genes (three distinct ones have been so far identified) to commercial wheat varieties has ushered in a new era in wheat yields. The variety Gaines bred in North America by incorporating the Norin dwarfing gene holds the world record for wheat production, having yielded nearly 10,000lb. per acre in a 25-acre plot. The wheat varieties developed in Mexico under a cooperative programme of the Rockefeller Foundation and the Mexican Ministry of Agriculture have helped to treble the average yield of wheat in that country within a decade. Mexican dwarf wheats like Sonora 63 and Sonora 64 were hence introduced into India in 1963. During the past two seasons in fields fertilized with over 100lb. of nitrogen these wheats have given yields of the order of 5,000 to 6,000lb. per acre. With the previous varieties yields higher than 4,000lb. per acre were seldom possible owing to the occurrence of severe lodging under conditions of high soil fertility and frequent irrigation. Though the morphological frame of the Mexican dwarf wheats proved ideal for intensive agriculture, they had red grains and hence gave dark *chapathis* (unleavened bread, which is the form in which wheat is mostly consumed in India). The farmer and the consumer prefer amber coloured wheat grains and hence these dwarf wheats were subjected to treatments with radiations and chemical mutagens. In the progenies of plants treated with ultraviolet and gamma rays, mutants with amber grains, which had all the other characteristics of the parent strains, were isolated this year and these can be appropriately regarded as the most precious atomic babies of 1965, so far as India is concerned.

Making Cotton Resistant to Jassids.—One of the major needs of India is more extensive cultivation of cotton varieties with a long staple length. Many long staple varieties stature and good grain quality but poor tillering ability, has been improved from an average number of six tillers per plant in the parent to over eight in the mutant.

Transmutation of Species

All the allied species of bread wheat, *Triticum aestivum*, have been synthesized from a single variety in New Delhi. The sub-species created artificially include what are known botanically as *Compactum, sphaerococcum, spelta, macha* and *vavilovi* (Figure 3). A similar transmutation of species has also been accomplished in the emmer wheat series, to which the macaroni wheat, *T. durum*, belongs.

The origin of new species or sub-species through single gene mutations suggests that although the evolutionary scale is usually traversed only by minute steps, occasionally jumps of larger quanta can take place. While most of these mutants are largely of theoretical interest, a mutant in the bread variety N.P. 797 obtained in treatments with radioactive sulphur (S^{35}) having the ability of adventitious branching recorded in nature only in the "Egyptian Miracle wheat" (*T. turgidum* var. *mirabile*) is of great practical interest. When it was first isolated this mutant had much sterility and also a weak expression of the branching character. By selection during the past five years, plants with well branched ears and good fertility have been developed (Figure 4). These plants produce nearly twice as many grains per ear as the parent variety. Fortunately they have also an associated dwarfing habit and may enable us to raise Sorghum-like wheat varieties.

Changes Not Found in Nature

Examples of the artificial creation of genes not found in a world collection of varieties exist in plants like barley and snapdragon, but they are very few. This is to be expected

cal sources and for detailed exploration by narrow-beam radio telescopes.

The present catalogue positions are known to be accurate to at least 1 minute of arc and in some cases to ¼ minute. About 600 of these positions have been examined on the 48-inch Palomar Sky Survey plates, leading to a total of 200 identifications with galactic and quasi-stellar objects. Confirmation of many of the northern quasi-stellar objects has been obtained through cooperation with Dr. Sandage using the 200-inch telescope at Mount Palomar, while just recently, in collaboration with the Australian National University, identification of the first two quasi-stellar objects in the southern sky has been obtained by photo-electric observations on the 40-inch telescope at the Siding Spring Observatory.

The traditional methods of interpreting observations using paper, pencil and the pen-recorded output of the radio telescope will always have an important place in radio astronomy—especially when there is no way

object known as N49, he found that the radio brightness was some hundred times that which could be accounted for by thermal emission.

A special examination of this object was made by Westerlund on the 74-inch Mount Stromlo telescope, which led to the exciting conclusion (Figure 2) that it was the remnant of a supernova — a catastrophic explosion which must have taken place some 5,000 years ago. Supernova remnants are, of course, well known in our own Galaxy, but this is the first such remnant to have been detected outside the local system. Further study shows that two other objects, N63A and N132D, in the Large Cloud are also remnants of supernova explosions even farther back in time. The sensitivity of the Parkes telescope is such that it is just possible that similar remnants may be discovered in some of the nearer external galaxies, and observations to this end are being made at the present time.

Polarization and Faraday Rotation.—Another exciting discovery at Parkes was that

M. S. Swaminathan

Cytogenetical Research at the I.A.R.I

Newspaper cuttings

A CLEVELAND, OHIO NEWSPAPER MARCH, 1960.

Study Urged on Peanut Oil, Cancer Link

By Science Service

WASHINGTON — Investigating peanut oil as a cancer-causing agent might be worthwhile, two Indian scientists have suggested.

Peanut oil caused many mutations in wheat seed which had been soaked in it for 24 hours, reported M. S. Swaminathan and A. T. Natarnatarajan of the Indian Agricultural Research Institute, New Delhi.

