



KRISHAK SAMACHAR

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Editorial

Farmers, Reflect on Your Crop Outturn

All over the country *rabi* crops, like wheat, gram, barley etc. have now been harvested, threshed, winnowed and weighed. The results of your efforts to produce as much as possible from your land are now known to you. Some of you have obtained phenomenal yields, while others average, and many subnormal yields. Why? This is the time to reflect and analyse the results and the causes. What did I do? What should have been done but could not be done? Did I plan my work properly? Did I execute it properly? Did I make effort to get the improved seeds for sowing? Did I do the sowing in time? Did I irrigate the crop in time? Did I apply the manures and fertilisers in time in adequate quantities and properly? Did I adopt plant protection practices? In short, to what extent did I procure or avail of the inputs necessary to get increased yields? To what extent has nature helped or affected adversely my crops?

These are some of the vitally important points for reflection. Their analysis will be your guide for the future, and the deficiencies could be made up and failures guarded against. There is no need to be despondent if your crops have yielded poorly. Compare your results with those of your neighbouring farmer, who may have been a very successful farmer, and find out in what respect and to what extent he was at an advantage over you. Take his advice and help so that you may catch up with him in the next season.

Keep your eyes open. Observe closely what your successful farmer neighbour does or what is being done on a demonstration farm or plot, and try to adopt the practices on your own land. Technical knowledge regarding crop husbandry or animal husbandry is now fairly readily available. Most of the inputs can also be had, although may be to a limited extent. Genuine urge and supreme effort are required to exploit them to your own and the Nation's benefit. Success or failure will depend upon the degree of your urge and effort.

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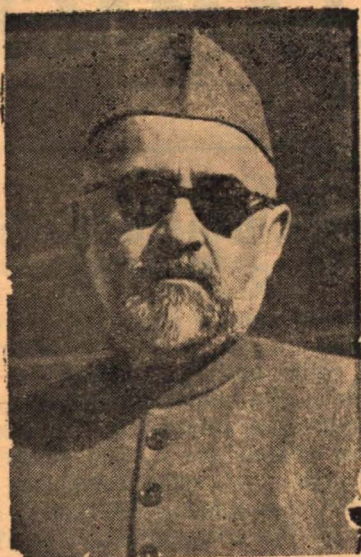
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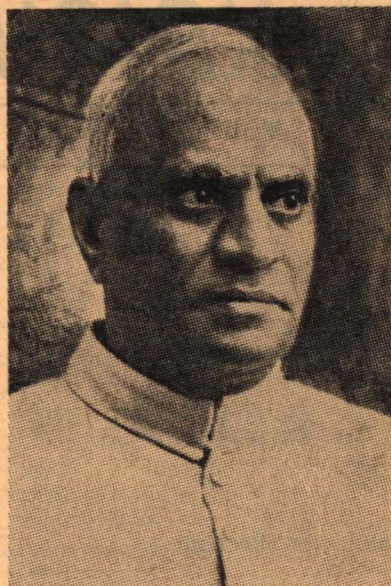
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Felicitations



Dr. Zakir Husain (70) was elected third President of India. Dr. Husain brings to his high office a rich experience of an educationist and an administrator. Bharat Krishak Samaj wishes him every success in his new assignment.



Shri V.V. Giri who has been elected Vice-President of India is a veteran trade union leader and an able administrator. Bharat Krishak Samaj wishes him every success in his new assignment.

New Search for Protein

Malnutrition afflicts an estimated 350 million children, or 70 per cent of the world's population under the age of six. Half of its victims probably will die before they are grown; the remainder may be marked for life by stunted physical and mental development.

Malnutrition is no stranger to history. In recent years, however, medical men have begun to recognize one of its forms as a particular menace to world health. Its name: Kwashiorkor—or, less exotically, protein deprivation.

All of us have 18 per cent of our weight as protein. We build our body proteins from protein in food; a normal adult male requires about 70 grams per day; other segments of the population—pregnant and nursing women, the sick and injured, infants and children—require proportionately more.

Throughout the world we get this protein mostly from cereal grains. One hundred million

tons of proteins are furnished annually by world production of cereal grains, which contain an average of ten per cent protein.

But cereal grains do not furnish quite enough protein per meal to take care of our requirements. So, even though they are eaten in large quantities, cereal grains must be supplemented by protein concentrates.

The choice protein concentrates are the animal proteins such as those in meat, milk, eggs, or fish: about 20 million tons of animal protein are eaten annually in the world. Use of animal protein varies markedly in different countries and closely follows the per capita wealth of the country. It ranges from 70 grams per day in the United States to five grams per day in India.

Another way of putting it is to consider the number of people who get less than 15 grams

of animal protein a day : this is the majority of people in the world. Only about a quarter of the world's population gets more than 30 grams of animal protein a day.

What happens in those places of the world where there are sufficient calories in the diet but insufficient protein because of lack of protein concentrates ?

Take, for example, people who eat mostly corn as in Central America, or mostly tapioca as in the Dominican Republic, or mostly rice as in India. As expected, the sensitive elements of the population suffer first and most from protein malnutrition : pregnant and lactating women, the sick and injured, adolescents, and particularly post-weaning children in the ages of two to four.

These groups develop the syndrome called Kwashiorkor. This is originally a Ghanaian expression used to describe the poor health of toddlers recently weaned from mother's milk, a source of high quality protein. Freely translated, it means "the sickness the older baby gets when the new baby comes". In Guatemala, mothers often stop nursing infants when they are about six months old, an age when they require some three times as much high quality protein per pound of body weight as the average adult. Even at two years, the weaning age in some parts of Central Africa, a child needs about one and a half times the proportion of protein adequate for an adult.

Kwashiorkor victims suffer stunted growth, diarrhoea, swollen tissue, and hair discolouration; often they die from measles, chicken pox, and other child-hood diseases that otherwise wouldn't be fatal. Recent studies of afflicted youngsters in Mexico seemed to show permanent damage to the central nervous system.

Studies also suggest that the listlessness and apathy of some people in under-developed countries may be in direct consequence of infantile protein malnutrition.

In theory, the way to eliminate protein malnutrition in the under-developed regions is the same as is being done in the developed countries : more efficiency of production, more efficient strains of plants and animals, more fertilizer, and more good agricultural practice.

In reality, it does not work that way. Developing countries do not have the means for a highly industrialized agricultural production. New and cheaper sources of protein concentrate must be found for them.

Animal protein is delicious and interesting, but it is expensive. Five pounds or so of plant protein are required to make one pound of animal protein. From eight to ten times as much water is required to make the equivalent amount of animal protein as compared with vegetable protein.

