zones of Uttar Pradesh.

PREPARATION OF HAY

The grass makes an excellent hay. When cut in October and dried in the midday sun for four hours, it loses a good deal of its moisture in the dry, non-humid climate of the western districts of Uttar Pradesh. When packed loosely over a cone in the shed, it dries in about seven to eight days and retains the green colour of its foliage. The hay thus prepared is much relished by cattle, sheep and goats.

FEEDING SCHEDULE

On the basis of feeding trials conducted, the following feeding schedule has been worked out.

For about three months, i.e., from July to mid-October the grass can provide a 15-pounder Hariana cow a well-balanced green ration when fed alone at the rate of 100 pounds daily with five pounds of *bhusa*. Beyond October, hay at 20 pounds a day with 2.5 pounds of *bhusa* would meet the production requirements of a ten-pounder cow of the same breed.

Calves can be maintained during their period of active growth on 80 pounds of green grass along with two pounds of *bhusa*, or eight to ten pounds of hay with two pounds of *bhusa*.

When fed chaffed with green *jowar* or *kadbi*, the amount of green grass or hay can be cut down to half.

Grasses can meet the feeding requirements of our milch and draught cattle to a great extent, but the nutritional status of our grasses is generally poor. Fed alone, they do not provide even a maintenance ration for the cattle. Some popular leguminous grasses like berseem and lucerne are rich in calcium and protein, but lack in phosphorus and so are a most unbalanced feed. Pastures on the lines of western countries are not possible in our country, as our farmer is unable to spare land for this purpose.

Protected from grazing,
***ghia bati* grows luxuriantly**

So, what we need is grasses native to the country which could be grown without much cost and care and could provide not only a maintenance feed but also an average production ration for the cattle. *Ghia bati* is one such grass. In fact, creeper grasses, particularly of the genus *Ipomoea*, of which six species are native to Uttar Pradesh, seem to have vast potentialities as useful cattle fodders. Such grasses may also be found in other states if they are sought for.

Good Days Ahead For Kashmir Wool Industry

by

I. Bhatnagar

April 1959

WITH its valleys, green lands and fine pasturages, the State of Jammu and Kashmir is excellently suited to be a wool-growing country. Sir Francis Younghusband wrote in 1909 : "Kashmir villagers keep immense numbers of sheep, for round their villages and on mountain uplands there is an abundance of lush grass; the leaves of the willow trees and of irises furnish winter fodder, and these animals are not only thus easily fed, but also furnish their owners with clothing, with food, and with manure, and by crowding in the lower portion of his house keep him warm in winter."

On the 33 lakh acres of Alpine meadows, scrub forests, culturable and reculturable areas this side of the Kashmir cease-fire line, subsist about 32 lakhs of livestock ; of this, sheep comprise about 9.78 lakhs.

Sheep farming and wool industries are among the oldest industries of Kashmir and provide livelihood to a large population of the State. Apart from trade or commerce, or as a means of livelihood, wool is an important article for people living above the snowline. The Kashmiri regards his sheep up to the age of four years as destined for wool production, and it is only in times of dire necessity or on occasions of great rejoicing that he parts with his ewes.

The quality of the Kashmir wool varies from district to district. It seems to depend on the character of the grasses on which the sheep feed in summer. Thus, the grasses of the southern pastures are rank and strong, and the wool of that part of the valley is long and rather coarse, and the blankets made from it are not as valuable as those of Shopian, where the mountain pastures are sweet and wholesome. The best and the softest wool comes from the country west of the Wular lake, and people say that its excellent quality is due to the abundance of mulberry leaves. Wethers (*bala*) up to the age of five years give the largest quantity of wool.

A woman trainee of the Weaving Centre, Leh, spinning *pasham*

WOOL TYPES

The type of wool produced in the State may be classified as follows.

From sheep belonging to Bakarwals. These are tended by a nomadic class of people called Bakarwals who with their flocks spend the summers in the high grazing grounds of Kashmir and the winters in Rajouri, Reasi and Udhampur in Jammu. Their flocks contain white, black, and brown sheep and have the highest yield of wool per sheep. Since a Kashmiri peasant usually produces only so much as is necessary for his personal requirements, the commer-

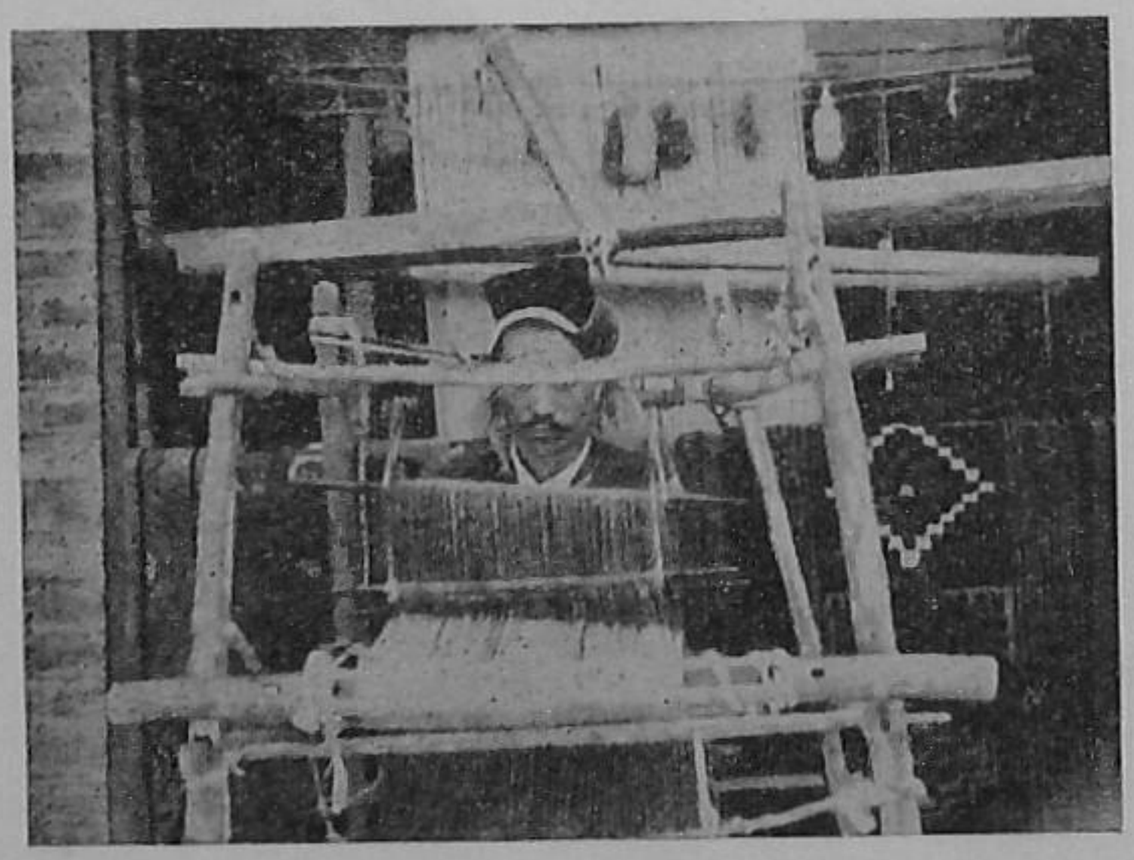
The local sheep (*left*) **is small and yields only a half-pound clip; the half-bred Rambouillet ewe** (*right*) **gives six pounds**

cial demand for wool is met from the clip produced by the flocks owned by Bakarwals.

From sheep belonging to Gaddies. The sheep kept by the Gaddies spend the summers in the cooler grazing areas of Kistwar, Badarwah and Basoli, and the winters in the lower plains of Basoli, Kathua, Ramnagar and Udhampur. These flocks come next to the flocks of Bakarwals both in numbers and the yield of wool per sheep. The flocks mostly contain white sheep.

From sheep belonging to Jammu villagers. The south and the south-west plains of Jammu, which serve as the winter quarters for the migratory flocks, have a very limited scope for sheep breeding and wool-growing, as this area has a hotter climate and less moisture. Consequently, the flock owners here possess a few sheep of their own, and the wool these yield is not commercially important. However, the number of sheep on the higher hill-districts of Jammu, parts of Reasi, Ramban, Rajouri, Ramnagar, Basoli, Kistwar and Badarwah—is larger than in the southern plains, and is important both from the viewpoint of quality and quantity of the wool produced.

The Kashmir wool is long-staple and soft. It is this wool which the Kashmiri handicraftsmen manu-



A Ladakhi carpet-weaver working on an old loom

facture into *chaddars* and tweeds. The wool from Shopian is considered to be the best in the whole valley. The wool from Guraz, too, is fine and long-staple.

The best and the finest wool in the State is, however, *pasham*—a variety obtained from the undercoat of the Kashmiri goat living in the valley of Chauthan which connects Ladakh with Tibet. The *pasham* is of two varieties: the fleece of the domestic goat, called *pasham*, and that of the wild goat, wild sheep, etc., called *asli* or *shahtus*. The total production of *shahtus* is negligible. It is gathered laboriously from the thorny bushes through which the wild goat (called ibex) passes, leaving its wool, which grows only on its neck, sticking to them; or it is obtained from the skin of the dead animal.

PASHMINA INDUSTRY

The *pashmina* industry is one of the oldest and the most famous industries of Kashmir. Most of the raw material for this industry is imported from Tibet where the Pashmina goats abound. Within its own territory, bordering Tibet, in areas like Kashmir Changthang, Rupshu, etc., Kashmir has a population of about ten thousand goats of this type. These goats, however, produce a slightly inferior type of *pasham*. With a view to improving and increasing the production of this useful fibre, about 300 *pashmina* goats were imported from Tibet and distributed among the nomadic flock owners of this area during the First Plan period. However, the Tibetan goats failed to thrive in the valley, as the climate of the State is not sufficiently dry and cold to induce the undergrowth of wool which nature provides these animals in severe climates.

Shearing in the State takes place twice a year, and in some places, three times, the shearing season being February to March, July to August, and October to November. On the whole, two clips are common, one in autumn and the other in spring.

The autumn clip called *Tzhut*, is of longer staple than the spring clip, the former being combed and used for warp, and the latter carded and used for weft. The mean fibre length in the two shearings is three to $3\frac{1}{2}$ inches, the mean diameter varies from 27 to 42 microns, the percentage of hairiness is from ten to 15, the density of the fibre per square inch of the skin-area varies from three to eight thousand.