Since there is believed to be a relationship between mutation-causing agents and cancer-causing agents, they said, it may be worthwhile pursuing the oil's effect on genes and chromosomes from the point of view of cancer and its cause.

"The role of nutrition with reference to the incidence of cancer is now widely realized and there are indications that a search for carcinogenic compounds in human dietary regimens might be worthwhile," they reported. "Peanut and mustard oils are widely used as cooking media in tropical countries."

TIMES OF INDIA, JANUARY, 1960.

Delhi Will Soon Have An "Atomic Garden"

USE OF RADIATION TO EVOLVE NEW STRAINS

By A Staff Reporter

AN "atomic garden" will soon blossom in Delhi to help the farmer reap richer harvests by sowing better varieties of plants.

The first of its kind in the country, the garden, being laid out at the Pusa Institute, will harness radioactivity to produce new strains resistant to disease and pests, and to suit different soils and climes.

At the "atomic garden", scientists of the Pusa Institute, working on the principle that radiation changes hereditary characteristics of plants, will bombard crops with Gamma rays from Cobat 60 to evolve "mutints"—plants radically different from their "parents."

Useful "mutints" will be multiplied in the Pusa fields and the seeds will be marketed for growing bigger and better crops.

Safety measures have been taken to ensure that the radiation from the garden is not absorbed by reareach workers and other people—a big dose can be fatal.

A 12-foot-high wall around the garden will contain the radiation. Electronic "locks" will keep the intruders out and see to it that Gamma rays are not emitted when men are working in the garden.

SOURCE OF RADIATION

The source of radiation, Cobalt 60, imported from Canada, will rest in a thick lead casing in the centre of the circular garden. It will be "remote-controlled" from a panel room, 300 feet away, so that it can be raised out of its casing when radiation is needed for plants.

The panel room will be manned day and night. Research workers will wear "radiation sensitive" badges to detect the smallest trace of radioactivity. They will also undergo medical tests periodically.

The first experiments will be conducted on "potted" plants. But gradually they will be extended to cover regular crops sown in eight different sectors of the garden. Seeds in special trays will also be exposed to radiation.

The crops will be fed by artificial rain, produced by specially-designed hydrants.

The intensity of radiation on each group of plants will be measured by special trolleys containing X-ray films.

The entire equipment has been designed by Indian engineers. So far, the project has cost about Rs. 3 lakhs.

The garden was designed by a group of scientists at the Pusa Institute including Dr. C. Dakshanamurthy, a radiological safety expert, and Dr. M. S. Swaminathan, who recently visited similar gardens in Sweden and Germany, under the guidance of Dr. B. P. Pal, Director of the Institute.

The establishment of the garden follows four years' research on "atomic mutations" in botanical laboratories of the Pusa Institute under Dr. Swaminathan. Already four new varieties of wheat, one of cotton and one of tobacco have been evolved. Atomic radiation has also helped in improving the quality of chrysanthemums in two cases.

One of the new varieties of wheat has developed large "awns" and is well protected against birds. Another has smaller but stouter stems to withstand the winds. The remaining two varieties are rust-proof.

The "atomic-variety" of cotton is resistant to 'jassid' insects, while the new variety of tobacco, with large leaves, is an improvement on the Guntur variety.

About 40 scientists are conducting research in different departments of the Institute on the use of atomic energy in agriculture. The biggest team is working on the "atomic energy for better crops" experiment under Dr. Swaminathan.

Experiments conducted by Dr. N. P. Datta at the Institute with radioactive isotopes have also established that the best way to use fertilisers in case of paddy is to sprinkle them on ground surface while in case of wheat they have to be below the ground surface.

SCIENCE NEWSLETTER, JANUARY 30, 1960.

NUTRITION

Peanut Oil Causes Mutations in Wheat

INVESTIGATING peanut oil as a cancer-causing agent might be worthwhile, two Indian scientists have suggested.

Peanut oil caused many mutations in wheat seed that had been soaked in it for 24 hours, report M. S. Swaminathan and A. T. Natarajan of the Indian Agricultural Research Institute, New Delhi. Since there is believed to be a relationship between mutation-causing agents and cancer-causing agents, they say, it may be worthwhile pursuing the oil's effect on genes and chromosomes from the point of view of cancer and its cause.

"The role of nutrition with reference to the incidence of cancer is now widely realized and there are indications that a search for carcinogenic compounds in human dietary regimens might be worthwhile. Peanut and mustard oils are widely used as cooking media in tropical countries," the scientists point out.

Details of their study appear in *Journal of Heredity* (Vol. 50, No. 4, 1959). They soaked einkorn, emmer and bread wheats in peanut, mustard and castor oils. The seeds were sown in the field or germinated in the laboratory in petri dishes. In both bread wheat and einkorn, the peanut oil caused the greatest reduction in germination. Fertility was also reduced in the bread wheat. Some of the mutations produced may be of economic value, the scientists say.