So the pressure is on to develop new sources of protein concentrate, with emphasis on the plant sources. Tests are being made on many sources including fish, algae, proteins from micro-organisms, proteins from grass, proteins from cell structure.

Researchers working in various areas are making dramatic progress in developing sources of high quality protein foods for human consumption. Their successes may make the difference between useful lives and premature death for millions of humans.

High-lysine Corn

High-lysine corn developed at Purdue University, has received a great deal of attention. A two-day conference was held at Purdue in June to discuss the potentials of high-lysine corn.

Lysine is one of the key "building blocks" which make a balanced protein. Regular corn is very low in lysine, so it must be supplemented with soyabean meal or other proteins to get efficient utilization by live-stock.

High-lysine corn is a tremendous scientific breakthrough. This is the first time that the protein composition of a grain has been changed drastically by a single gene (heredity trait).

The corn can bring a dramatic improvement in human diets heavy in corn meal as in Latin America. The key gene, called "Opaque 2", can be bred into current corn varieties. But it will probably take another five to ten years to develop a number of high-lysine varieties for widespread production. What is required is slow, painstaking, and evolutionary—not revolutionary—work before this higher nutritive grain will be ready for the farmer's field.

Seed Proteins

Another source already available, and about which considerable is already known, is the seed proteins. If all the protein of just the cottonseed, peanuts, and soybeans now being grown were made available directly as a concentrate for human consumption, this would have the effect of doubling the quantity of protein concentrates now available.

This alone is considered sufficient to wipe out the world protein concentrate deficit that now exists.

Cottonseed contains about 20 per cent oil and 20 per cent protein. When the oil, seed coat, and linters are removed, there remains a product which contains between 45 and 55 per cent protein.

The Institute of Nutrition in Central America and Panama has developed an all-vegetable formula called Incaparina which contains a cottonseed protein concentrate. Children who entered hospitals in advance states of Kwashiorkor were cured on diets containing 38 per cent cottonseed protein concentrate and the rest mostly corn.

It was estimated that two million pounds of Incaparina were produced in 1964 in Guatemala and Colombia. A number of commercial companies are interested in this development in various places in South America.

Soybean Protein

The soybean, of course, is an excellent source of high quality protein. Soybeans are consumed directly by humans in Asia, but a lot of work has gone into developing palatable process soybean products with various levels of oil and protein.

A full-fat soybean flour developed by the United States Department of Agriculture contains 40 per cent protein and 20 per cent fat. It can be made with hand labour in pots over an open fire. The beans are simply soaked overnight, boiled ten to fifteen minutes, air-dried, cracked, de-hulled, and ground.

The addition of small amounts of high protein soy flour will greatly improve the nutritional value of foods such as soups, stews, breads, and various drinks.

In Hong Kong, a very enterprising manufacturer has produced a soyabean milk which is bottled and distributed in such a way that it is competitive, not only with cow's milk but also with soft drinks. Actually school children drink more of it during their lunch hour than soft drinks.

Then there are the cereal-soybean mixtures. Researchers have developed several formulae for blended food products using soybeans, grains, and dry milk.

There is a formulation called Pre-Nutro in South Africa which is based on dry skimmed milk, processed full-fat peanuts and soybeans fish flour, and other additives. This concentrate is diluted with corn or corn flour to provide a product containing 22 percent protein. It is meant to be a protein concentrate. In 1963, two thousand children were being fed with this product with no deaths and cases of Kwashiorkor.

Yet the applications mentioned here, and others not mentioned account for a very small proportion of the current protein potential from oilseeds.

The Problems Involved

The reasons why the seed protein concentrates are not being eaten more are in two general categories: those related to nutrition and those related to acceptance.

First, seed proteins do not have the quality of animal proteins. Egg protein is considered good and a protein standard 'milk protein has been used as a basis of comparison with most other protein concentrates. Both of these are much better in quality, in their composition of essential amino acids and in the proportion of essential amino acids to total amino acid nitrogen, than seed proteins.

Oilseed proteins can be upgraded in the processing by supplementing with amino acids, by blending with other proteins, by using higher concentrations, or by improving the protein quality of the other partner, the cereal.

However, the fact that a material is nutritious does not guarantee that it will be accepted as a source of human food. Selection by the human being of a food is a complicated process which is ultimately connected with other cultural patterns. He will not accept the food merely because it is good for him. It has to be satisfying; it has to be pleasing; and it has to be interesting.

Here again the animal protein foods have been at the pinnacle of aspirations of people in terms of desire for a most satisfying food. If new protein concentrates are to be introduced, processors must learn how to tailor-make them for each culture and every specific need. (*Reprinted from World Agriculture April 1967*)

World Agriculture Fair Memorial Shivaji College

Chatrapati Shivaji Jayanti was solemnly and most fittingly observed all through Maharashtra and many parts of India early this month. We, therefore, take this opportunity of giving publicity to the World Agriculture Fair Memorial Shivaji College established in 1961 in the rural area of Delhi State to commemorate the World Agriculture Fair so very successfully and creditably organized by the Bharat Krishak Samaj in 1959-60. The association of the name "Shivaji" with the college has given it a unique character. We reproduce below a note on the Shivaji College written by the Principal, Dr. Tulsi Ram. This will give our readers some idea regarding the origin of the college, what it is doing at present and its future plans.

World Agriculture Fair Memorial Shivaji College, New Delhi was founded in August 1961 by the Late Dr. Panjabrao S. Deshmukh in commemoration of the World Agriculture Fair, held in 1959. The College was founded under the auspices of Bharat Krishak Samaj and Shri Shivaji Education Society, Amraoti, Dr. Deshmukh then being President of both these organisations. The Bharat Krishak Samaj initially placed at the disposal of the Governing Body of the College a sum of Rs. 2,50,000 out of the proceeds of the World Agriculture Fair. The W.A.F. Memorial Farmers Welfare Trust created by the Bharat Krishak Samaj has further enriched the funds of the College with a donation of Rs. 1,50,000. Of the amount thus received Rs. 300,000 forms a consolidated Endowment Fund. A sum of Rs. 109,000 has been spent on the construction of a prefabricated block of rooms and the maintenance of the College since 1961. The college was started at the request of the villagers of Delhi in the interest of rural education and the Village Panchayat Mitraon (Najaf Garh Block), has donated to the College on lease 150 acres

of land for use in the furtherance of this noble cause.