Though sheep breeding has been practised in the State since early times, and even today hundreds of shepherds are reported to be solely engaged in it, yet for centuries no efforts were made to develop better wool or mutton breeds, either by selective breeding or by introducing new breeds. There is no control at the moment on the movement of livestock; neither is there rational use of grazing area, nor any limit placed upon livestock numbers. CONTINUED ON PAGE 28

No Embryo, No Bad Eggs

by

T.D. Mahadevan

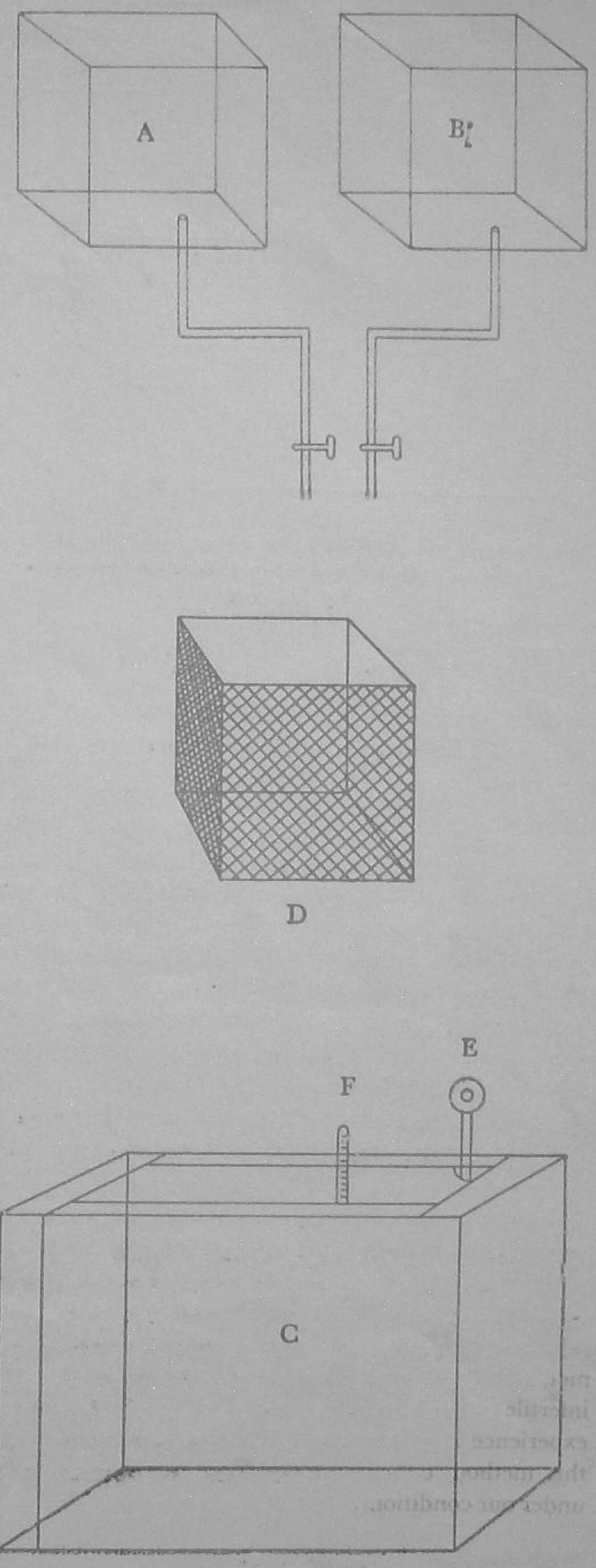
Poultry Research Division
Indian Veterinary Research Institute
Izatnagar

WHETHER you call it thermostabilization or killing the embryo, one thing is sure: eggs treated this way remain edible for at least ten days even in the hot summer months of northern India. This is done by a 30-minute immersion of eggs in water the temperature of which is maintained at 130°F (54.5°C). Trials at the Indian Veterinary Research Institute, Izatnagar, indicate that the method is cheap and effective, and can be easily adopted in our villages.

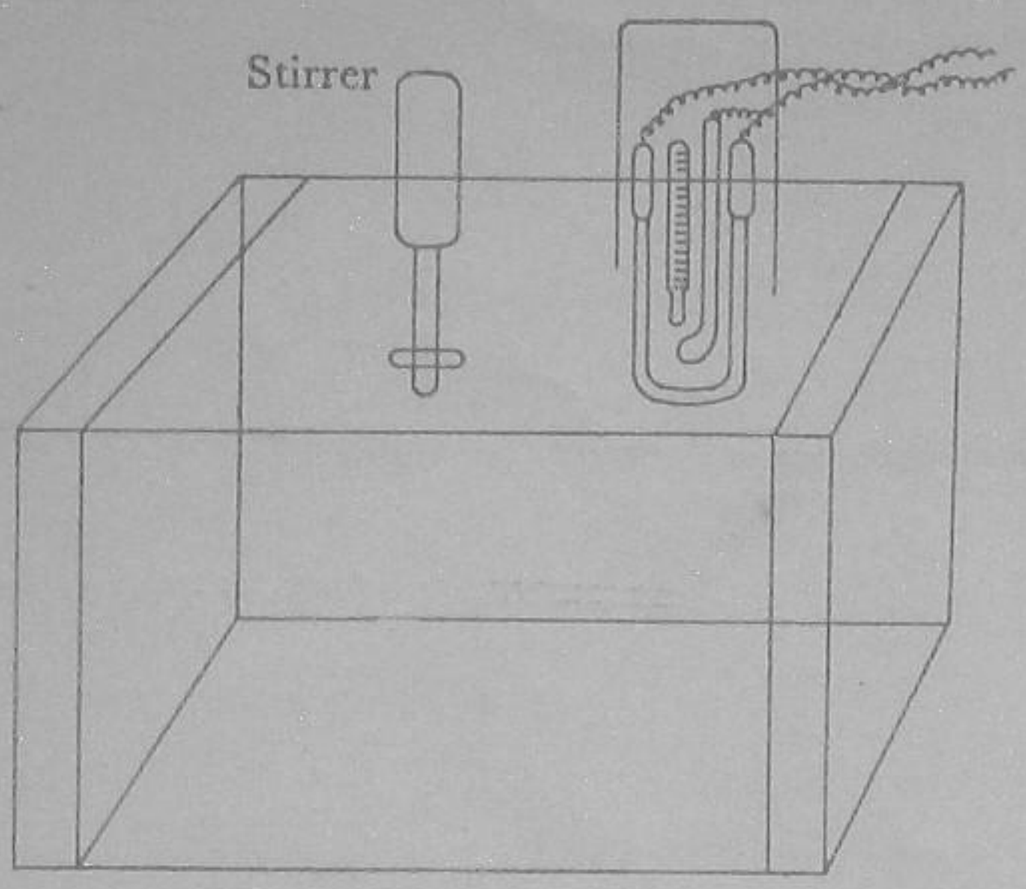
Egg production is seasonal and the domestic hen lays the largest number of eggs in the spring season. In foreign countries, eggs produced during the spring season are usually kept in low-temperature cold storages and carried over to the lean periods, i.e., autumn and winter. In India, however, commercial poultry farms are practically non-existent. The entire egg production is in the hands of villagers who generally keep a few hens.

Egg consumption, on the other hand, is confined to the cities and towns. Since the villagers get only a few eggs from their hens, they take no particular care in marketing them. The village hawker purchases these eggs without regard to their quality and sells them to the wholesaler. The wholesaler in turn sells them to the retailer; it is from the latter that the consumer gets his daily supply of eggs.

Obviously, while the quality of eggs available in the market during winter is not bad, in summer when the temperature in the shade is around 115°F, most eggs become inedible before they reach the consumer.



A. **Hot water tank**
B. **Cold water tank**
C. **Thermostabilization tank (18 in. × 18 in. × 14 in.)**
D. **Wire-net basket (15 in. × 12 in. × 11 in.)**
E. **Stirrer**
F. **Thermometer**



Where electricity is available, this water-bath with electrical controls to regulate the temperature of the water may be used

This is either due to embryo development or loss of moisture. Eggs worth crores of rupees are thus lost every year.

VEGETABLE EGGS

Many in our country do not know that the male bird or cockerel is not necessary for the hen to lay eggs. Eggs laid when no male bird is running with the hens are called "infertile" eggs. These eggs differ from "fertile" eggs, that is those which have been fertilized by the cock, in that they do not have any embryo in them, and are also called "vegetable" eggs. Both fertile and infertile eggs, however, are good for the table, but only fertile eggs can be used for hatching.

In the plains of India, fertile eggs kept at room temperature develop an embryo during most parts of the year. This problem does not arise with infertile eggs, as they do not contain an embryo, and remain edible longer, even at summer temperatures. So, one method of preventing egg losses would be to produce infertile eggs for table use. But judging from the experience of other countries it seems doubtful whether this method can be widely and successfully adopted under our conditions.

COLD STORAGE

Another way would be to hold eggs in cold storage. However, this is not possible due to the small size of the unit of production, poverty of the producers, backwardness of those engaged in the egg trade and the generally low egg-prices, except in a few of the big cities.

There is a common belief that piercing the egg-shell with a sharp needle kills the embryo. Experiments conducted at the Institute laboratory, however, did not prove this. Actually, puncturing the shell does more harm than good by admitting bacteria and mould. Hence, the importance of some simple method of killing the embryo.

After a number of preliminary trials, it was found that the optimum temperature for embryo destruction lay between 50° and 60°C in water, and that a 100 per cent embryo destruction took place at 54·5°C in 15 minutes. Keeping eggs in water maintained at 130°F (54·5°C) for 15 minutes is called defertilization. In early trials it was found that defertilization could be effected by immersing the eggs at 60°C for ten minutes. This temperature, however, was seen to be harmful. Further, it was found that eggs kept at 130°F for 30 minutes had some decided advantage over eggs kept at 130°F for 15 minutes. In addition to the destruction of embryo, the albumen quality also slightly improved.

THERMOSTABILIZATION

Eggs intended for thermostabilization should not be very old, for quality once lost cannot be restored. Nor is it advisable to thermostabilize eggs as soon as they are laid. The animal heat from the eggs should be first allowed to pass off. All eggs intended for thermostabilization should first of all be candled to eliminate damaged eggs and eggs with internal defects. Only eggs of good quality should be used.

Eggs intended for the treatment are then placed in a wire basket which can hold about 230 to 250 eggs of the standard size. Quantities larger than this should not be treated at one time. Firstly, it is difficult to handle too large a number; secondly, the percentage of damaged eggs at the end of the process will be high; and thirdly, it will be difficult to control the temperature. The wire basket with the eggs is then lowered into a water-bath containing water at a temperature of 130°F.

A small hot-water tank of a convenient size is kept at a slightly raised level from the ground. Water in the tank can be heated by any convenient means, viz., firewood, charcoal or electricity. A tin cover at the top helps keep the water hot. A tube with a stop-cock at the bottom enables the hot water to be drawn out conveniently.

Another tank contains cold water. It is similar to the hot water tank, and is also kept at a raised level. The cold water from this tank is first of all allowed to

CONTD. ON PAGE 22

WHAT'S NEW IN FARMING

BETTER *BAJRA* YIELD

THE second fortnight of July is the best time for sowing rain-fed *bajra*, according to research results obtained at the Agricultural Research Station at Niphad in Bombay State.