Science News Letter, January 30, 1960

PEANUT OIL CAUSES MANY MUTATIONS IN WHEAT

1/15/60W

By SCIENCE SERVICE

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TALK BROADCAST FROM THE AIR, NEW DELHI, ON THE 19th JAN., 1960.
ALSO PUBLISHED IN
AKASHVANI
CAITRA 28, 1882 SAKA, APRIL 17, 1960

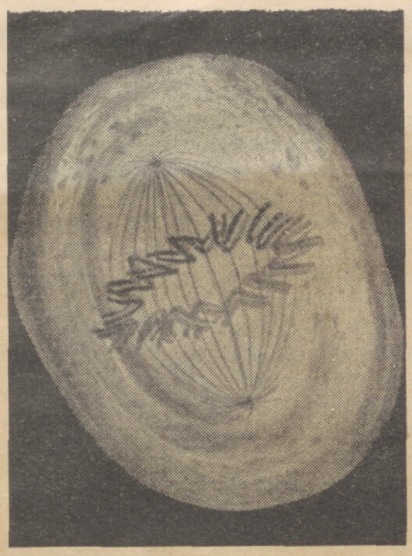
SCIENCE

Man-made Evolution

During the recent 'Atoms for Peace' Conference at Geneva, a paper on "Polyploidy, Radiosensitivity and Mutation Frequency in Wheat" read by Dr. M. S. Swaminathan of the Indian Agricultural Research Institute, New Delhi, roused considerable interest. His paper dealt with the problem of inducing mutations in wheat, which is a "polyploid" plant (a plant which has more than two of the basic sets of chromosomes. (Chromosomes are the minute thread-like structures found in every living cell which while helping body-growth by cell division and multiplication, preserve the identity of each cell. They are the carriers of qualities from one generation of cells to the next). He explained how mutation breeding might be preferable to classical methods such as hybridization for incorporating specific characters found in a desirable variety.

Just a hundred years ago, Charles Darwin published his *Origin of Species,* proving that "species are not immutable". He knew nothing, of course of the modern mutation theory. Although his view, that environment could modify individual organisms and that these modifications were communicated through the blood stream to the germ plasm down through the generations, was discarded later, natural selection by survival of the fittest remains the corner-stone of the evolutionary process. Not content with the natural selection, the modern geneticist began to work for wide variations in order to make the best selection in accordance with his prescribed needs and particular conditions. He wanted to economise on time and speed up the process which in unassisted nature took centuries.

X-Ray irradiated Chrysanthemum



Splitting of chromosome inside a cell

This he is now capable of doing by combining the desired qualities found in various species and eliminating undesirable ones. In nature, these are effected by various means such as changes of climate, exposure to danger, and other ecological factors which favour the survival of particular variations.

In the laboratory, we have the old, not-so-scientific method of cross pollination, the modern method of chemical treatment and the recent method of irradiation by radio isotopes and X-rays to cause mutations. Cross-pollination, however, is no answer to many of today's plant-breeding problems. With the discovery of Colchicine in 1937, capable of doubling, chromosome number (the effect being size enlargement) in both plant and animal cells, scientists have found an easy method of bringing about mutations.

Colchicine is an alkaloid chemical found in small traces in the seed and corn of a plant called Autumn crocus. Its application even in a 0.1 per cent concentration will cause a chromosomal increase without any toxic side-effects. Since it is prohibitively costly—at present £3 per gram —scientists are looking for other chemicals having this property. It was found recently that castor oil and groundnut oil have this property though not to the same extent.

Since the chromosome number is a determinant factor in the size of a living organism, the doubling of chromosomes in plants artificially will result in producing larger plants, with larger leaves and flowers, larger pollen grains; shorter, stouter fruits and larger seeds. There is an optimum limit to this process for every species, after which any chromosomal increase can only be to its disadvantage. Often this physical mutation may result in the permanent sterility of the plant.

A variety of water-melons completely devoid of seeds has been evolved at the Indian Agricultural Research Institute. It has the added advantage of having a higher sugar content. The process of doubling chromosomes with Colchicine should find wide application in economic plants in which the use is of the vegetative part, flowers or roots and the reproduction is vegetatively.

Experiments with radioactive isotopes in plant research have revealed innumerable possibilities in plant breeding. Apart from its applications in research work in manuring, radio-isotopes are used to produce mutations. The ionizing radiation which they emit induces permanent heritable changes in living cells. The X-ray is also used instead.

The scientists in the Indian Agricultural Research Institute have been trying for the last few years to produce radiation-induced mutations in seeds, seedlings and flowers of wheat, cotton, tobacco, potato, tomato and many ornamental plants. The Institute has already evolved a rust-proof, high yielding wheat variety, the first of its kind to be produced anywhere in the world. Recently the scientists in the Institute succeeded in producing a fully bearded mutant of the above wheat variety

Rust-proof, mutant wheat

with all its former qualities and a still higher yield. Farmers prefer the awned (bearded) variety since it reduces damage to grains by birds. This mutation was produced by treating seeds with radio-active phosphorous. Similarly, the seeds of the annual chrysanthemum was irradiated with X-rays at the Institute and half a dozen mutant varieties of beautiful chrysanthemum flowers were produced.