The College is a co-educational institution affiliated to the University of Delhi and provides instruction upto B.A. (Pass) in Hindi, Sanskrit, English, History, Economics, Political Science, Mathematics and Commerce. There are 428 students on roll and 24 teachers, besides 22 members of administrative and other staff. The Principal Dr. Tulsi Ram M.A. (Delhi), Ph.D. (London), is a young man with rural background and brilliant academic record.

A large number of the students on roll come from villages. They are earnest seekers but largely handicapped. In the context of a society that is changing fast, a man from the village might suddenly discover that not only his achievements, but also his potentialities are limited. Hence it is our duty here towards our village boys and girls that we keep them on the right track of self-confidence and help them develop their potentialities to fruition. In this sense our institution has a definite rural bias.

"Rural bias", however, does not imply a militant exclusion of the values of Modern Science and urbanization. In fact, we are moving towards a society in which a man might work in his factory or office in the city but live in his village-home on his mechanized farm. With the disappearance of the physical distance between the town and the country, the emotional and cultural differences also will disappear and are disappearing. Education is a process of social integration, and the hundreds of boys and girls that come to us from the city together with those who come from the villages make up a community which is the community of the India of tomorrow. We believe in the preservation of rural simplicity and candour from rigidity and stagnation, and the protection of

urban refinement from cynicism, and our ideal of education is the union of moral simplicity and cultural refinement in a scientific and rational world.

Therefore, besides giving class-room instruction, supplemented by reading in the library, we encourage our students to participate in co-curricular, social and cultural activities, and thus enable them to inculcate in themselves the capacity for management, co-operation and the art of leadership. There are various students societies such as Students' Union, Social Service League, World University Service, Dramatic Club, English Association, Sahitya Sangam, Alpna (the College Magazine), History Association, Political Science Association, Mathematics Seminar and Commerce Club. All these societies are managed by the students under the guidance of teachers. Moreover, the students take active part in N.C.C. and sports and our achievements on the parade ground and playground have been, in spite of tremendous physical limitations, worthy of note. Our results in the University examinations have been far above the average.

Of course, we have yet a long way to go in order to come up to our own expectations. For this we need encouragement both from the parent bodies and from the judicious and liberal sections of the public. And we promise that our staff and students will try their best to justify this valuable trust placed in them.

Our Needs:—The College has so far been housed on a temporary site in rented and prefabricated buildings. But now the Delhi Administration has kindly allotted us a permanent site measuring 15 acres on the west of Ring Road, between Rajouri Gardens and Punjabi Bagh in West Delhi. The land will cost a sum of about Rs. 140,000. The buildings that will be raised on the permanent site are contemplated to be functionally useful and aesthetically satisfying, and on the whole worthy of the name of Bharat Krishak Samaj, W.A.F. Memorial Farmers Welfare Trust, Chhatrapati Shivaji Maharaj and the Late Founder-President Dr. Deshmukh. Moreover they have to be more spacious than the present temporary buildings in order to house Arts, Commerce and Science Faculties including agriculture. In addition to library, laboratories and accommodation for sports and N.C.C. we have

to provide our students with amenities such as Common Rooms for boys and girls, Gymnasium, Students Centre, Canteen and Swimming Pool for aquatic sports. This accommodation will be needed for at least 1000 to 1200 boys and girls in the beginning, and later might have to be extended in the context of expanding University education. It is estimated—and and this is a modest estimate—that for all these buildings, furniture and equipment the Governing Body will require a sum of Rs. 15 lakhs. All-told, the College may need a sum of Rs. 16 lakhs including the cost of land. Of this the Governing Body will need to raise a sum of Rs. 8 lakhs, the Government contribution being 50%.

The annual recurrent deficit of the College at present is about Rs. 25,000. When the college has grown to full life with 1200 students on roll reading for various graduate and post-graduate courses, the annual deficit will rise from this figure to about Rs. 50,000 or Rs. 60,000. In order to raise this amount annually the college will need to increase the present Endowment Fund of Rs. 3 lakhs to Rs. 5 lakhs. The present needs of the Governing Body then amount to Rs. 10 lakhs exclusive of the matching grant that will be forth-coming from the University Grants Commission for buildings at 50-50 basis.

The Late Dr. Deshmukh was a man of inexhaustible energy and indefatigable perseverance. With his unflinching courage and unassailable optimism he inspired the members of the Governing Body and proceeded straight to his goal with unshakable determination. He was a man of such comprehensive powers and solid integrity of character that he summed up in himself many a man and institution. But with his demise the responsibilities of the Governing Body, with Shri R.B. Deshpande as Working Chairman, have now become collective in a larger degree than before, and the Governing Body needs the assistance of the Bharat Krishak Samaj, W.A.F. Memorial Farmers Welfare Trust, Shri Shivaji Education Society, and all philanthropic individuals, communities and organisations. It requests them to come forth with liberal donations in order to complete a work that has, in fact, just begun. This would be a fitting memorial to the Late Founder President, Dr. P. S. Deshmukh.

American Farm Leaders Report

Since publishing the Summary report of the U.S. Farm Leaders on their visit to India in 'Krishak Samachar' Vol. 11, No. 4, April, 1967, we have received the detailed report from the group. Excerpts from the report are given below :

"It was at the dinner (by U.S. Agricultural Attache) that we first heard of the fabulous high-yielding Mexican wheats India is now growing. One day we visited our American Embassy for briefing with Mr. Boulware and others in his department, and we also again visited the Indian Agriculture Research Institute to see a cattle programme which consisted of crossing Australian Holsteins with an Indian breed, Sahiwal. A farm implement museum was our next stop; here we saw many old—some even ancient—farm implements, besides newer ones now being used and those being manufactured for introduction to the farmers of India. This display showed how far the farmer has progressed in his use of machines, and was a hopeful thing, we felt."

"We toured a government owned dairy (Delhi Milk Scheme) which collects milk from the farmers. A man on a bicycle, with four cans hanging on it, collects the milk from the villagers and pedals to a collection point when it is put in ten-gallon cans on a truck and hauled to another collection point where the cans are emptied into a 7000 litre stainless steel bulk tank and taken to the bulk plant. The plant takes the production of about 2,00,000 farmers, averaging about a quart per farm. This milk supplies about 40 per cent of the milk for a city of 3.4 million people. The plant itself was a marvel of cleanliness, modern machinery, and labour-saving devices."

"Our introduction to the Mexican wheat growing in the fields came on our first trip out to a farm. Mr. Mahinderpal Singh had fields of beautiful wheat which would yield 75 bushels per acre, and he has previously had yields of 100 bushels per acre. This is far better than the dry-land-farming prospects in the 'Bread basket' area at home, so we were really impressed. We were also pleased to see the brick homes Mr. Singh had constructed for some of his labourers to live in. They were far better than the average villager had."