Other useful findings which farmers can adopt are:

1. The best seed-rate is four pounds per acre with 15 to 20 inches spacing.

2. An application of 40 pounds nitrogen (as ammonium sulphate) and 20 pounds phosphoric acid to the crop gives 50 per cent more yield.

3. The nitrogenous fertilizer should be drilled in two equal doses, the first at sowing and the second a month later.

4. The phosphatic manure should be applied at the beginning and placed deep in the soil.

COCONUT BEETLE

COCONUT farmers usually use "beetle hooks" for hooking out and killing the rhinoceros beetle—a major pest of coconut which damages the palm badly.

Now, they can as well use BHC (0.1 per cent) or "Chlordane" (0.1 per cent) for an efficient control of the beetle.

As the beetle breeds in such places as compost and manure heaps, decaying stems of coconut or leaves, it is necessary that the chemical be sprayed on these places once every two months, drenching the material well.

In addition, a mixture of sand and BHC (five per cent) powder in equal proportions should be applied to the leaf-axils of coconut palms to kill the beetles visiting them. A pound of the BHC powder will be needed for treating a single palm this way.

To obtain a good control, however, all coconut growers in an area should take up the control measures. Otherwise, the beetles breeding in untreated places will fly out and attack palms in the treated gardens.

STORING VEGETABLE SEEDS

MANY farmers find that a good number of the vegetable seeds that they store in their kitchen fail to germinate.

The reason for this is that when they store the seed in a new earthen pot and hang it over the fireplace, the excessive heat from the fireplace damages the seeds.

One good way of storing the vegetable seeds would be to collect seeds

from the best fruits allowed to mature fully on the plant, dry them, and store them in glass jars, adding one or two moth-balls. This will help keep grain weevils and disease germs away.

It is also a good rule not to row more than one variety of *bhindi*, brinjal or chillies in the same garden if good, true-to-type seed is desired. If more than one variety is grown near one another, cross-pollination affects the quality of their seeds.

★ ★ ★

CONSUMERS' CO-OPS IN U.S.S.R.

CONSUMERS' co-operatives in the U.S.S.R. are steadily widening their field. Their retail trade has increased by 82 per cent since 1953. In 1957, the increase in sales as compared to 1953 was: woollen fabrics 66 per cent; silk fabrics 158 per cent; clothing 102 per cent; and footwear 108 per cent.

The increase in sales of cultural and household goods like radios, bicycles, etc., ranged from 100 to 220 per cent.

A new branch of trade in the consumers' co-operatives in the U.S.S.R. is the sale of farm products on commission basis. In 1957, stores handling such trade in cities, workers' communities and district centres sold 8,200 million roubles' worth of foodstuffs.

Receiving all-round aid from the State, the co-ops comprise a mass organization of 35 million people. Some 1.5 million are employed in the stores, catering and procurement establishments and industrial enterprises. The co-operative system also runs four institutes, 77 specialized secondary schools and 129 co-operative commercial schools.

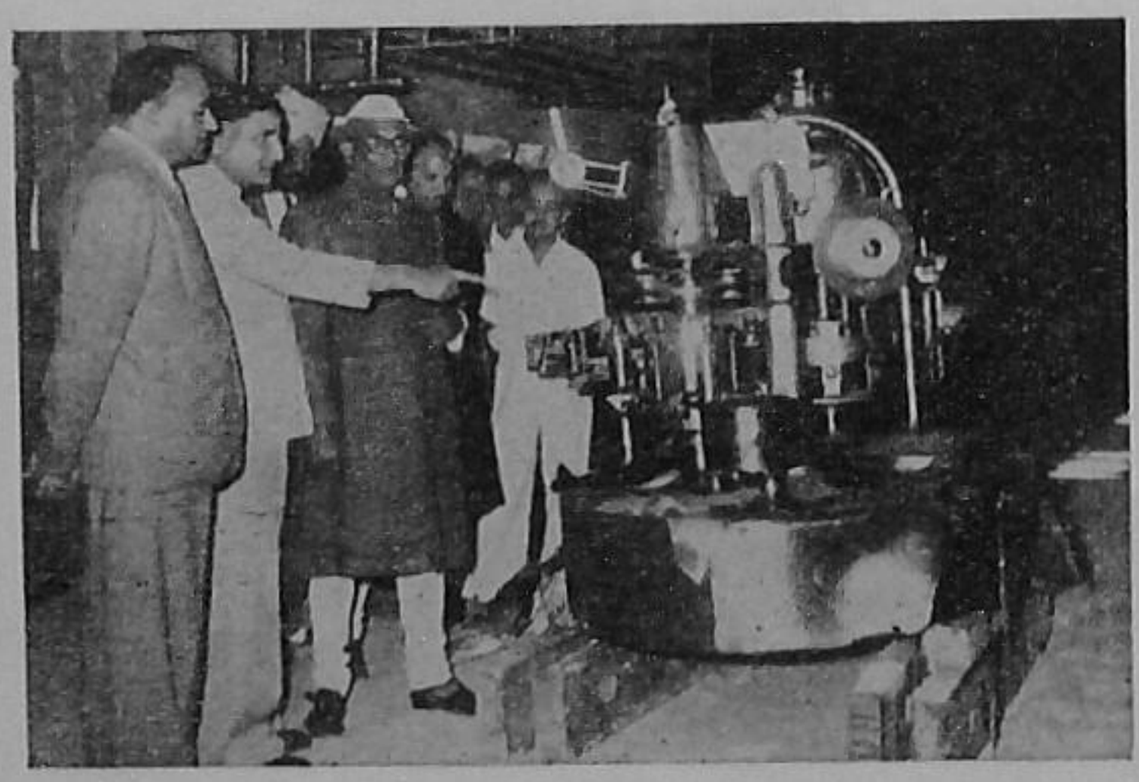
The co-ops play an active part in the extension and consolidation of economic ties between tour and country and the improvement of the material and cultural standards of the people. Work is conducted on democratic principles, with elections to administrative organs, their accountability to the shareholders, public control over work, etc.

All citizens over 16 may be members of the rural consumers' co-operatives. Every member has the right to discuss its activities, to elect and to be elected to the board, to submit proposals for its improvement, etc.

Soviet Delegation In India

Members of the Soviet Goodwill Delegation to India visit the Central Mechanized Farm at Suratgarh. His Excellency A. A. Andreyev, leader of the delegation, examining a sheaf of mustard grown at the Farm. The Farm is receiving tractors and other equipment from the Soviet Union.

The Delegation pictured at the Union Ministry of Food and Agriculture. Beginning extreme right are: Dr. M. S. Randhawa, Additional Secretary, Shri K. R. Damle, Secretary, Shri A. P. Jain, Minister of Food and Agriculture and Dr. Panjabrao Deshmukh, Minister of Agriculture.



Dairy For Delhi

The Central Dairy now coming up opposite Patel Nagar Railway Station, Delhi, is expected to start working in September this year. A part of the Delhi Milk Scheme, its daily capacity will be 7,000 maunds, with a potential capacity of 12,000 maunds.

The Union Minister of Food and Agriculture on a visit.

Threshing Paddy With Roller

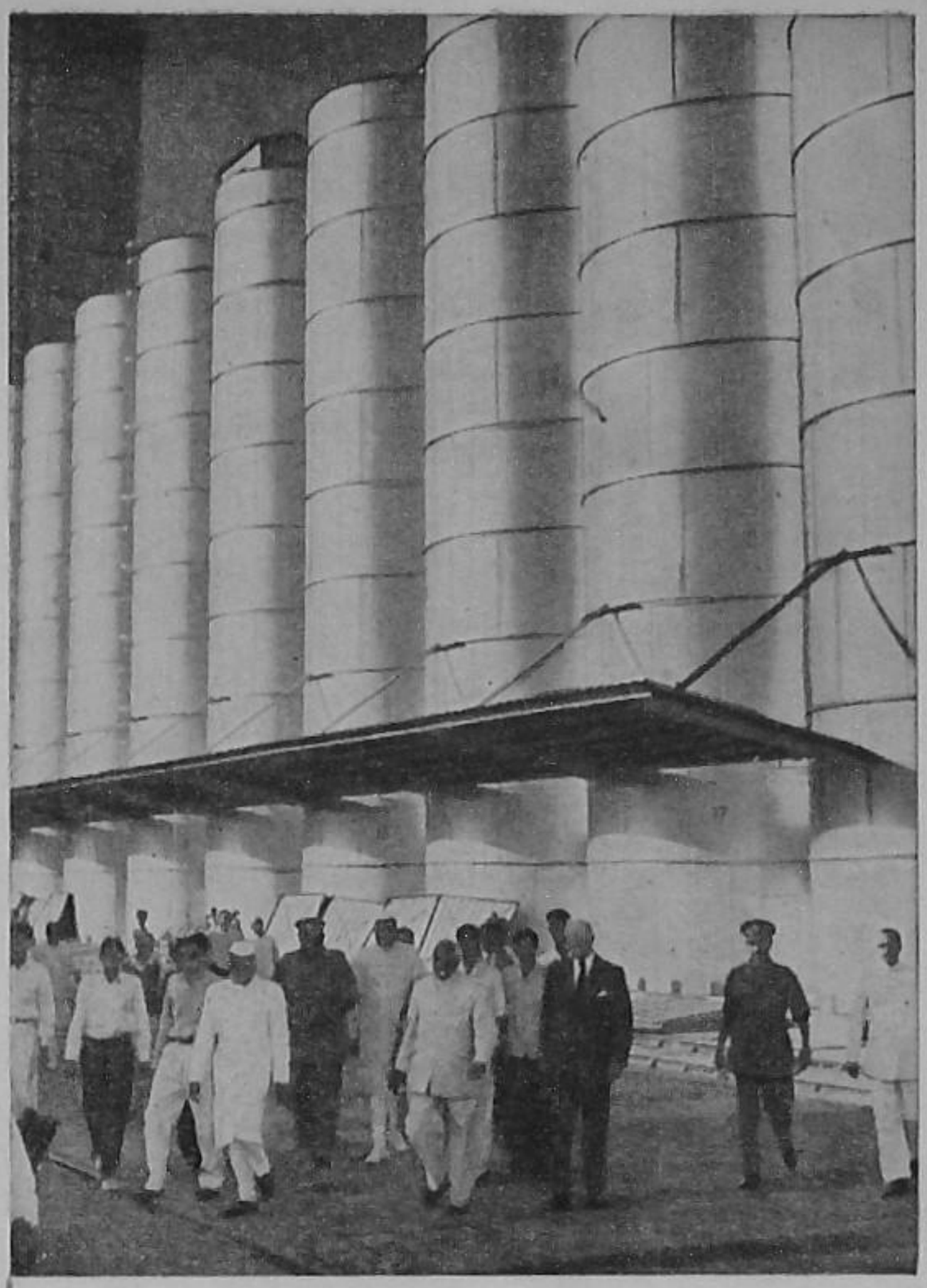
By using a stone roller at the Co-operative Farming Society, Hunsur in Mysore, it has been possible to thresh in a day paddy from four acres. The stone roller is commonly used for threshing *ragi* in Mysore.