Dr. B. P. Pal, the Director of the Institute, looked forward to a great intensification of the mutation research programme with the establishment shortly, of a 200 Curie Cobalt 60 "gamma garden" in an isolated plot in the farm. Many crop plants and fruit trees will be irradiated in this 'garden' at various stages of development and thus the potentialities offered by atomic radiation in plant breeding will be fully exploited.

Though there is no immediate prospect for large-scale utilization of Colchicine effects and mutation power of radiation in animal breeding, the sterilizing effects of radiation is put to good use in the control of insect pests under field conditions. In the West Indian island of Curacao, the screw-worm has been eradicated through the use of a most ingenious method involving the sterilization of male flies in the laboratory by gamma rays and their subsequent release in the field in large numbers, so that the female flies mating with them will not produce fertile eggs. This method, now also used in the U.S.A., is being tested in the control of the corn-borer and other pests at the Indian Agricultural Research Institute.

Mysterious Vitamins

The functions of many of the Vitamins are still something of a mystery. Yet we know that they are vital to life. Swollen tongue and scaly skin suggest avitaminosis due to lack of Niacin. Nervous disorders and heart palpitations may be indications of beri-beri due to thiamine (Vit. B) deficiency. Vit. A is essential to good eye-sight, and its absence causes night blindness and skin rashes. But none of these vitamins are manufactured in the human body. They are supplied through food.

Studies in the vitamins are something rather new in India. With the starting, perhaps for the first time in the country, of a post-graduate course in nutrition, the Lady Irwin College in New Delhi has made a happy beginning this year. A systematic research in Vit. P present in indigenous vegetables and fruits was already in hand in the College under Dr. Bimla Puri, a Colombo Plan trained expert. The presence of Vit. P in appreciable quantity in conjunction with Vit. K along with iron, calcium and phosphorus has been noted in the leaves of common useful kitchen plants like *poi, methi, pudina, bathua, chulai,* mustard, soya and spinach. The presence of Vit. P has also been observed in brinjals, *dhania* leaves, lettuce, onions, sweet potato, cabbage and cauliflower.

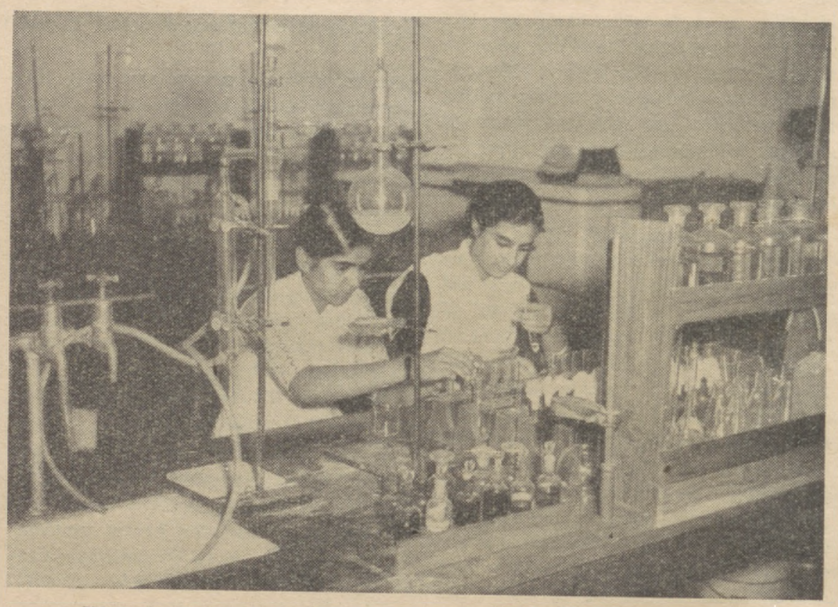
It has been found that Vit P, which has a diuretic and purgative effect on the system, also acts on the heart and the blood pressure. Its presence cures many defects of capillary permeability.

Another project on which Dr. Puri is working is designed to ascertain the nutritional value and vitamin content of foodstuffs commonly consumed in Delhi State. She has found by actual analysis that the food composition tables of Indian foodstuffs so far available referred to them in their raw state, and that the actual nutritional value of much of the food at the time of consumption is, in fact, very much lower. Dr. Puri is planning a thorough survey of the foodstuffs prepared in restaurants, hotels, hospitals and ordinary homes.

All plants and almost all animals, except primates (men, apes and monkeys) and guinea pigs, make their own Vit. C otherwise known as ascorbic acid. Chemically very similar to simple sugars, it is found in the human body in abundance. The average daily requirement of Vit. C of an adult is about 50-60 mgs. When the body fails to obtain Vit. C in required quantities, the blood vessels become weaker and break easily, so that they are bruised at the slightest impact. The gums bleed and become puffy and wounds heal slowly.