"Our trip through the Escort Tractor factory was a heartening one. They were producing 10 tractors a day, plus many other items including motor cycles and scooters. The factory finds it hard to procure a competent supply of labour. They were building a new plant which would increase tractor output to 30 per day. With the demand for tractors increasing, it is sometimes necessary for a farmer to wait a year to get delivery of a popular brand."

"The trip to Mr. Lekhani's (Life Member Farmers Forum,) farm (Green Field, Faridabad), which had literally been dug out of a rock hillside—is one we will never forget. The farm operation was a tribute to the determination and inventiveness of the owner; nothing went to waste. Every operation was planned to save labour and utilize available facilities to the fullest extent which appealed to the frugal farm wives of the group. He was using cow dung to make methane gas for use as cooking fuel, then using the slurried product, from which the gas had been removed, as fertilizer for the grapes."

"On our first extended tour out of Delhi, we left our cars on the highway and were taken by jeep through dust and sand to a mud-hut village (Khilora, Dist. Alwar), several miles off the main highway. Each of the three couples was assigned a host, who took his guests to a village home for breakfast. Everywhere we went, the friendliness, the warmth of the welcome received in spite of their meagre means, and the children left a warm feeling around our hearts. The village council met, and the big problems they were working on as a group was to acquire electricity to run their walls and make their lives a little easier. We enjoyed seeing the camel walking around and around, lifting water by means of a Persian wheel. We learned that bullocks need a boy to prod them to keep moving while most blind-folded camels have no more sense than to keep working all day long by themselves. Where water is found to be easily available, the older, more laborious and slower methods of hoisting water in animal skins is sometimes used. Teams of bullocks pull the water to the surface, and men empty the skin container into the irrigation ditch."

"We were guests of Jugalkishore Gupta at Circuit House in Alwar at noon. We visited a piggery which was a marvel of cleanliness, and also an inspiration to all of us. As our Oklahoma farmer remarked, "It was better than anything we had seen in Oklahoma."

"As we left Jaipur we headed out into the desert area. The people, the camels, and the villages seemed to blend into the desert scene. It was a drab picture, yet where water was available, green crops showed up and quite often large herds of goats could be seen. The camels—called the "airplane of the desert" by one man—fascinated us and kept our camera shutters clicking."

"At Rohtak, we were again honoured guests, this time of the local Indian Farmers Forum. We viewed local farms with excellent crop prospects; we were guests at a luncheon through the courtesy of Capt. Charan Singh, Secretary of Haryana Farmers' Forum and visited a monastery for Hindus.

Another one-day trip we took was to Bagpat, where we visited the village of Mr. & Mrs. Puech (Life Members of Farmers' Forum). Mr. Puech and his charming wife graciously entertained us in their home in the village although it no doubt entailed a great deal of planning in order to do so. We again toured a mud-hut village, viewing the Hindu temple, observing a village tailor (who happened to be a woman) visiting the home of a village officer and walking through the beautiful mango groves."

"Arriving in Panchi-Gujran, we were met by our host families. The Fosters stayed with the Khanna family, the Peirces with the Bedi family and the Glausses with Col. Kalha and his family (all Life members of Farmers' Forum). The Fosters' host family, even though they had not been expecting them, immediately made them feel very welcome."

"These two days were one of the highlights of our trip to India. We had the opportunity actually to become a member of an Indian family. The warmth and love shown to us is something we will always remember. Col. Kalha's daughter had just returned from her honeymoon. We ladies enjoyed seeing all of the beautiful wedding saris, and also the pictures of the wedding. Another daughter of Col. Kalha's will be coming to the U. S. this summer on the IFYE Exchange Programme. We are all hoping to see her again this summer if it is possible."

"The following day, after observing the farming operations on our hosts' farms, we visited a tubing and pipe factory in Gannaur. It was interesting to find that 90 per cent of the production from this plant is exported. After visiting the factory, we stopped to see a leper colony financed and operated by an American woman doctor. This was our first experience with such an institution, and it was wonderful to see work being done. Later in the day we visited a Mahatma Gandhi Training Centre. Here selected individuals are getting training in food production, basic health and sanitation. There is one school in each State, and an average of 25 students are graduated each year. The motto of the school is something people all over the world should remember; "Cleanliness is like heaven. Dirt is like hell." We were very impressed with the work being done at this school.

In the evening a bounteous dinner was served at the Kalhas, with all the host families and guests present. The evening was made more enjoyable for some of us who dressed in the traditional Indian garments. The following morning was sad, for it was time to depart. We will always remember the warm hospitality shown to us here by our host families."

"In Karnal we visited the National Dairy Research Institute, where they are training students in the processing of milks, cheese, butter, and other dairy products and by-products. They also have a 400 cow dairy at the school, where they are milking Sahiwal cows, buffalo cows, Brown Swiss, cross-breeds, and Holsteins. Here we found that due to the shortage of drinking milk in India, the dairies are not permitted to use milk for manufacturing at this time. We had lunch with H.S. Nalwa, Life Member of the Farmers Forum, and drove on to Chandigarh."

"Chandigarh is the capital of Punjab. This is a very modern city, built in the last 15 years. It is said to be a miracle of planning. We noticed very few cattle wandering in the streets. Arriving at the State Guest Hotel, we were greeted by Col. Sir Buta Singh, who, we felt, was an old friend by this time."

"The Governor of the two States, Punjab and Haryana Shri Dharma Vira, invited us to tea, then took us on a fast tour of the grounds and fields closeby. Even our farmer men were somewhat out of breath when the tour ended, and the ladies had long since dropped out."

"Our first evening in Chandigarh, we were

hosted to a buffet by the Chief Minister of Punjab. The next day, we toured this clean beautiful city and saw the University and Medical Centre, which is considered the best in India. We drove to see the Moghal's garden which was built about 500 years ago, and is not only a marvel of planning and beauty, but is kept in excellent condition."

"A visit to the large government fertilizer plant was interesting. The plant makes calcium ammonium nitrate fertilizer with an elaborate electrolysis separation of gases, and the production of heavy water. This is the only plant in Asia making heavy water (one less molecule of hydrogen). A year's production is stored in a fairly small tank. The reason given by producing CaNA4N03 was that the ammonium nitrate which is widely used in America is explosive. Another curious fact was that a large standpipe was pouring out pure oxygen into the air, as it was a by-product of the manufacturing process. We could not imagine a private concern wasting this valuable by-product in the air. As badly as India needs fertilizer, we were told, the plant has to shut down quite often because of shortage of power."