Threshing of paddy is generally done by beating the stalks on the ground and then having it trampled by cattle. This requires time, extra labour and cattle. In a working day of seven hours, ten cattle are required to thresh 1½ to two acres. With a stone roller, however, threshing can be easily and quickly done.

To prevent the grain getting broken up, a layer of straw nearly six inches thick is spread on the hard threshing platform. The cut crop is then spread over this six to nine inches deep. The stone roller is then worked over the paddy for about an hour with occasional turning of the straw.

—Jb. Syed Nasiruddin

NEWS and PICTURES



Punjab Campaigns Against Loose Smut And Earcockle

During May and June last year, the Punjab Department of Agriculture launched an all-out drive to wipe out the Loose Smut and Earcockle diseases which take a heavy toll of the wheat crop in the State.

As a result of the campaign, Loose Smut and Earcockle were eliminated from 1,71,831 and 4,69,238 maunds of wheat seed, respectively. It is estimated that 2.5 lakh and seven lakh acres, respectively, have been sown with wheat seed free of Loose Smut and Earcockle. The resultant gain in yield is expected to be of the order of Rs. 50 lakhs.

The ball was set rolling with a fortnight of intensive propaganda and demonstrations of the Solar Treatment and the Flotation Method. The plan followed was: each Village Level Worker along with the available members of the staff of the Block spent two days in each village of his circle of ten villages. The nature of the diseases and their control was first explained fully to the farmers. The actual control operation was carried out by the cultivators with the assistance of local *panchayats* and village leaders, each of whom was assigned a definite number of farming families.

In the non-Block areas of the State, the campaign was carried out by the District Agricultural Officers with the help of the District Extension staff, and the Plant Protection Inspectors. The managers of the Department's experimental and seed farms also treated seed for their own needs.

The combined Loose Smut-*cum*-Earockle Campaign was terminated in July on account of the rains. But since the Flotation Method for separating Earockle galls can be employed any time before sowing wheat, it was again taken up in September after the rains, and continued through October, November and December.

—Arjan Singh *and* **Kishan Singh Bedi**

Hapur Elevator

The first of its kind in India, the grain silo-*cum*-elevator at Hapur was opened by Shri V. V. Giri, Governor of Uttar Pradesh on 23rd March, 1959. It is equipped with the most modern mechanism for loading and unloading, weighing, cleaning and disinfecting foodgrains. Erected at a cost of Rs. 27,00,000 with the help of the U.S. Technical Co-operation Mission, the silo-elevator has a capacity of 10,000 tons. It is a part of the Union Government's plan to construct storage accommodation for building up a buffer stock of grain.

CONTINUED FROM PAGE 18

Thermostabilization Of Eggs

run into the thermostabilization tank. When this is half-full, the stop-cock of the cold water tank is closed and the hot water from the other tank allowed to run into the thermostabilization tank. A stirrer is used to mix them. The hot water is allowed to run in till the temperature of the water in the thermostabilization tank reaches 130°F. Then the wire basket containing the eggs is lowered into the water. The water level in the tank is adjusted in such a way that there is at least an inch of water above the topmost layer of eggs. This will ensure that all the eggs are well immersed in the water.

When the temperature drops, more hot water is added by slightly opening the hot water pipe; it is stirred. The hot water is added till the temperature again reaches 130°F. If the temperature shoots up, cold water is added and it is brought down. The eggs are thus kept in the water-bath for 30 minutes, and the temperature maintained at 130°F.

Thereafter, the eggs are taken out and cooled immediately by placing the wire basket in running water or in a bucket of water with the water changed three to four times till the eggs reach the room temperature.

Even if the eggs happen to remain in the water tank for longer than 30 minutes, the quality will not be affected, nor will the eggs coagulate. But cooling the eggs as soon as they are taken out of the water-bath is a *must*.

Any

Questions

Or

Suggestions?

Address these to the Editor, "Indian Farming," Indian Council of Agricultural Research, Queen Victoria Road, New Delhi-2.

Shri Purushotam Naidu

GOOD VARIETY, EXPERT ADVICE BEHIND BIG JOWAR YIELDS

SHRI Purushotam Naidu of R.S. Puram, Coimbatore, attributes his big *jowar* yields to the improved variety *Co. 18* and the tips he gets from the experts at the Agricultural College at Coimbatore.

Naidu, who won the State, District and Tehsil prizes in the 1955-56 crop competitions with an acre-yield of 6,280 pounds of *jowar*, visits the College for advice whenever he has an agricultural problem. And that is how I met him. He owns a 100 acres irrigated by lift irrigation, in addition to 35 acres of coconut and arecanut *topes*.

Confident of scoring another victory, Naidu entered the 1956-57 competitions also. First of all, he grew *bajra*, and applied farmyard manure at 75 cartloads to the acre. After harvesting *bajra* and removing the stalks, he raised tobacco in the same field.

Thereafter, he prepared the field for *jowar*: gave four ploughings, and ploughed in superphosphate at 200 pounds per acre. Then he sowed the *Co. 18 jowar* which matures in 85 days and has a sweet stalk. He took particular care to give timely irrigation and weeding. When earheads appeared, he dusted the crop twice with "Gammexane" ten per cent to protect it from pests and diseases.

Unfortunately, however, when the crop was ready for harvest, there were strong winds and incessant rain for a week. The crop lodged and the grain germinated in the earheads. Even then the yield worked out at 3,610 pounds per acre.

—S. Meenakshi

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BONE RESOURCES OF INDIA

NEARLY 3.6 lakh tons of raw bones valued at seven crores of rupees are annually available in India, but only about a third of this quantity is actually used, according to a report of the Directorate of Marketing and Inspection, Ministry of Food and Agriculture. The rest is allowed to go waste for want of organized effort.

Bones are a valuable source of phosphatic manure and 1.35 lakh tons are utilized every year by 98 bone-crushing mills which produce crushed bones, bone sinews, bone grist and bone meal. Bone-digestors set up on a cottage scale produce crushed bones and bone meal and consume another 130 tons, while about 350 tons are utilized by cottage industries in making combs, buttons, paper cutters, cigarette holders and toys.

The export of bones and bonemeal as such is prohibited, but, on an average, exportable by-products bring in nearly Rs. 2.5 crores in foreign exchange.

Bone fertilizers are becoming increasingly popular in Kerala, Madras, Mysore, Orissa, West Bengal and Assam, in spite of religious prejudice and high cost. Efforts are being made to cut down prices to popularize bonemeal. Some states have provided funds under the Second Five Year Plan for the production and sale of bonemeal.

The major portion of the bone supply comes from dead animals, especially larger animals like cattle, buffaloes, horses, ponies and camels; unlike Western countries, only an insignificant number of animals enter slaughter-houses. The report suggests that for increasing the collection of raw bones, full use be made of the Community Projects organization, village *panchayats*, flaying centres and town municipalities. Better prices should also be offered to the primary collectors, purchasing depots be set up in Community Project Areas, and movement of bones restricted.

READERS WRITE

Would you please let me know in detail the causes of cannibalism in chicks? Is it caused by some deficiency in their diet or lack of proper excercise?

I. Ahmad,
Yusuf Building,
Fraser Road,
Patna.

Cannibalism is a vice met with among birds of all ages. In young chicks, the trouble is confined to toe and tail-picking. Among mature birds, vent, tail and comb are the regions most frequently attacked.

The possible causes are: overcrowding, over-heating in the brooder-house, deficiency of minerals and vitamins, and lack of exercise.

Prevention is better than control. Cannibalism can be prevented by: not overcrowding the house, keeping the chicks busy and encouraging exercise by placing a fresh sod of green grass in the house for the chicks to work on, providing sufficient nesting and feeding space, and darkening the room. Proper amounts of protein and salt in the feed and green feeds also prevent that unusual craving caused by a deficient diet. The trouble also disappears as soon as the chicks are given fresh range.

If the birds have started to pick, the following control measures may be adopted:

(*a*) Dissolve one tablespoonful of common salt per gallon of their drinking water for the first three half-days in succession; give fresh water the other half of three days.

(*b*) Use oats at ten per cent in the ration.

(*c*) Remove all injured birds and birds found picking, as soon as observed.

(*d*) As a last resort, cut one-fourth to half of the upper beak of the birds.

★ ★ ★

About 3,000 paddy acres are affected by blast in this area, in spite of the fact that the seed is treated and spraying done at different stages. The variety GEB 24 *is the worst sufferer and the area mostly hit is near the forests. The incidence is during October-November which is the rainy season for this area. Use of more green leaf increases the incidence.*

Kindly suggest suitable preventive measures.

K. G. Dastagir,
Block Development Officer
Chinnagottigallu,
District Chittoor.

Seed-treatment and spraying normally do not give an appreciable control of paddy blast under certain conditions. Rains undoubtedly help the disease develop. Use of more green-leaf manure by raising the nitrogen level of the soil makes it more susceptible to the fungus. Close proximity to forests by itself does not promote the disease, but the grasses growing underneath may serve as a source of infection. This possibility has to be thoroughly examined, which can be done after a proper study of the diseased specimens.

Growing of resistant varieties is the only satisfactory method of control.

SO SIMPLE

TO PREPARE COMPOST

CHEMICAL fertilizers supply plant foods to the soil. But farmyard manure or compost or any other organic manure will not only supply plant foods but also organic matter which is also needed by the soil. Organic manures have one more advantage: you can yourself prepare them easily and cheaply from cattle wastes and farm wastes.

The most common organic manure is farmyard manure. It is made from cattle-dung, urine and litter. But most farmers do not take enough care in preparing this manure. They keep the manure in heaps exposed to the sun and the rain and do not conserve the cattle urine at all. As a result, much of the plant food in the manure is lost.

FARMYARD MANURE

Farmyard manure is best made in pits. The size and the number of pits will depend upon the number of cattle you keep. Normally, each pit should be ten feet long, four feet broad and three feet deep.

Most farmers collect cattle-dung from their cattle-sheds, but they allow the urine to go waste. Urine is rich in plant foods, and should not be wasted. Therefore, line the floor of your cattle-shed with concrete, or ram hard metal on it, so that the urine will not seep into the ground.

Collect farm wastes, waste fodders or weeds and spread on the floor of the cattle-shed. It will be a good bedding for the animals and will absorb all the urine. Collect the cattle-dung daily and mix it thoroughly with the urine-soaked litter for filling the pits.

It is better to fill the pit in compartments. Make a partition of bamboo sticks, dry stalks of *jowar* or maize or some such material. Keep the partition about a foot or 1½ feet away from one end of the pit.