Vit. C, which cannot be stored for long and which is destroyed by heat, is found in fresh fruits and leafy vegetables; it is absent in animal products. The species-difference in regard to the biosynthesis of this mysterious substance was a subject of study recently by two Indian scientists, R. N. Roy and B. C. Guha of the University College of Science and Technology, Calcutta. They found that the kidney tissue of reptiles, amphibians and those birds which belong to groups that evolved early, could make Vit. C. In the most recently evolved groups of birds, like the magpie, the robin, the crow and the myna, this built-in function of manufacturing Vit. C was found transferred to their liver. The red-vented bulbul and the Indian fruit bat, like men and monkeys, have no such chemical mechanism at all. The scientists found that the enzyme systems involved in making Vit. C, whether in liver or kidney, are identical or closely similar in all species. They infer that in the evolutionary ascent, the mechanism of Vit. C synthesis seemed to pass from the kidney to the liver and disappeared from the body altogether in the latest species.

In 1957, the country imported Vitamin C alone of the value of Rs. 12 lakhs. The National Chemical Laboratory at Poona has worked out recently a new synthetic process to produce Vit. C in commercial quantities. A number of other schemes for the manufacture of Vitamins including Vit. A from lemon grass oil are also in various stages of progress.



Vitamin research at Lady Irwin College: Unsolving the mystery

TALK BROADCAST FROM THE AIR, NEW DELHI, ON THE 19th JAN., 1960.
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CAITRA 28, 1882 SAKA, APRIL 17, 1960

Radioisotopes—extremely minute things—seem to be able to help us grow more food. More strength to them, we say.

RADIO-ISOTOPES FOR AGRICULTURE

Dr. M. S. SWAMINATHAN, Cytogeneticist, Indian Agricultural Research Institute, New Delhi.

WITH the advent of the atomic era, the old alchemist's dream of transmutation of elements has come true. We now know that elements having identical chemical properties but different atomic weights exist in nature. Such elements are called isotopes. Some insotopes are stable and these can be detected and estimated only by their difference in weight from the normal forms. The unstable isotopes are radiocative because the nuclei of their atoms disintegrate, emitting one or more types of radiation. With suitable instruments, these radioisotopes can be detected in very small amounts—literally a few atoms—because of the enormous energy liberated during atomic disintegration. In a nuclear reactor such as the 'Apsara' reactor at Trombay or the Triga reactor in the American pavilion at the recent World Agriculture Fair, stable isotopes can be converted into unstable or radioactive ones by bombarding them with neutrons. Nearly all the common chemical elements, like carbon, phosphorus, sulphur, iodine etc. can now be obtained in the form of suitable radioisotopes. In contrast to a stable isotope which can be detected only by a detailed chemical analysis, a radioisotope readily betrays its identity by the radiation it emits. It is, therefore, an elegant tool for use as a tracer in physiological, nutritional and a wide range of other experiments. For example, if the atoms of a chemical constituent of the tea we drink are made radioactive, we can then follow the tea in its travels in the body and find out its ultimate fate. In fact, radiotracer research had its genesis in a remark of this kind casually made by Professor Georg de Hevery of Sweden over a cup of tea.

AGRICULTURAL RESEARCH

Radioisotopes can be used in agricultural research in two important ways, firstly, as tracers and, secondly, as sources of irradiation of biological tissues. Research in the fleld of biology and agriculture has so far been handicapped by the apparent impossibility of the experiments that would be most instructive. Radioisotopes have now removed this limitation and thereby added a new dimension to biological research. Thus, the use of radiophosphorus has enabled agricultural scientists to study the efficiency of fertilizers in a new and striking way. The conditions under which phosphorus is best made available to the plant have been studied with different soil types, methods of irrigation, depths of application of the fertilizer and types of plants. It was found in an experiment conducted at the Indian Agricultural Research Institute that phosphatic fertilizers are utilised best by a variety of paddy when the fertilizer is applied at the ground surface. On the other hand, the maximum uptake of phosphorus occurred in a variety of wheat when the fertilizer was applied at two inches below the ground level. Such experiments help in formulating correct and dependable procedures of fertilizer application and thereby of more efficient and economical agronomic practices. In a similar way, isotope studies are also leading to the development of more efficient insecticides and fungicides. Tracer experiments are particularly valuable in studies on the metabolism of certain elements like zinc and boron which, though essential for plant and animal health, are needed in only microscopically small quantities. But the most outstanding contribution made by radiotracer technique is in the elucidation of photosynthesis, the process by which green plants, using energy from the sun, convert carbon-dioxide from the air and water from the soil into sugars. This process is the very foundation of agriculture, but the efficiency utilization of solar energy in this process in our crop plants is of the order of only one to two percent. The same is true of various biosynthetic processes like nicotine production in tobacco, fibre development in cotton and synthesis of various edible and essential oils in many plants. With the knowledge concerning the basic mechanism of these processes now becoming available for the first time, thanks to radiotracer techniques, we can devise means of increasing the efficiency of both photosynthesis and biosynthesis.

I mentioned earlier that besides being useful as tracers, the radiations emitted by unstable isotopes are also valuable in agricultural research. Radiation can penetrate biological tissues and induce changes in them. One of the first potential applications of radiation to be investigated was, therefore, whether it could be used to kill insect pests infesting growing crops or stored food material. The use of radiation to preserve foodstuffs is particularly attractive because it involves no change in temperature unlike all other prevalent methods of preservation. Extensive research carried out in this field in Europe and North America suggests that radiation may be of value in extending the storage life of meat, cereal grains and products, dried fruits and potatoes.