"In this area there were large irrigation canals coming from the hills carrying clean blue water. We saw the source at Bhakra Dam. This dam is 17 feet higher than Boulder Dam, and contains enough cement to build a road 8 feet wide and 1 foot thick around the equator. It was especially interesting because it had equipment from many countries, Japanese turbines, English generators, and German cranes. One side of the dam was being equipped with large Russian generators but only one was in operation. The other side with its five generators had been completed for some time."

"The next day we visited the State of Himachal Pradesh, and for some of us it was the first opportunity to see terrace farming. The stone houses with their slate and straw roofs were quite different from the mud and brick houses of the villages on the plains. We also noticed that the hill people were very friendly. The children always waved as we passed them on the road."

The Indo-German Project at Sundernagar proved interesting from two view points: first, the fact that West Germany is able to be in the position of helping a developing country; and second, the technical assistance available. The fine job the 8 German technicians are doing along with the Indian agricultural officers was

also very interesting. The irrigation and drainage programmes introduced were new for this area, as well as the spotted highlander cattle in the country. Through artificial insemination over 4000 indigenous cattle have been bred to the higher-milk-producing highlander cattle. Plans for a 10,000 litre a day milk processing plant was also mentioned as being in the planning stage.

"After spending the night in Mandi, we visited a soil testing laboratory and a poultry farm at Sundernagar. We were shown soil maps of the districts which are being plotted at the laboratory. We were also shown many modern pieces of equipment being used there. The Government poultry farm there is hatching, raising, and distributing 5000 chickens per month to the villagers in the area."

"On the day we arrived in Meerut, we were welcomed by Mrs. Shakuntla Pundrikakash, (Member, Governing Body, Farmers' Forum), nicknamed 'Mrs. Happy' for she always had a smile. We first visited a small vineyard where the farmer was using the practice of nylon netting to keep the birds from damaging the grapes. The netting was used only for portion of the year. The owner felt this was more practical than putting up a wire mesh for the same purpose. We then drove to Mrs. Kaksh's farm and were welcomed by a large group. We were garlanded with beautiful flowers. The wheat here again was excellent, as well as the crops of gram, sugarcane, and peas. This land was irrigated with wells, and the latest hybrid seeds and modern fertilization techniques were being used. After viewing the farm we returned to Mrs. Kaksh's farm house. Here we enjoyed a warm reception with entertainment furnished by the villagers, which we tried to return with a song and dance of our own. Mrs. Kaksh then told how she had profited from her trip to the U.S. Sponsored by FWA. She told of how production had increased on her farm, and of the better farming techniques she was using since her visit to the U.S. We were then served dinner and had a chance to visit with the villagers. We also visited with a farmer who was farming 40 acres and felt the biggest problem of the farmer in India is that of government acreage limitations, and also the problem of mechanizing the small farm and still maintaining an economic unit. We felt that a part of the answer to the problem is cooperative ownership of farm machinery between two or more farmers. This is a practice that is still popular

in the U.S. in many areas. Due to the size of the operation, cooperative ownership becomes the only practical way to own many of the necessary farm tools.

In the afternoon we attended a meeting of the Meerut Farmers Club, and discussed farming in the U.S. and India during an informal discussion period. This farm group was also using the new varieties of wheat and working with the extension officer, Mr. H.P. Singh, to improve the farming practices. That evening we had dinner with Seth Banarsi Das whose joint family owned the local sugar mill and had a pleasant time eating and visiting. The next morning we woke up to the sound of rain which we understood was quite unusual for this time of year. The plans for the day had to be changed somewhat due to the wet weather. We first visited Mr. Rathi and saw his beautiful roses, of which there were many varieties. We then visited the farm of Sri Balbir Singh, but remained inside due to the weather. We had lunch and an enjoyable visit. About two we returned to Meerut, and were hosted at tea by Mrs. Kaksh in her spacious home. The rain stopped long enough for us to enjoy her garden and take some pictures before returning to Delhi."

"We visited Agra on Tuesday, March 28. We left Delhi by train, travelling in an air-conditioned coach which left little to be desired. The trip took about three hours and we travelled through mostly non-irrigated areas and the crops showed the results of the drought condition of India."

"When the average person looks at a picture of the Taj Mahal, he is aware that it is a beautiful structure in a pretty setting in India. It is only when one sees it personally that he becomes aware of how large it really is and the beautiful art work that has been done. The way in which it was designed and constructed was a feat of engineering and art that can never be equalled in this day and age.

"In the afternoon we visited the Red Fort of Agra and Palace of the Shah Jehan which had a wonderful view of the Taj in the distance. The feature of the heating and cooling system in the double walls and ceiling were very interesting, as well as the Hall of Mirrors in the palace. We were all very impressed with the arts, engineering, and beauty that had been accomplished here in the sixteenth and seventeenth centuries. Certainly no trip to India would be complete without seeing

the Taj Mahal and Agra."

"We found Madras to be warm and humid the moment we arrived. We were met at the airport by Mrs. Jaya Arunachalam and Mr. R. Srinivasan, and taken to our hotel. In the evening we took a short tour of Madras and a long walk along the seashore which was very beautiful and also cool and refreshing.

The next day we travelled about 20 miles to a government experiment station where we saw the new varieties of rice, as well as their work with vegetables and groundnuts. With the new varieties of rice, the farmers in this area will be able to grow three crops of rice a year. We were impressed here, as we had been able at the other government research stations, with the fine work being carried on.

In the afternoon, we visited a cooperative silk weaving centre. In this centre patterns are developed for the weaker members of the cooperative, who take them to their homes where they produce them in beautiful silk saris and silk cloth. The cooperative then markets the silk for the members in India and other countries.

The following morning we visited a very fine museum in Madras where we saw, among other things, some remnants of a city that was 5000 years old. Due to lack of time we were able to see only about half of the exhibits. We felt this short look we had at Southern India added much to our experience and our overall picture of India."

"Mrs. Usha Deshpande was an excellent guide and tour director, as well as our Chief of Protocol. She had many problems to cope with concerning our tour, but always managed to come up with the right decisions, no matter what the problem happened to be. One time when—through no fault of hers—a mistake was made on the confirmation of two of our plane tickets, she spent a solid hour getting matters straightened out to our complete satisfaction. Everywhere we went, people came up to speak to her. They were invariably overjoyed to see her. It made us proud to be associated with her, and we hoped we would conduct ourselves so she in turn would be glad she had been our guide.