Put the cow-dung-litter mixture in the compartment you have thus made in the pit. Sprinkle earth over it. Put the second day's collection over the first day's collection. Repeat till the heap rises a foot above the ground level. Cover it with a two-inch layer of soil.

Shift the partition another foot or 1½ feet away. Fill this compartment as you did the first one. Repeat till the whole pit is filled.

If you are not able to dig a pit or if you are in a hilly area, you can prepare farmyard manure in a heap above the ground. Select a patch of rocky ground 12 feet long and eight feet broad. Line it with stones or bricks to make a six-inch high platform. Spread on the platform the day's collection of cattle wastes in a layer six to eight inches high. Spread a two-inch thick layer of earth over it. Go on adding more cattle wastes and earth daily. When the heap is four or five feet high, give the top a conical shape and plaster the top with dung and earth.

You will get well-rotted farmyard manure in four to six months.

PREPARING COMPOST

Generally, farmers do not have sufficient farmyard manure for their fields. But they have a large quantity of farm wastes which can be converted into valuable manure by composting. A very good manure can be prepared from farm wastes such as crop stubbles, sugarcane trash, banana skins and stumps, weeds and vegetable wastes. This material can be composted in pits or heaps.

First, crush under a roller all hard materials like sugarcane stubble, *jowar* stubble and dry stalks. Split up and cut all the soft but bigger-sized materials like banana stumps.

Dig a pit of the same size as in the case of farmyard manure. Heap up all the available refuse round the pit.

To make the material decompose easily, you have to use a "starter." The starter can be dung or urine. If these are not available, well-decomposed manure, tank-silt or surface scrapings from forests can be used.

First, put the refuse in the pit in a layer about a foot high. Sprinkle 16 gallons (four or five buckets) of water and a thin paste made with 60 pounds (two buckets) of dung in 16 gallons of water. Spread half a basket of ash and a basket of the starter on the layer. Put the second layer of trash over this. Five such layers will bring the heap two feet above the ground level. Cover this with a three-inch layer of soil on the top. See to it that you fill the pit completely in a day or two.

The manure will be ready for use in six to eight months. Compost prepared this way is twice as rich in plant foods as farmyard manure.

The farm wastes can also be composted above ground, like farmyard manure.

From sugarcane trash. A very good compost can be made from sugarcane trash. First, dig a pit 15 feet long, eight feet broad and two feet deep. The pit should be as near an irrigation channel as possible to maintain sufficient moisture in the pit for decomposition.

Spread a foot high layer of sugarcane trash in the pit. Sprinkle a mixture of dung and water over this layer. Make up similar layers till the material rises three feet above the ground. Cover this with a layer of earth.

From forest leaves. Spread a layer of forest leaves in the pit. Sprinkle sufficient water. Spread a layer of earth on this. Fill up till the material rises two feet above the ground level. Cover with earth.

From water hyacinth. Remove the weed from the water. Three to four days after removal, spread the weed in six to eight-inch layers. Cover each weed-layer with a half to one inch thick layer of cattle manure or tank-silt. When the heap is four to six feet high, plaster with mud.

From paddy husk. To prepare a powdery manure from paddy husk, spread a ten-inch layer of husk in the cattle-shed. Over this, spread a nine-inch layer of paddy straw or other litter. The top layer should be renewed from time to time, but the layer of husk should be allowed to remain in the shed for six weeks.

After six weeks, remove the paddy husk and compost it in a pit. It turns into an excellent manure in about nine months.

FISH can keep well for 23 days in ice containing aureomycin. "Acronize B," a commercial preparation, at five p.p.m. concentration is suitable for the purpose.

VISITS of honeybees to cotton flowers can increase yield up to 50 per cent. They visit the flowers in large numbers between December and May, and promote pollination.

TERPINEOL, an alcohol of the terpene series, promises to improve the yield and quality of sugarcane, especially when applied at 184, 368 and 736 p.p.m. of soil.

POTATOES can be preserved longer by gamma irradiation. Irradiated samples have been found to taste better than non-irradiated ones, even after eight months. Sprouting is also reduced.

PLANTS absorb nutrients not only through the roots, but also through leaves, fruits, branches, the stem, and even flowers. Using phosphorus 32, it has been seen that their uptake of certain nutrients applied in a soluble form to the leaves is 95 per cent, while it is not more than ten per cent with application through soil.

To GET the best results with herbicides : have the soil surface firm and even to avoid pockets of unsprayed ground; have the soil surface fairly moist, and time the spraying to avoid rain within 24 hours of the treatment; do not spray in windy weather, because the drift may damage susceptible crops.

"FRITS," a new fertilizer tried in the U.S.S.R., can feed the plant for a number of years, once it is introduced into the soil. It contains 25 to 75 per cent silica, two to 15 per cent potassium oxide and ferric oxide and one to ten per cent cobalt oxide or other trace elements. It is not liable to be washed away from the soil or destroyed during tilling.

IF YOUNG ducklings have been without water, it is a sound practice to give them a drink of warm milk, if possible, as their first drink. This helps avoid intestinal cramp and staggers.

KEEP in mind that when hens are too fat, feed consumption and mortality go up, shell-quality slips

farm flashes

and production slumps. To keep hens in correct laying condition, feed a balanced ration, keep them free of enteritis and worms and do not have pullets too fat when they start laying.

WITH underground irrigation pipes, as used in Texas and other parts of the U.S.A., it is easy to give crops the exact amount of water needed. No labour is needed to do the shovelwork and there is no problem of weeds growing in ditches and canals.

IF DURING the hot weather, low-fibre ration is fed to cows, milk production will be higher, body temperature will be lower, and cows will have a better appetite and breathe easier.

IF COCONUTS have to be stored for 45 days or more, it is safer to store them unhusked in sand, preferably in a vertical position with the stalk-end up. Nuts selected for storage should be well (but not over) mature, large-sized, oblong in shape and in fresh condition.

TO PREVENT foot rot of arecanut, improve the drainage of the garden by providing four to five-foot deep channels at suitable intervals. Remove the affected palms. Apply half to one pound of fine sulphur of 200 to 300 mesh to the pits left by the palms removed, then fill them up. Dig trenches nine inches deep and of three feet radius around healthy palms and apply about the same quantity of sulphur; then cover the trenches.

CONTD. FROM PAGE 16

Kashmir Wool Industry

As a consequence, well-defined breeds or types of any livestock, including sheep, do not exist in the State. What is found is a heterogeneous sheep population, though some broad types like Karnah, Guraz, Kashmir Valley, Bakarwal, Badarwah, Poonch, etc., are evident.

In the absence of grazing facilities and with the demand on land for food production, the sheep population has been showing a steady decline. The Report of the Livestock Census of 1940, taken by the Director of Land Records, State Government, puts the total sheep population at 20,15,995. The figures given by the Animal Husbandry Department for the year 1955 indicate the sheep population to be 9,78,809. The number of goats also has declined from 14,74,381 in 1940 to 4,87,415 in 1955.

LOW FLEECE-WEIGHT

The biggest drawback, however, is the low fleece-weight. The average produce from the sheep is one to two pounds, which is very low compared to the Merino of Australia (range ten to 45 pounds), and English breeds (range ten to 20 pounds). Even this yield is usually coarse, medulated, hempy and of various colours.

The estimated annual production of wool is 12,000 maunds. The average per capita consumption in Kashmir is roughtly 0.25 pound compared to 12 pounds in New Zealand, ten pounds in Australia and six pounds in U.K.

In July, 1931, the Government of the State invited Mr. Aldred F. Barker of the University of Leeds, England, to the State. In his very interesting report on the cottage textile industry of Kashmir, he suggested certain lines of improvement. In accordance with these recommendations and with a view to bringing about improvement in the quality of wool, the State Government established a Sheep Breeding and Research Farm at Banihal. Research conducted on cross-breeding various indigenous sheep to foreign breeds at the Farm has indicated that of the foreign breeds, the Merino of Australia is suited to the climate. Intensive experiments on the introduction of Merino blood have shown that the weight of fleece of the local sheep can be increased. The half-breds show an increase of a 100 per cent ; three-fourth breds show an increase of 200 per cent.

FUTURE DEVELOPMENT

No serious effort was made to improve sheep in the rural areas in the State till the inauguration of the State's First Five Year Plan. Two additional sheep farms, one at Andherwan, Kashmir, and the other at Billawar, Tehsil Basoli, Jammu, were established, besides providing the necessary facilities at the existing Sheep Breeding Farm at Banihal. These two new farms have now been properly organized and equipped.

Under the Second Five Year Plan, a comprehensive development programme is envisaged and twenty-nine sheep and wool extension centres are to be organized in the rural areas. It is proposed to establish 29 Field Development Units, each consisting of 2,000 to 3,000 breeding ewes, where, besides the genetic improvement of sheep and wool, intensive efforts will be made to control sheep diseases. Efforts will also be made to introduce a better system of shearing, sorting and grading of wool in these units. It is also planned to organize wool marketing in the State to give better returns to the various woollen manufacturers. It is thus expected to double the wool production in the State by 1960-61.

A cattle-*cum*-sheep farm is being developed at Leh where Changthang sheep and Tibetan Pashmina goats are improved either by selective breeding or by cross-breeding with some foreign breed.

Up to 1957, 223 rams were distributed from various Sheep Breeding Farms to flock owners for breeding purposes. Besides, 126 rams were loaned temporarily during the sheep-breeding seasons in the neighbourhood of Banihal and Reasi.

The necessity to develop this industry properly need hardly be stressed when most of the rural population in the State is still ill-clothed and ill-equipped for the rigorous winter of Kashmir and the State imports about five thousand maunds of wool and woollens valued at about 29 lakhs from Tibet, other parts of India and foreign countries. In spite of all its shortcomings, the State still exports about seven thousand maunds of raw wool, *pasham*, yarn, carpets, *namdas*, *gubhas*, embroidered and other goods valued at roughly twelve lakhs of rupees annually. Developed on scientific lines, the industry will not only provide a livelihood to poor unemployed peasantry during the off-season, but may also meet some of the fine wool needs of India.

The Hawaiian Way to High Sugarcane Yields

by
Madanlal Fakirchand

HAWAII is known for its record sugarcane yields and sugar recovery per acre: the 1955 figures were 140 tons of cane and 15.52 tons of sugar.

The Hawaii Islands are situated between 5°N and 22°N. The climate is tropical, the maximum temperature being 90°F and the minimum 60°F. The rainfall is distributed throughout the year, and in some islands, it is 0 to 50 inches and in others, 50 to 100 inches. Wherever there is less rainfall, lift irrigation by pumps is employed. The water has to be lifted up from 100 to 600 feet, depending on the water-level available. That is why irrigation is very expensive. Wherever there is ample rainfall throughout the year, irrigation is not done.