The sterilizing effects of radiation have also been put to good use in the control of insect pests under field conditions. For example, the screw worm, a serious pest of cattle, has been totally eradicated from the West Indian island of Curacao by a most ingenious method. The male flies were first sterilized in the laboratory by exposing them to radiation from radioactive Cobalt and then released in the field in large numbers. In this species females mate only once, and those mating with sterile males do not produce fertile eggs. Over a period of years, the population of this pest gradually dwindled and ultimately died out.

EFFECT ON HEREDITY

Perhaps the most widely discussed aspect of radiation has been its effect on heredity. When a living organism is exposed to radiation emitted by radioisotopes or generated by other means, profound changes take place in genes and chromosomes which are the fundamental material determining inherited character. Some of the progeny of an irradiated plant may differ from the parent in one or more characters and these plants will transmit the altered characteristics to later generations. This process is known as mutation. Mutations occur spontaneously in nature, but relatively rarely. Radiation increases the frequency

(~~Continued on page 43~~)

of appearance of mutations by fifty or hundred fold, or even more, and thus new variability can now be created artificially. Since variation is the life blood of plant breeding, it is hardly necessary to stress the significance of this development in increasing food production through better crop varieties. Work of this type has already paid rich dividends in Sweden, Germany and the United States. In the Indian Agricultural Research Institute several economically valuable mutations have been obtained in wheat, potato, cotton, tomato and tobacco, and I shall cite one exmaple of a useful mutant. As is well-known, many wheat varieties resistant to the rust and loose smut diseases have been bred and released by the Indian Agricultural Research Institute. Some of the new Pusa wheats, however, do not possess awns, which are bristle-like structures found on the flowers. Our farmers like the awned wheats because the presence of awns prevents damage to grains by birds. While it will take many years to incorporate the character of awning in an awnless wheat by conventional breeding techniques, fully awned mutants of several new varieties have been obtained in one season by treating the seeds with radioactive phosphorus. Seeds of these mutants are being multiplied and within the next few years, some of the wheat varieties which our farmers grow may be the products of irradiation.

Finally, you may wonder to what extent we are making use of radioisotopes in agricultural research in India. Research on the lines I have just indicated is already in progress at the Indian Agricultural Research Institute, New Delhi, the Atomic Energy Establishment, Trombay, the Bose Research Institute, Calcutta, and a few other centres. The twin basic needs for such research are, first, the easy availability of radioisotopes and the instruments necessary to detect radiation and, secondly, trained personnel. Our requirements of radioisotopes will be fully met when the Canada-India reactor, now nearing completion at Trombay, goes into operation later this year. Most of the instru-

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ULTRAVIOLET REDUCES MUTATIONS
FOLLOWING X-IRRADIATION OF WHEAT

11/19/59W

By SCIENCE SERVICE

WASHINGTON, -- Ultraviolet light protects wheat seeds against the chromosome changes that usually follow exposure to X-rays, a team of Indian scientists reports here.

However, the protection is only effective at certain levels of irradiation, M. S. Swaminathan and A. T. Natarajan of the Indian Agricultural Research Institute, New Delhi, India report in the current journal, Science (Nov. 20).

Studies such as this one help point the way to improved plants and animals by indicating how changes or mutations are caused and what is involved when they do occur.

Pretreatment of the bread wheat seeds with ultraviolet for one hour significantly reduced the mutation rate following irradiation at 11,000 and 16,000 roentgens. Yet, the scientists find, there was an increase in the mutation rate when the pretreated seeds were exposed to higher doses at 22,000 and 33,000 roentgens. No mutations occurred in seeds irradiated with ultraviolet light alone.

Although the types of mutations that showed under the various irradiations were mostly similar, chlorophyll deficiency or the albina mutation turned up in plants treated with ultraviolet plus 16,000 roentgens of X-rays. Albinas have not previously been recorded in mutation experiments with bread wheat, the scientists point out.

They suggest that ultraviolet pretreatment induces a mutation in the "factors" that control chlorophyll development in the plant.

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ments needed for radiotracer work are also being manufactured in India by the Atomic Energy Establishment. In view of the serious health hazards involved in work with radioisotopes as well as the specialised nature of radiotracer studies, the need for undergoing proper training before taking to such research is obvious. Facilities for getting training in the measurement, handling and use of radioisotopes are available in India at the I.A.R.I. and at Trombay. An international training course on the use of radioisotopes in agricultural research sponsored jointly by the Government of India, UNESCO, FAO and IAKA has been inaugurated on January 20 at the I.A.R.I. India is well launched on an intensive programme to press isotopes into the service of agricultre.