We hope we can carry part of her warmth, her cheerfulness, her gaiety, and her love for India back to our homes. Her ability to work with not only foreigners but her own people was brought home to us many times. We were often reminded that a smile accomplishes

much, as we observed her talking with people in all walks of life. A big 'Thank you' is extended to her and we each hope we can soon entertain her in our own homes."

"It is impossible to list each activity and give the pertinent facts about each, much as we would like to do so. We were scheduled to see other farming areas at both Jaipur and at Kashmir but due to circumstances beyond our control, it was not possible to go into these farming areas. As we travelled through the ten States we were privileged to visit, we often spoke of how the people of India love beauty. We saw many beautifully landscaped gardens ablaze with colour and we enjoyed them as fully as their owners. We also saw tiny plots of flowers around mudhuts some no larger than an ordinary-sized meat platter, yet it satisfied someone's inner desire for a bit of beauty."

"We were always conscious of how generous the people were, no matter what their station if life might be. One day, two small children came down the hillside to watch us as we ate lunch of some fruit and a soft drink. One of our men handed each of them a wooden lead pencil. They smiled and thanked him before scampering back up the hill. Soon they were back with a huge pine cone for the donor of the pencil. All of us remarked on what a nice gesture it was on the children's part. They were sharing the best they had with their new-found friend."

"We were invited to go to a Hindu wedding ceremony. Although we did not stay for the entire service we saw the coming of the bridegroom, the meeting of the bride and groom, and their garlanding of each other. We were told the ceremony goes on until three or four in the morning. No wonder their marriages last better than ours!"

"The giving of flower garlands is such a lovely act of welcome which we enjoyed several times, always with a fresh sense of really being welcomed. It makes us wish we in the U.S. had some equally glamorous gesture to welcome our international friends. Only Hawaii, with its custom of leis for newcomers, equals the garlanding in India."

"In the villages we visited we found the women wanted to talk once they forgot their traditional shyness. They wanted to touch our skin, our hair (which probably felt scratchy to them as they have long hair and no permanents), and even our nylon-clad legs. They were curious as to why we were not wearing coverings on our heads, and whether we did work in the fields—hoeing, chopping etc."

"The women of India work very hard with few items of convenience, and bear many children. We were really surprised at the causalness with which the problem of overpopulation is discussed. The Government is doing much work in the area of family planning with free clinics and free insertions of the so-called loop. We read that a government-owned factory will manufacture several types of contraceptives for distribution to women all over India. There are huge bill-boards showing a small family with a message such as "Practice Family Planning" sometimes in English and sometimes in Hindi. Even the back of a bus had an ad saying much the same thing as the male co-director of the orientation told us. Even one midwife said she had done insertions of the loop on women desiring it, so surely the birth rate will go down gradually."

"The joint family operation of farms, factories, and shops seemed to us to foster respect for the elders in the family. The youngmen appeared to work right along with uncles, fathers and even grandfathers very well, as did the sisters-in-law, mothers and aunts. One house where we were entertained had 16 bedrooms, they told us."

"We were also impressed with the "D.P.'s" meaning those who lost their land, cattle, and even personal belongings, in Pakistan after the partition of 1947, for they were definitely an ambitious group and had done well. Many we met were Sikhs who had had to literally start over with desert land which they have now made into garden spots. Truly inspiring. One other item must be mentioned: the handicrafts. We saw beautiful handwork which had been done right in the villages we visited, and we also visited shops where items of beauty were being made. Boys of only nine and ten were making intricate designs in brassware. This creative ability is a wonderful gift that so many Indians seem to have in abundance."

"We were guests of the Director of Birla Institute of Technology and Science at Pilani, and State guests in Chandigarh of the Punjab Government and in Mandi of the Himachal Government, for which we were indeed grateful. The flowers and grounds, the beautiful views, the accommodations, and the over-courteous attention to our needs and desires will always be remembered with appreciation. Again—"Thank you"."

"As we left India we felt very grateful for the hospitality and friendship extended to us. The only way we can express our appreciation is to say: "Namaste—satshriakal—meharbani—shukria"."

Late Dr. G.V. Chalam—A Tribute

Padma Shri Dr. G.V. Chalam, Managing Director of the National Seeds Corporation passed away on 8th May, 1967. His untimely and sudden death came as a great shock to his numerous friends and admirers. In his death, not only the farming community, but the whole country has suffered an irreparable loss.

Dr. Chalam took his Master's degree in Agricultural Botany from Banaras Hindu University, obtaining First Division, in 1936. He later received training at the Indian Agricultural Research Institute, New Delhi and was awarded the Ph. D. Degree by the Patna University in 1943. Dr. Chalam received further training in the Indian Agricultural Research Institute, New Delhi, in plant breeding and genetics.

In the course of his distinguished career, he had been District Agricultural Officer, Assistant Director of Agriculture in charge of Land Reclamation and Seed Multiplication; Economic Botanist-cum-Paddy Specialist, and Reader in Agricultural Botany, Orissa Agricultural College; Deputy Director of Agriculture, Joint Director of Agriculture, Orissa; Dy. Agricultural Commissioner, Ministry of Food & Agriculture; First General Manager, National Seeds Corporation; Dy. Agricultural Commissioner, Indian Council of Agricultural Research and Joint Commissioner (State Liaison), Government of India, Ministry of Food, Agriculture, Community Development and Cooperation, New Delhi. He was the Managing Director of the National Seeds Corporation at the time of his death.

Dr. Chalam is the author of a number of scientific papers and books and the main author of 'Rice in Orissa', co-author of 'Soil Management in India,' and also main author of 'Introduction to Agricultural Botany in India' Vol. I and II, and 'Seeds Manual' for the Indian Seed Testing Laboratories in collaboration with USAID seed specialists. Dr. Chalam was a member of several learned societies, Vice-President of the Rice-Research Workers' Association of India, Member-Secretary of the Central Variety Release Committee and Member, Coop. Team on Agriculture,

Planning Commission. He was awarded Padma Shri for his meritorious work in the field of agriculture, which award he richly deserved.

Dr. Chalam introduced in India Taichung Native-1 paddy with practically one kg. of seed and built up a programme of nearly 1 million acres within a brief period of two years, consisting of 4 seasons, and all this with certified seeds only. With the introduction of Taichung Native-1 in India new vistas in high yield have been opened, where yields of 80—100 maunds per acre were hitherto rare, and have become now common with Taichung Native-1 in most of the States in India.