The daily wage for a labourer in Hawaii is 12 dollars (about Rs. 60) per day of eight hours. All work, therefore, is done by machines as far as possible. The salary of a farm manager is 1,500 dollars (about Rs. 7,500) per month The ratio of salaries of the lower and the higher staff is only 1 : 5.

PRELIMINARY TILLAGE

Soil for sugarcane is prepared by giving: one 16-inch deep ploughing, one discing, and one subsoiling of 20 to 24 inches with a heavy subsoiler. Bunds 150 to 300 feet long, depending upon the porosity of the soil, are then prepared for irrigation. Ridges 4½ to 5½ feet broad are thereafter made. About 8,000 to 8,600 running feet of them are obtained per acre as against 10,000 to 12,000 in India. For an even distribution of water, levelling is then done or aluminium water-flumes fitted.

ROOT ZONE

Every measure is taken to have a deep and extensive root-zone for the sugarcane crop. The farmers know from experience that the yield of sugarcane is in proportion to the root-area. The following figures give an idea of this relationship:

Yield of sugar per acre	*Root-zone depth*
15 tons	3 feet
12½ tons	2 feet
10 tons	one foot
5 tons	six inches

So they try to maintain good drainage in the soil. Poor drainage keeps the tonnage low.

Drainage in tight, deep soils is improved by : applying bagasse compost, molar drains, gypsum with compost, deep drains, furrows adjusted according to the porosity of the soil—the more porous the soil, the less the distance and *vice versa* (range 150 to 300 feet).

Sugarcane varieties from different parts of the world are tried at the Sugarcane Breeding Stations and thousands of new varieties crossed and produced every year. The present improved varieties are : *H-37-1933*, *H-44-3098*, and *H-38-2915*.

Planting of sugarcane is done by planting machines at about ten acres per day, with a seed-rate of 8,000 to 8,500 setts. Planting is done in the months of June, July and August.

Weeds are controlled by chemical weed-killers sprayed by tractors. Intercultivation is done by small cultivators drawn by tractors of high clearance. The number of rows is less (due to the broad furrows), ranging from 27 to 32, as against 40 to 44 per acre of 150 feet × 300 feet in India.

MANURING

The manurial requirement of the soil is first determined by a soil analysis. Then NPK, boron, manganese, copper, iron, etc., and soil amendment for *p*H are applied. The results of the manure application are noted and leaf and sheath analysis is done in the second, fourth and twelfth months from the time of planting. Then, manures are supplied according to the needs of the plant.

The general manurial doses are: phosphate—150 to 300 pounds applied

at the bottom of the furrow according to soil requirement; nitrogen—50 pounds at planting time, 75 pounds two months later and another 75 pounds four months later. At the beginning of the second year, 50 pounds or a 100 pounds nitrogen is given either in irrigation water or by aerial spraying in the form of urea. On an average, a total of 250 pounds nitrogen per acre is given. But it varies from 200 to 400 pounds according to the needs of the soil and the plant. Potash—200 to 300 pounds per acre according to need.

HARVESTING

Harvesting is done by machine. A harvesting machine harvests 240 to 320 tons of sugarcane per day of eight hours. The harvesting season starts in January and ends in October. The percentage recovery of sugar varies from 11 to 12 from month to month. It is 11 per cent in January, 11.25 in February, 11.5 in March, 11.75 in April, 12 in May, 12 in June, 12 in July, 11.75 in August, 11.5 in September, and 11.25 in October. The recovery starts rising from January; top recovery is in the months of May, June and July; it starts dropping from August and is the lowest in October. Crushing comes to an end in October.

Three or four ratoons, each of two years' age, are taken.

Increased technical know-how has enabled the Hawaii sugar industry to set up record production figures. For instance, the Qlokale Sugar Company's plantation obtained 140 tons of sugarcane or 15.52 tons of sugar per acre. The plantation had 2,086 acres of a total of 4,400 under cane. In 1910, the recovery figure was only 4.81 tons.

In the words of Dr. Baver, Director of the Sugarcane Research Station, Hawaii: "No one thing is responsible. It is the combination of good seed, good fertilizers, good cultural practices, and the team-work between plantation management, their fieldmen and research men in taking the results of research into the field. A major cause for high yields of cane in Hawaii is the fruits of research from the Experiment Station, the University of Hawaii and the plantations themselves. Out of this work have come new varieties through a comprehensive breeding programme. These new varieties have had an extremely important effect on the growth of production. The Experiment Station spends about 350,000 dollars annually on developing new varieties. The investment return is close to 20 million dollars a year in increased sugar yields."

If it's lucerne

SUPER CAN EASILY REPLACE CATTLE MANURE

in Saurashtra

by
V. T. Motwani
Agricultural Research Farm
Halvad, Saurashtra

SUPERPHOSPHATE can easily replace cattle manure in the case of lucerne. This has been observed at the Agricultural Research Farm at Halvad.

At the most, five bags of single superphosphate are required, compared to not less than 20 cartloads of cattle manure. Thus, by using superphosphate the cultivator will also save on transport. The cattle manure thus saved can be utilized with greater advantage for other commercial crops grown in rotation with lucerne.

Lucerne is an important green fodder crop of Saurashtra, and the area under it has been increasing with the recent availability of canal water. The crop is usually manured with cattle manure at 20 cartloads per acre.

But the quantity of cattle manure available in the State is limited due to the low density of cattle population and loss of cow-dung due to the nomadic habits of the cattle owners. Artificial fertilizers, therefore, have to fill the gap.

As Saurashtra soils are poor in nitrogen, it was felt that application of nitrogenous fertilizer to lucerne just before sowing and immediately after each cutting, in addition to the basic dose of phosphatic fertilizer, might result in higher yield. A trial was, therefore, laid out at the Halvad Farm to find out to what extent phosphatic fertilizer, with or without nitrogenous fertilizer, could replace cattle manure. Phosphatic fertilizer alone was tried for three years, and in combination with nitrogenous fertilizer for two years.

INCREASED YIELD

Phosphatic fertilizer as single superphosphate in different doses was incorporated into the soil before sowing with a five-coultered drill run in two directions. The following results were obtained :

Dose of fertilizer	*Average yield of three years in maunds*
No fertilizer	66.03
130 kilograms of superphosphate	182.7
260 do.	252.8
390 do.	300.0

The yield of 300 maunds with application of 390 kilograms of superphosphate compared well with the average yield obtained with cattle manure.

Nitrogenous fertilizers were applied as ammonium sulphate and groundnut cake in a 1 :1 ratio on the basis of nitrogen by broadcasting in six doses—the first at sowing and then at each cutting, the dose increasing proportionately with each cutting.

The increase in yield due to ammonium sulphate, however, was not so marked as in the case of superphosphate alone. It was found that the yield increased with increased doses of superphosphate; even 130 kilograms of superphosphate gave a better response than 240 kilograms of ammonium sulphate plus 720 kilograms of groundnut cake (the highest doses in the second experiment); for every maund of combined nitrogenous fertilizer, the maximum increase was only 3.6 maunds per acre, as compared to 20 maunds with superphosphate.

The results obtained with nitrogenous fertilizers combined with superphosphate were, however, somewhat better : an increase of 4.3 to 14 maunds per acre for every maund of fertilizer. But even these were not so encouraging as those with superphosphate alone. There was also a decrease in yield with the higher dose of nitrogenous fertilizer in the combination.

ECONOMICS

The economic aspect of the different fertilizer treatments was also studied. It was seen that the higher the dose of superphosphate alone, the greater the profit. Taking the price of fodder to be 80 nP per 40 pounds, the extra yield with nitrogenous fertilizers alone did not cover even the cost of the fertilizer. In combination with superphosphate, a maximum profit of Rs. 12 per acre was realized, which, however, declined with higher doses of nitrogen. Superphosphate alone at 260 to 390 kilograms per acre gave a profit of Rs. 170 to 225.

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What You Need to Know About Fertilizer Use

by

D.K. Sharma

TO grow good crops, it is not enough that the farmer comes to know through a soil test what plant-food elements his soil lacks and to what extent. He also needs to know in what form, by what method and at what time he should supply them.

Of the various plant-food elements, the most important are nitrogen, phosphorus and potassium, which often limit crop production. Each of these is needed by plants in substantial quantities and must either be furnished by the soil or by fertilizers added to the soil.

WHAT FORM

Two forms of nitrogen—nitrate and ammonia—can be used equally well by plants. Most nitrogen fertilizers are soluble and change into nitrates in a short period; so they move with the soil moisture. Nitrogen, therefore, must be applied with definite regard to rainfall and irrigation practice. For example, if the crop being fertilized is subject to heavy rainfall in a season, the nitrogen should be given in more doses than one. Nitrogen in nitrate form is lost by leaching and is, therefore, not recommended for a crop like paddy. Nitrogen in ammonia form is, however, held by the soil and is not leached.

Sodium nitrate is a nitrate form of nitrogen. Nitrate nitrogen is one-half of the nitrogen in ammonium nitrate. Ammonium sulphate and anhydrous ammonia are ammonium forms of nitrogen.

The movement of phosphorus and potassium within the soil profile is much slower, and they are not subject to much leaching. Unlike nitrogen, therefore, they may be applied in one dose. For best results, however, they must be "placed" in the effective root-zone.

Fertilizers are available as liquids, powders or pellets, each requiring a different mode of application. Liquid nitrogen can be very effectively applied in irrigation water. Some phosphorus and potassium fertilizers are water-soluble, but cannot be used effectively in water since they may become unavailable through "fixation."

HOW TO APPLY

The particle size of the fertilizer is also important. For example, phosphorus in acid soils is more effective when it is not intimately mixed with the soil. Thus, it should be applied in powder or near-powder form in bands or localized areas. Pelleted fertilizers have the advantage of not coming in contact with excessive quantities of soil and may, in some cases, be much more effective when applied broadcast.

In the paddy crop, surface application of ammonium sulphate does not give the full benefit, so a sub-surface application is much better. This consists in applying fertilizer in pellet form two inches below the soil surface. The pellets are prepared by mixing ammonium sulphate and soil in the ratio 1 : 10. These pellets are pushed into the mud two inches deep at suitable distances not more than 18 inches apart. In this way, loss by leaching is appreciably reduced.

THREE KINDS

Fertilizers are of three kinds: acid, neither acid nor basic, and basic.

Ammonium sulphate, ammonium chloride, ammonium nitrate, ammonium phosphate, anhydrous ammonia, urea and superphosphate are acid fertilizers. When these are added to the soil they make it acidic. If, however, the soil has a high lime content, the acidity of these fertilizers is neutralized and their undesirable effects prevented. In the case of soils which do not have enough lime, it is advisable not to use large doses of acid fertilizers.

Fertilizers which are neither acid nor basic can be used on all types of soils without damaging the soil. Calcium ammonium nitrate is an example of this group.

The nitrates of calcium, sodium and potassium are basic fertilizers. These fertilizers should not be added to saline or alkaline soils. In acid soils, on the contrary, these have a useful effect, as their bases react with the soil acidity and make the soil "sweet."