AIR DELHI

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INDIAN NEWSMAGAZINE

PUBLISHED EVERY SUNDAY

Radio Isotopes and Plant Breeding

The most fruitful advances of science in recent times owe to the inventors of new tools and appliances which have enabled scientists to work at quicker pace with amazing accuracy. Of these, the more recent and extensively used are the radio isotopes. It would be difficult to give an accurate number of the isotopes now made available and the fields of investigations in which they find use, as both are on the increase every moment. At the World Agricultural Fair, in New Delhi, both the American Pavilion and the Atomic Energy Establishment of India focussed attention on the great possibilities of the use of isotopes in agricultural research. A seminar of agricultural experts of India and other countries (U.K., U.S.A., U.S.S.R., W. Germany, and Hungary) on the use of radio isotopes in agriculture was in session in the W.A.F. premises to discuss, exchange experiences and formulate the future policies to harness these for increased crop production in our country.

The isotopes of a radioactive element are known as radio isotopes and all the others are designated stable isotopes. Radioactive isotopes of certain heavy elements, for example, uranium and radium, occur in nature. However, radioactivity may artificially be induced in those elements which are naturally not radioactive, by bombardment with various types of elementary particles such as neutrons, protons, deutrons and alpha particles with the aid of the cyclotron or an uranium pile reactor. Atoms of all radioactive elements gradually disintegrate through emission of charged particles and radiations. For the artificially radioactive elements, which are of considerable importance in biological studies, the disintegration takes place through emission of electrons and protons.

Transmutation of Elements. Through loss of these particles and radiations by radioactive isotopes, one element is transmuted into another. The period of time required for half of a known weight of the isotope to be converted into the kind of atom into which it is degraded, is known as its "half life"—which varies from less than a second to many hundreds of years. Thus three radioactive isotopes of carbon, viz., C^{10}, C^{11} C^{14} are available with half life of 9 seconds, 21 minutes and 5000 years respectively. A radioactive isotope betrays its presence wherever it may be, by the continual emission of charged particles which can be detected accurately with a Geiger counter or an electroscope.

Among the different fields in which radio isotopes are now being used at the I.A.R.I., New Delhi, the experimental results in plant breeding to produce superior varieties of crops, merit special mention. It is now known that cultivated crops have evolved from wild ancestors through selection by man over a very long period of time and as a result of conscious breeding for characters of economic importance. Nature occasionally provides mutants but these are few and need not necessarily be of any economic importance. The plant breeder still tries to take advantage of many favourable mutations, but unfortunately, in more intensively bred crops, such as wheat, for instance, a stage seems to have been reached where the natural variation appears to be quite inadequate for the needs of the plant breeder.

The treatment of plants with radioactive isotopes gives rise to several variations in the characteristics of the plant providing a large material of variations for the breeder's choice. While it would take several years to bring about this change by conventional breeding methods, the change can be achieved in a single generation by the radioisotope treatment. Thus, by the treatment of wheat plants with radio-active phosphorus and sulphur, several awned plants have been obtained in the normally awnless wheat varieties. This is of considerable importance, as awned varieties are prefered by Indian farmers, for the presence of awns prevents damage to grains by birds. This fruitful line of study is being pursued to induce awning character into rust resistant varieties of wheat.

Crop Improvement. A programme of improvement of a rich variety of crops grown in different soil and climate conditions of this country is of very great importance. However, it is necessary to mention the observations of Dr. R. A. Silow (F.A.O. Rome) that "the use of radiation induced mutations does not provide the answer to all plant breeding problems, nor is to be regarded as a short cut to crop improvement. Irradiation is only the beginning of a long period of painstaking work extending over many years that will be required to identify the potentially useful mutations, to develop them into agronomically acceptable varieties and to test their superiority under field conditions before they can be put into production. This procedure will not always be simple and straightforward, for as well as having advantages, the method has its limitations. It will certainly not replace conventional plant breeding methods but should be regarded as a supplement to them."

A programme of crop improvement with these isotopes is at present under way at the I.A.R.I., New Delhi and a few other centres, where a band of energetic young scientists work under the leadership of Dr. B. P. Pal, a plant breeder of great eminence who presides over the activities of the nerve centre of agricultural recearch of India, the I.A.R.I. With the assistance of Dr. C. Dakshnamurti and Dr. M. S. Swaminathan, he obtained the necessary trained personnel for this new project of research work through an international training course on the use of radio-isotopes arranged especially for young scientists of India and other underdeveloped countries of South East Asia. This course was inaugurated on 20-1-60 by Dr. P. S. Deshmukh, Union Minister for Agriculture at the I.A.R.I.

NEW TRENDS IN FARM RESEARCH

By
DR. B. P. PAL, Director, Indian Agricultural Research Institute, New Delhi

"NOW, here, you see, it takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that," said the Red Queen to Alice. This quotation from "Through the Looking Glass" illustrates the situation in the field of agricultural research probably more vividly than in any other field On the one hand, advances in medicine and public health continuously enhance the unbalance between the number of people to feed and the supply of available food, and, on the other, advances in industrial technology and a rise in the standard of living create problems of quality and consumer preferences with regard to food material.

Also, the extension of the area under cultivation by means of irrigation and other projects and the practice of intensive agriculture in areas already under the plough all create fresh problems such as the need for new varieties which can respond well to manuring and irrigation, increase in the incidence of pests and diseases and unfavourable changes in the chemical composition of the soil.