Dr. Chalam took great interest in the Bharat Krishak Samaj and his advice to the Samaj was readily available. He actively participated in the National Convention of Farmers organized by the Samaj in 1964 and made valuable contributions,

I knew Dr. Chalam since his Post-graduate training at the IARI when I was in charge of Post-graduate teaching in the Division of Botany. His craving for knowledge on agricultural subjects and love for agriculture and the concern for the farmers were evident even as far back as about 25 years or more. A few days before his death I had the occasion to speak to him on phone. I wanted to know if he could spare some time for two life members of the Samaj who wanted to discuss with him certain problems relating to improved seeds. Dr. Chalam replied "Mr. Deshpande, I can always spare time for the farmers and the Samaj howsoever busy I may be". His passing away is a great loss to the Samaj and a personal loss to me.

On behalf of the Samaj, and my own, I take this opportunity to extend to the bereaved family our heart-felt condolence.

R.B. Deshpande
Secretary
Bharat Krishak Samaj &
Editor,
Krishak Samachar

Science News

Brinjal Pests Control

Carbaryl or trichlorphon is most effective in controlling brinjal leaf beetles and fruit borers, according to experiments conducted at the Agricultural College and Research Institute, Coimbatore.

Three applications of 0.1 per cent sprays of carbaryl or trichlorphon beginning from the time the transplanted crop is one and a half months old check both the pests. The fruits must, however, be picked at least a fortnight after spraying and thoroughly washed in water.

Of the two pesticides, carbaryl was found to give better results and also more economical to use. It, however, does not kill mites as trichlorphon does.

A new Arhar

A new variety of arhar (redgram) which gives 150 kilograms of seed more than the best variety so far grown has been evolved at the Indian Agricultural Research Institute, New Delhi. This variety is called Arhar S 103.

At the Institute, it gave an average 1,120 kilograms of seed per hectare.

Arhar S 103 is tolerant to wilt. The seed is of good quality, shining brown, round and bold in size. Its plants are tall and erect. Therefore, larger number of plants can be grown on an hectare.

Potato Root-knot Nematodes

By intercropping potato crop with French marigold, root-knot nematodes can be considerably controlled. This has been found out in experiments conducted at the Central Potato Research Institute, Simla.

Growing of French marigold (*Tagetes patula*) plants alternately with potato rows reduces the number of these worms in the soil and their attack on potato roots and tubers.

Marigold can also be grown in the same row after every one to four potato plants for the same purpose.

The hird tcrop

A common cropping practice followed by

farmers in Hoshiarpur and Gurdaspur in Punjab and Kangra District of Himachal Pradesh will be of wide interest to others in view of the urgent need for stepping up food production.

In these areas, the farmers take a maize variety called satha makka, because of its 60-day duration, soon after the rabi crop is harvested. The maize gets harvested before the kharif crop is due to be sown. Thus, it is possible for them to raise three crops a year.

The farmers finish sowing satha makka by the end of April, and in case later than the 13th of May. They also water the crop profusely.

Taking advantage of its short duration, satha makka can be grown in between the sugarcane rows as well. All the cultivation care given to the cane crop will do for satha makka, excepting an extra dose of 8 to 13 kilograms of nitrogen per hectare.

Another practice, which also is suitable for adoption by farmers is the growing of a crop of common millet (cheena or vergu) in rotation with paddy and wheat or hybrid maize and wheat.

Kopergaon Mung

The growing of mung as a summer crop is possible with an early maturing variety called Kopergaon.

Normally, mung is grown as a kharif crop in Madhya Pradesh, but it fails to come up well if there are very heavy rains. Kopergaon is, however, suitable for growing in summer wherever it can be irrigated.

This variety was evolved at Chhindwara Agricultural Research Farm, Madhya Pradesh. It matures within 60 days and so is well-suited for planting along with maize during summer (March to May). On the Research Farm, grown along with maize, it always gave more than double the yield of kharif mung. If a green manure is desired for the incoming paddy, Kopergaon can be ploughed in after first picking.

More Crop Fertility from Poultry Farm

Poultry manure is the richest in plant food value of any of the farm manures. Correctly

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Samaj News

Ramgarh Krishak Samaj

On the initiative of Shri Indra Singh Dharamwal of Ramgarh, Nainital, a village level Krishak Samaj has been set up at Ramgarh. A sub-committee was set up of the following members, with each member undertaking individual responsibility :

Shri Indra Singh Dharamwal	Founder and Advisor, Public Relations.
Shri Umed Singh	Treasurer
Shri Amar Singh	Secretary
Shri Jasodh Singh	Advisor—Agro Industries
Shri Dalip Singh	—do— Horticulture
Shri Bahadur Singh	—do— Scientific Agriculture
Shri Khem Singh Rawat	—do— Nursery Production
Shri Gobind Singh	—do— Dairying
Shri Chatur Singh	—do— Vegetable Production
Shri Puran Singh, B.Sc.	—do— Plant Protection.

Bharat Krishak Samaj congratulates Shri Indra Singh Dharamwal on this useful work he is doing for farmers and commends this example to other members of the Samaj. Shri Dharamwal is a very enthusiastic Life Member of the Samaj.

Freedom From Hunger Project

A Project called "Freedom From Hunger" was inaugurated on 24th April, 1967 at Anna Purana Farms, Powai, Maharashtra. The project was organized by the Lions Club of Bhandup in close cooperation with the Thana Krishak Samaj. The Project was inaugurated by Padmashri Harish Chandra Patil ex-President Maharashtra Krishak Samaj and presided over by the Dist. Governor Lion Dhanayaybhai M. Parekh. Hon. Shri M.G. Vartak, Minister of Civil Supplies, Government of Maharashtra, was the Chief Guest.

Fixation & Wheat Prices in Punjab

The District Farmers Forum, Amritsar passed a resolution on 27th April, 1967, disapproving the Govt. decision to form single State zone, which it said would benefit only the traders. The resolution reminded the government

that in 1962 the Ujjal Singh Committee worked out Rs. 56.00 per quintal as the cost of production of wheat. Since then the price index had risen by 50%, so that the cost of production of wheat per quintal was Rs. 84.00. Adding the cost of managerial ability as also to cover the uncertainties created by low prices, a margin of 10% over the cost of production should be allowed, thereby fixing the price at Rs. 92.40 per quintal. In case this reasonable price was not fixed, the Punjab farmers would be compelled to switch over to cash crops, the resolution said.

Madras Farmers Forum—New President



Shri M. Bhaktavatsalam is now 70 years and a man of proved administrative ability. He has served Madras State for 20 years as Minister and has handled all the cabinet portfolios at one time or other. Hard work, unlimited patience, mastery of facts, attention to details, tact and capacity to maintain smooth relations are some of his admirable qualities. Simple and abstemious in habits, Shri Bhaktavatsalam is a man of learning and humility. With abiding interest in agriculture he has always been striving to make this State not only self-sufficient but also produce exportable surplus. As President of our Madras Organization he will find ever widening opportunities for rendering more and more service to the farmers and farming.