TYPE OF SOIL

The time and method of fertilizer application vary with the soil type. The amount of nutrient that a soil can hold depends largely on the type of soil and the clay minerals present in it. For example, a sandy soil

has a lower capacity to hold nutrients than a clayey soil containing a high percentage of organic matter.

In heavy soils, heavier doses of nitrogen can be applied at one time and in excess of the crop requirement with less danger of loss, as they can hold nitrogen in desirable locations for a longer period than light soils.

Availability of soil phosphorus for crop utilization depends largely on the soil reaction. In an acid soil, the retention of phosphorus is very great owing to the presence of appreciable quantities of iron and aluminium. They "fix" the added phosphate and reduce its availability. For this reason, phosphate fertilizers should not be applied in excessive quantities or much above the crop requirement in laterite soils and soils with a low *p*H.

CROP

Not only do crops vary in their nutrient requirements, but also in the time and method of fertilizer application for its most economic utilization. Crops with their effective root-zones quite shallow secure most of the plant food near the surface; others forage deep and utilize the plant foods at deeper levels. As a rule, fertilizers will be more effective at the level where the root concentration is the heaviest.

WHAT TIME

A plant's requirement of nutrients is never uniform. Usually, it is small when the plant is young, rises rapidly when it enters the growth period and again falls as it approaches maturity. The crucial stages are the early growth period, when the nutrient requirement is low but high nutrient concentrations are needed because the root system is still small, and the time of the fastest growth, when the total demand is high. For best results, therefore, an adequate supply of nutrients in an available form has to be ensured at these times.

THE FOOD OF THE WHEAT CROP

by
R. S. Bhatty

THREE hundred and fifty years' continuous experimental work has not so far perfected our knowledge about the food of plants. Ever since the first investigations of van Helmont, a Dutchman, who asserted that water was the "principle of vegetation," something new has continuously been discovered. It is now believed that twelve elements are essential for a healthy growth of the higher plants; deficiencies of one or more of these have been associated with various forms of crop failures.

Of these essential elements, some are needed by crops in relatively large and others in comparatively small amounts. Accordingly, Wallace has classified them into two groups: Major Elements required in large quantities—nitrogen, phosphorus, potassium, calcium, magnesium and sulphur; Trace Elements required in small quantities —iron, manganese, boron, copper, zinc and molybdenum. It is the deficiency of the major elements that is most important in farming and around which the whole fertilizer industry is built.

In this article, the functions of the essential elements in the nutrition of the wheat crop are discussed. Failures of wheat crops due to trace element deficiencies are generally of much less economic importance than those due to shortages of major elements like nitrogen, phosphorus and potassium.

MAJOR ELEMENTS

Nitrogen. Nitrogen is a constituent of plant proteins and the most important among the essential elements in the nutrition of wheat. Records of ancient civilizations referring to the use of organic manures and burying of green manure crops offer strong evidence that nitrogen has been deficient in the cultivated soils of the world since the beginning of agriculture. In 1843, Lawes of England conducted what was probably the first experiment to counter the belief of Liebig of Germany that a succession of good crops of wheat could be taken by supplying other minerals but not nitrogen. In the famous Broadbalk wheat experiment at Rothamsted in England, he showed that a fantastic increase in the yield of grain and straw could be got by combining nitrogen application with other minerals. Since then, experiments the world over have shown that nitrogen is the chief requirement of wheat.

Nitrogen is taken up by wheat from the soil in the form of nitrates, and with the carbohydrates synthesized in the leaves forms various amino-acids. Nitrogen in the form of nitrates is highly soluble in water and is readily leached from the soil. It is estimated that only about 35 per cent of the added nitrogenous fertilizer is recovered by the crop and the rest is lost due to a variety of causes. It is not surprising, therefore, that nitrogen deficiency is of common occurrence in all wheat-growing soils.

Nitrogen produces a vigorous vegetative growth and a deep-green colour in foliage. Excessive vegetative growth, however, delays maturity of the crop and increases its susceptibility to lodging and disease. Symptoms of nitrogen deficiency are short and stunted shoots and pale-yellow leaves. On the whole, the plant is poorly developed, with small heads of grain, and a considerably reduced yield.

Phosphorus. Phosphorus occurs in plants in quantities much smaller than nitrogen and potassium. Phosphorus is closely concerned with the growth process, and is an essential constituent of the protoplasm. Most of the phosphorus is assimilated when the plants are young, and is translocated to the grain during the process of ripening.

Phosphorus has been known to stimulate root development in

young plants, and is of great value in heavy soils which do not permit easy penetration of the roots. Phosphorus shortens the vegetative period of the crop and hastens maturity. In England, an optimum supply of phosphorus has been said to shorten the growing period of wheat by about ten days.

Phosphorus is very slow-moving in the soil, and most of it is converted into forms which are not available to the plant. Wheat recovers only about 14 per cent of the phosphatic fertilizer applied. The rest gets "fixed" in the soil as traces found in the drainage water.

Under acidic conditions, that is, in soils with a low *p*H, soluble salts of iron and aluminium react with the added phosphate and unite chemically to form insoluble iron and aluminium phosphates. The degree of precipitation of the phosphate depends upon the acidity of the soil. The higher the acidity, the less the availability of the phosphorus applied.

Deficiency symptoms of phosphorus are similar in many ways to those of nitrogen. The leaf colour is dull greyish-green and a red pigment is produced at the base of the leaf. The root development remains poor and the ripening of the grain is delayed. The tillering and the number of tillers bearing ears is lowered. In extreme cases, the crop fails miserably.

Potassium. Potassium is the last in the famous NPK trio. It does not act like nitrogen and phosphorus in the plant, and is not an integral part of the plant-building materials. It is said to have a biochemical function during photosynthesis and is known to regulate the efficiency of this process. Potassium shortage in the leaves leads to a decreased assimilation of carbon dioxide and a reduction in the leaf area.

There is a close relationship between the nitrogen supply and the potassium requirement. An abundant nitrogen supply produces profuse and fast-growing foliage, the efficiency of which in photosynthesis depends upon the availability of potassium to the plant. In brief, potassium helps in the synthesis of simple sugars and starch and in the translocation of carbohydrates; it helps in the reduction of nitrates and the synthesis of proteins, and promotes photosynthesis.

Potassium is abundant on the earth's surface. Its natural supply has been estimated at 24 times that of phosphorus. Soils which are rich in artho-clase felspars "yield" sufficient quantities of potassium for the growth of wheat. Potassium does not turn insoluble or get "fixed" as quickly as does phosphorus; except under heavy rainfall and in light soils, losses by drainage are not great.

Calcium. Calcium is required for the growth of meristems and for the functioning of root-tips. Calcium occurs chiefly in the leaves of plants, and is present in small quantities in the grain. The amount of calcium removed by wheat varies with the yield and the fertility of the soil. On an average, wheat recovers seven to ten pounds of calcium from an acre.

Calcium neutralizes the effects of organic acids in the plant metabolism. Calcium deficiency occurs in acid soils, but may also occur in alkaline ones. Calcium does not move freely from the older to the younger parts of the plant; the deficiency symptoms, therefore, appear first of all on the tips of leaves.

In the field, calcium deficiency symptoms of plants are complicated by the secondary effects of soil acidity and the excess of manganese under acidic conditions. Calcium deficiency rarely manifests itself in the crop as such, but indirectly affects the availability of the other nutrients in the soil.

Magnesium. Magnesium is a constituent of the pigment chlorophyll and is essential for its formation. In its absence, leaves show a chlorotic condition. Among cereals, barley is the most susceptible to magnesium deficiency.

Magnesium acts as a carrier of phosphorus in the plant and accumulates it in the grain during the process of ripening. Magnesium has also been shown to stimulate tillering and to influence the formation of ears and the ripening of the crop. Magnesium deficiency occurs along with calcium deficiency in acid soils and shows up as interveinal, chlorotic stripings on the leaf.

Sulphur. Sulphur occurs in plants as a constituent of certain amino-acids, proteins and the protoplasm. Sulphur is also concerned with the formation of chlorophyll, though it is not a constituent of it. Sulphur deficiency has never been known to occur—nor is it likely to occur—as the judicious use of ammonium sulphate in the past has built up large reserves in the soil.

Carbon, hydrogen and oxygen. These elements are not considered mineral elements, and are of little practical importance due to their abundance in the atmosphere. They are synthesized into simple carbohydrates in the process of photosynthesis, and form the basis for the formation of amino-acids and proteins.

TRACE ELEMENTS

Trace elements in the past have been found to be associated with various deficiency diseases and conditions of general unhealthiness. They are required by crops in such small quantities that soils usually contain sufficient amounts of them. Trace element deficiencies

are closely connected with the lime content of the soil, and are often corrected by adjusting the soil *p*H.

Iron. Iron is required for the formation of chlorophyll in the green parts of the plant. It occurs in abundance in most soils, except those which contain free chalk or lime and have a *p*H value above 6.5. Under alkaline conditions, it is changed into forms less useful to the plants.

Potassium deficiency is said to aggravate iron deficiency; so does excess of soluble phosphates, by precipitating iron as insoluble iron phosphate. Cereals are very resistant to iron deficiency. When it is deficient, leaves become chlorotic and pale-green in colour; under severe conditions, they fail to perform the normal function of photosynthesis.

Manganese. The functions of manganese in the formation of chlorophyll are closely connected with those of iron. Manganese deficiency causes a disease called "grey speck," and is of common occurrence in oats among the cereals. Manganese deficiency, like iron deficiency, occurs in soils rich in lime and other bases.

In wheat, deficiency symptoms are not so characteristic as in oats. The leaves become pale-green and and show chlorotic striping. On severely affected plants, leaves turn brown and die off. Affected crops may be cured by spraying small amounts of manganese sulphate.

Copper. Copper deficiency in wheat was first discovered in England in 1946, and is well-known on the "muck" soils of the United States of America. It occurs in newly-reclaimed peats and is called the "reclamation" disease in Holland and the "yellow tip" disease in parts of Europe and Australia. Copper deficiency produces yellow-grey necrotic spots underneath the leaf-blade and greyish streaks of dead tissues, until the whole leaf dies off. Tillers are few and the death of the tiller without ear-formation is characteristic.

Zinc. The function of zinc is said to be connected with the assimilation of carbon dioxide in the plant. Soils usually contain adequate amounts, as it is required in extremely small quantities. Substantial increases in wheat yields have been reported with zinc sprays in the marshland soils of Kent.

Boron. The exact role of boron in plants is not known. Evidence suggests that its function is that of a catalyst or reaction regulator. A high calcium content in the soil renders the soil reserves of boron unavailable to the plants. Boron compounds are readily leached from the soil; hence, sandy soils are the most prone to its deficiency.