Celebration of National Farmers' Day At Jalgaon

This year the National Farmers' Day at Jalgaon was celebrated under the Presidentship

of Shri M.D. Chaudhari, Hon. Minister for Education and Forests, Maharashtra State. The function was inaugurated by Shri Vasantrao Naik, Hon. Chief Minister, Maharashtra State. On this occasion the inauguration of the Family Planning Project was also held by the Samaj in collaboration with the Farmers and World Affairs, Inc., U.S.A.

Life Members from the Jalgaon and Aurangabad Districts, some progressive farmers and Government Officials from Agricultural Department and Family Planning Department participated in the function.

The afternoon programme was devoted to discussions on hybrid crops and Family Planning.

A small exhibition was also arranged by the District Agricultural Officer.

On this occasion Shri Harishchandra G. Patil Ex-President of the Maharashtra State

Krishak Samaj, was felicitated on being awarded the title of "Padmashri" by the President of India.

Death Anniversary of Our Late President

10th April, the 2nd death anniversary of our revered President, Dr. P.S. Deshmukh, was observed most solemnly at Jalgaon office. All the Life Members took a solemn pledge to strengthen the Samaj and carry forward with devotion and missionary spirit the unfinished work started by the late Dr. Punjabrao Deshmukh.

Shri B.J.Trivedi succeeds Shri Basu

Shri B.J. Trivedi has succeeded Shri Basu as Secretary of the Young Farmers' Association of India.

Shri Trivedi has been closely connected with the Association since its inception and was till now its Joint Secretary.

Science News

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conserved, it is worth as much to the broiler raiser as an extra 1½ cents per pound on the selling price of broilers he raises. To the egg producer, it is worth as much as an extra dozen eggs per hen for the year.

Carelessly handled, poultry manure often loses as much as 70 per cent of its plant food value in 60 days, but properly conserved and used it can be a valuable source of fertility on any farm; on some farms, it can be the basis of the entire fertility program. When produced in volume—as when broilers, turkeys or layers are raised in commercial numbers—it can largely replace most commercial fertilizers and can build up poor farms to productive, profitable farms.

(Courtesy: World Farming)

Cloud-seeding increases rain-fall

Cloud-seeding will add 90 million to 100 million cubic meters of water a year to Israel's supplies at a cost of only 0.8 agorot (about a quarter of one U.S. cent) a cubic meter. This emerges from a report summarizing six seasons

of cloud seeding drawn up by Shaham, the electrical and technical services responsible for the project. From next winter on, the skies above all of Israel, north of Beersheba will be seeded regularly. The report makes allowances for technical mishaps which may reduce by half the percentage of rain-potential clouds to be seeded. Even then, the gross yield will increase by an estimated 270 million cu.m. of rainfall.

Under normal circumstances, about two-thirds of the rainfall are lost by evaporation and run-off, with only one third percolating underground to the water table. This third is equivalent to 90 million cu. m. a year. Considering however, that the figures are based on minimum estimates, the anticipated increase efficiency in flood-trapping techniques will probably increase the yield to about 100 million cu.m.

According to Shaham experts, inland precipitation increases, thanks to 'cloud-seeding', were as high as 27 per cent. The national average rise was, however, 18 per cent.

Fourth Plan : Agricultural Sector

(from previous issue)

IMPROVED SEEDS

At present improved seeds of foodgrain crops are estimated to cover about 120 million acres. A target of 274 million acres is envisaged for 1970-71. The approach will be to develop seed villages with guaranteed off-take and certification as a step towards area saturation.

The National Development Council Committee on Agriculture and Irrigation made the following recommendations in connection with improved seeds:

- (a) The Ministry of Food and Agriculture encourage each State to set up pilot seed villages for the Fourth Plan. Seed villages should be selected carefully with due regard to the suitability of soil, irrigation, human and organisational factors.
- (b) Since small holders, producing good seed may not be able to produce enough for sale, arrangements should be made to collect their seed quality produce by giving them an equivalent quantity of non-seed quality-grain.
- (c) Where a State can set up a seed corporation or large seed farms, the size of a farm should be determined with care. For economic production of good seeds farms should be between 300 to 500 acres.
- (d) The question of price and subsidy for seeds calls for reconsideration. The economics of production including the cost of processing, should be worked out and taken into account in regard to each category of seed.
- (e) The arrangements for testing and certification of seeds need to be strengthened and will call for periodic review.

The technical and administrative arrangements for supervision of multiplication, testing, promotion, certification, purchase, storage, credit and distribution will be strengthened. Distribution of uncertified seeds from Government and institutional seed stores including co-operative seed stores will be banned, area by

area, in a phased manner. A comprehensive seed law will be enforced in the interest of seed classification and seed control.

One of the important developments in the field of agricultural technology in recent years is the discovery of some very high-yielding fertilizer-responsive and non-lodging varieties of wheat and paddy and hybrid varieties of maize, jowar and bajra. The Ministry of Food and Agriculture has drawn up a comprehensive programme for these high-yielding varieties of crops to cover an area of 32.5 million acres. This programme will be taken up, as far as possible, in the IADP and AIIP districts. Even areas falling outside these districts could be taken up on account of their special suitability for growing these high-yielding varieties. In such cases the necessary organisation and other facilities will have to be built up on the pattern obtaining in the Intensive Agriculture Districts. The main feature of this programme is to saturate with improved seeds of significant high-yielding and fertilizer-responsive varieties about 8 million acres for wheat, 12.6 acres for paddy and 4 million acres each for hybrid bajra, hybrid jowar and hybrid maize, making a total of 32.5 million acres.

Fodder Crops for Sheep

The difficulties and expense involved in improving natural pasture have recently drawn attention to several fodder plants that are either unknown to sheep farmers or were neglected for one reason or another. Fodder pumpkins, Jerusalem artichoke, salt bushes are among the crops that had been tested by research workers years ago and were found to thrive in our climate.

Winter squash (*Cucurbita maxima*) yields heavy crops under dry conditions; the seeds are used for human consumption, while the rest of the fruit is fed to cattle or sheep. Jerusalem artichoke can be either cultivated or raised as pasture. When cultivated under irrigation it may yield up to 12 tons of green fodder, plus another 12 tons of tubers a dunam. Salt bushes could be planted as natural pasture over large tracts, unsuitable for other crops. The prickly pear thrives in dry regions and is adaptable to rocky, mountainous terrain.