Molybdenum. Deficiency of molybdenum has been of rare occurrence in cereals. Its availability becomes low in acid soils and increases when lime is applied. Deficiency of molybdenum is complicated by an excess of manganese and can be controlled by reducing the soil acidity.

NUTRIENT INTERACTIONS

To produce healthy crops, not only should the nutrient elements be present in sufficient quantities, but also in well-balanced proportions. Certain elements appear to oppose each other in action, while others help one another. The relationship is, therefore, either antagonistic or beneficial. Antagonistic effects become very much pronounced when the difference between the opposing elements is large, but disappear entirely when their levels become similar. The principal known antagonisms and beneficial effects between the various nutrient elements are : *antagonisms*—nitrogen/phosphorus, nitrogen/potassium, potassium/magnesium, phosphorus/potassium, nitrogen/calcium, calcium/manganese, magnesium/calcium, potassium/manganese and copper; *beneficial effects*—nitrogen/magnesium, potassium /iron.

* * *

ISI STANDARD ON MARKET YARDS

In our country, much of the trade in agricultural commodities—which contribute nearly 50 per cent of the total national income, is carried on in markets, the construction and layouts of which are far from satisfactory. These markets (*mandi* or *gunj* as they are known in Hindi) are congested and devoid of civic amenities such as resting sheds for people, urinals, garbage bins and cattle sheds.

For some time past, a need has been felt for constructing market yards according to planned layouts and conforming to certain standards. It is expected that such standards when made available and implemented would go a long way in improving the present conditions in the markets. The Indian Standards Institution has at the instance of several State Governments formulated a draft standard Layout for Regulated Market Yards for Agricultural Commodities (Doc: AFDC 5(61)).

The draft standard covers the layout and the requirements for regulated market yards for agricultural commodities. It takes into consideration the recommendations made by the Seminar on Regulated Markets held at Mysore in January, 1959.

In the standard, layouts for regulated market yards for general agricultural produce have been laid down. It is also proposed to include cattle and perishables such as fruits, fish and vegetables in the scope of regulated markets. It may then be necessary to lay down separate standard layouts for market yards, only for special commodities such as cotton, cattle, fruits and vegetables.

The draft standard is being widely circulated for eliciting comments. The last date for receipt of comments is May, 23 1959. Copies of the draft are available free on request, from the offices of the Indian Standards Institution located at New Delhi, Bombay, Calcutta and Madras.

HOW I GROW SUGARCANE

by

Kartar Singh "Dewana"

THERE is no reason why the Punjab farmer should not be able to catch up with his counterpart in the other sugarcane-growing States in respect of cane yield. All that he has to do is to pay proper attention to the various aspects of sugarcane cultivation. This is what I have learnt from my 37 years' experience with the crop, and last year my yield was 1,225 maunds to the acre.

I plough in *senji* grown after maize or cotton. As the sugarcane crop stays in the field for more than a year, the land has to be well-levelled. I plough the field ten to 12 times and give an equal number of *sohagas*.

Sugarcane is a heavy feeder. Keeping this in view, I add 20 to 30 cartloads of farmyard manure per acre at preparation of land. Besides, six maunds of ammonium sulphate and three maunds of superphosphate are given to the crop.

Sugarcane should be planted from 15th February to the end of March. Later planting generally gives a low yield. The field should first be given a good *rauni* irrigation. See that the irrigation water does not flow out of the field.

PREPARATORY CULTIVATION

When the land is in *wattar*, I give two *sohagas*, one ploughing with the *triphali*, another *sohaga*, two ploughings with the *desi* plough and again two *sohagas*. This brings the soil to a fine tilth, and this is important for raising a good sugarcane crop. In no case should clods be allowed to form.

Only improved and disease-resistant varieties should be used. I grow *Co. L. 29* and *Co. S. 245* (early varieties) and *Co. 453*, *Co. 312* and *Co. 617* (late varieties).

I obtain my planting material from healthy canes. Only setts which have two or three buds are selected. Till they are required for planting, the setts are kept soaked in water. I use 50,000 setts to the acre.

Before planting, I drill a mixture of ammonium sulphate and superphosphate at 1½ maunds each with a heavy *desi* plough, and plant double setts in furrows made two feet apart. So that termites and other insects may not attack the setts, I dust them with ten per cent "Gammexane" at ten to 15 seers per acre.

Line-sowing has the following advantages: hoeing can be done with the plough, which is economical; the crop gets ample space to grow; non-germinating setts can be replaced; and above all, propping becomes easier, the crop does not lodge and cannot be damaged by rats.

Till the seed has germinated, I give a *sohaga* every week. The seed germinates in about 20 to 30 days. Very near germination, I give a hoeing and then a *sohaga*.

IRRIGATION

The first irrigation is given on germination. When the land is in *wattar*, I drill a maund of ammonium sulphate per acre along the germinated rows with a cotton drill. The clumps are then weeded of grass, etc., with a hand-hoe, and the plough worked in between the rows.

The sugarcane crop requires a good number of irrigations—25 to 30. Before the rains, the crop should be irrigated weekly. With the onset of the rains, the interval may be increased or decreased according to need. Irrigations in May-June have a very good effect

on the growth of the crop and tillering; those in September-October improve the cane texture.

I apply 1½ maunds of ammonium sulphate per acre mixed with earth when it is raining. The fertilizer is placed around the clumps with the hands.

Before the advent of the rains, i.e., by June or July, earthing is done and propping begun. To start with, I tie two clumps together, but by August when the crop has grown well, four clumps are taken.

HARVESTING

The canes should be cut flush with the ground. The top is cut off where the internodes appear to be young. The cane should be utilized within 24 hours of harvesting; that which is to be sent to the mill should be covered with trash a foot thick and sprinkled over with water.

Red rot, the top shoot borer, the stem borer, the Gurdaspur borer and pyrilla are the enemies of the sugarcane crop. To prevent red rot, diseased setts should be rejected.

The top shoot borer attacks the crop in March. If it is observed in April, rogue out all affected clumps and burn or bury them.

The stem borer can be controlled by using ten to 15 seers of ten per cent BHC per acre at the time of planting. The crop should be frequently irrigated in the initial stages.

The Gurdaspur borer attacks the crop from August. A sure sign of its attack is that the tops begin drying and fall off if jerked. The dry tops should be cut off two to three inches below the affected portion and buried.

Pyrilla gets active about the first week of October, and can be seen flying about in the crop. The crop should be sprayed with DDT or BHC 50 per cent.

GUR PREPARATION

To extract the maximum juice from the sugarcane, you must use an improved crusher. I am using the "Sultan Nahan" crusher. I prepare *gur* with the "Jullundur Sardar" furnace which saves both fuel and time. The colour of the *gur* is also attractive.

I use a flat-bottomed pan for boiling the juice. To clarify the juice, I use *bhindi* mucilage. It is prepared this way: the plants are pulled out by the roots, beaten and soaked in water in an earthen pot. After two or three hours the mucilage is ready. When the juice is about to reach the desired consistency, I add five drops of mustard oil to it. I do not throw away the scum but mix it with ash from the furnace and use it as manure. *Gur* prepared in March keeps well and is not affected by moisture during the rainy season.

Ever Tried Ber Candy?

IF you like *ber*, you will like it even more when it is candied. *Ber* candy is really delicious. The grafted varieties like *Umran* are particularly suited for candying.

Good varieties of grafted *ber* are not only rich in flavour but also in food value. Besides vitamins A and B, *ber* is one of the richest sources of vitamin C, and has a calorific value of 16 per ounce. *Ber* is easily digested and has a laxative effect.

For candying, take large-sized, ripe but firm and sound fruits. Puncture them with wooden or celluloid-pointed picks.

Place the punctured fruits in a piece of muslin cloth and dip in boiling water for two or three minutes. This will soften them slightly and help the sugar penetrate better. Then take out the fruits and place them in a glass or earthen container.

Now, boil a 25 per cent sugar syrup (one part of sugar to three parts of water). Add to it an ounce of citric acid per 25 pounds of fruit; this will improve the texture of the candy.

Pour the syrup over the fruits till they are completely submerged. Put some weight over the fruits to keep them submerged all the time.

After 24 hours, remove the syrup and add to it a fourth of the quantity of sugar used previously. Boil this syrup and pour it back over the fruits. Repeat this process every 24 hours, adding sugar, till the syrup acquires the consistency of honey. This usually takes eight to ten days.

After this, allow the fruits to remain in the syrup another four or five days. Then take them out and spread them on wire-gauze trays to drain off the syrup.

Keep the fruits in the sun or in a warm room till they are dry and no longer sticky. This may take three to five days. Then pack in jars or cardboard cartons.

If any fermentation is noticed during the process, boil both the fruits and the syrup for five to ten minutes.

DRIED *BER*

Dried *ber* is very sweet and is greatly relished. Sun-drying of *ber* is common in the dry regions of north India where it is the only locally available fruit.

For drying, take fully ripe fruits, wash thoroughly and dip in boiling water. Spread in the sun on trays.

Drying takes eight to ten days. Then store in a cool, dry place.

Take care that drying is done under hygienic conditions.

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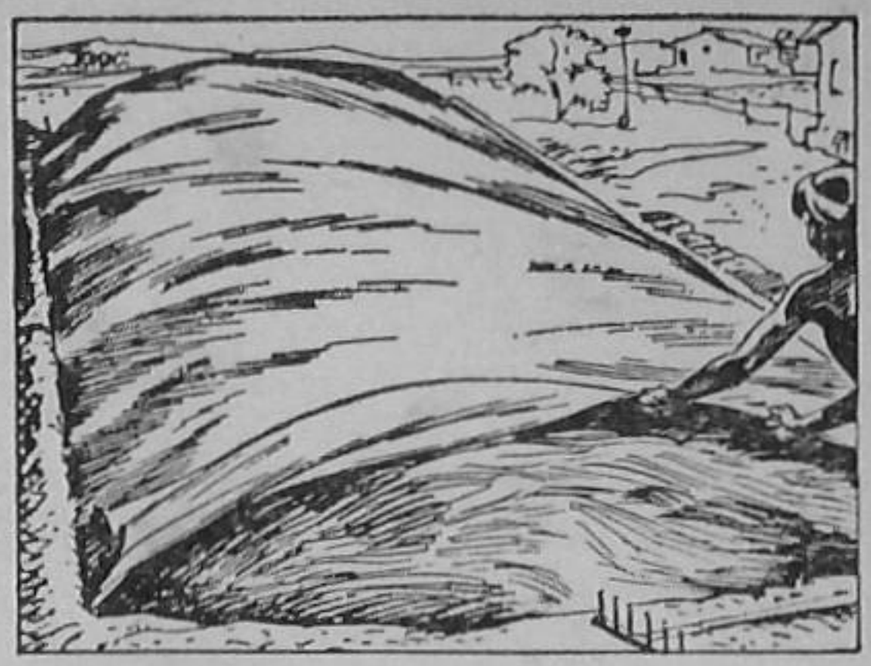

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