The agricultural scientist is therefore in the unenviable position of having to run twice as fast as he can even to maintain the status quo as regards food supply. This is no doubt a challenging situation and I shall endeavour to indicate in this article a few of the new trends in agricultural research which give hope that this challenge can be met successfully.

Atomic Energy

Since the present era has been popularly christened the "Atomic Age", it would be appropriate if the impact of the developments in the field of atomic energy on agricultural research is considered first. Atomic energy today is no longer the province of nuclear physicists and engineers alone. In fact the transmutation of disciplines is as much a part of the alchemy of atomic energy as the transmutation of elements. As far as agricultural research is concerned two aspects of atomic energy, radiation and radioisotopes, are of great promise. The characteristic of radiation of interest to agriculture is its ability to penetrate biological tissues and induce changes in them. One of the first potential applications of radiation to be investigated was therefore whether it could be used to kill insect pests infesting growing crops or stored food material. The use of radiation to preserve foodstuffs is particularly attractive because it can be used at low or normal temperatures, thereby avoiding the changes in digestibility and palatability associated with the common method of preservation by heating. Extensive research is in progress in this field and radiation appears to be particularly promising in preventing spoilage of stored foodstuffs such as meat, grain, cereal products and dried fruit and in extending storage life of potatoes and root crops by suppression of sprouting. The sterilizing properties of radiation are also finding application in pest control work. Thus the screworm, a parasite on animals, has been exterminated from the island of Curacao by releasing large numbers of adults that had been sterilized by irradiation. Many more important insect pests may get eliminated in this way.

Mutations

An application of radiation of quite different nature from that involved in food preservation and pest control is in connexion with the breeding of improved varieties of plants and animals. It has been known for more than three decades that radiation such as X-rays can cause heritable variation or mutation in plants and animals, and with the advent of atomic energy more potent radiation sources have become readily available.

Ears of the awned mutant of N.P. 809 produced by treating seeds with radioactive phosphorous.

Mutations also occur spontaneously in nature but at very infrequent intervals. Radiation increases the frequency of appearance of mutations by fifty or one-hundred fold or more and thus provides a relatively simple means of greatly expanding the variability available to the plant breeder for selection. This method of accelerating plant breeding has yielded rich rewards in countries like Sweden. Work in this field was started a few years ago at the Indian Agricultural Research Institute and already several economically useful mutations have been obtained in wheat, potato, cotton, tomato and tobacco. As is well known, many wheat varieties resistant to rusts and loose smut have been bred and released by the Indian Agricultural Research Institute and these have prevented the total loss of wheat crops in years of severe rust and loose smut epidemics. Some of these new Pusa wheats, however, have no awns (bristle-like structures found on the flowers) and this is a handicap since our farmers prefer the awned wheats in the belief that the presence of awns prevents damage to grains by birds. While it will take many years to incorporate the character of awning in awnless wheats by conventional breeding procedures, fully awned mutants of several new varieties have been obtained in one season by treating seeds with radioactive phosphorus. Seeds of these radiation-induced mutants are now being multiplied and will be released soon for general cultivation.

Breeder's Hope

Another promising mutation obtained in wheat is a stiff-strawed type which can stand higher levels of fertilizer application in comparison with the parent strain. This is interesting since breeding varieties which would respond to high soil fertility have assumed importance in India in view of the growing popularity among our farmers of the practice of fertilizer application. Theoretically, mutations may occur for any character whether it be governed by a single gene as in the case of the awn character in wheat or by a large number of genes which control quantitative characters like yield and quality. Beyond this, however, the most exciting implication of this work lies in the possibility that through the use of radiation the plant breeder may be able more directly to control the mutation process. Mutation has generally been considered to occur entirely at random but recent evidence suggests that different types of radiation like neutrons and X-rays differ in the range of mutations that they induce. Thus, stiff-strawed mutants in barley have been found to occur most frequently in neutron treated material. Besides radiation, many chemicals also possess the capacity to induce mutations. At the Indian Agricultural Research Institute it has been found that even some vegetable oils such as those obtained from castor and groundnut can induce mutations in plants like wheat. Research on the artificial induction of mutations is only in its infancy and much more work needs to be done before its potentialities can be fully evaluated. In order to intensify research in this field, a large-scale field irradiation device known as the "Gamma Garden" has been set up at the Indian Agricultural Research Institute. This Garden, which is three acres in extent, has at its centre a powerful radioactive cobalt source which can be used to irradiate plants grown in the garden with high energy gamma rays at any desired stage in the plant's life cycle.

Other Difficulties

Radiation has also enabled the plant breeder to overcome several other difficulties which at one time appeared to be insuperable. For example, it has provided a means of separating favourable and unfavourable characters that are genetically so closely associated that for all practical purposes they are inseparable.

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The third and last aspect of atomic energy in agriculture relates to the use of radioactive isotopes. Some workers have claimed that naturally occurring radioactive minerals can be directly applied to the soil as fertilizers to stimulate plant growth. If this were true, it will be of great interest to us in India, since we have extensive thorium deposits in the monozite sands of Kerala. But the application of radioactive fertilizers did not lead to increased yields in experiments conducted at the Indian Agricultural Research Institute. The primary value of radioisotopes lies in their use as tracers in studying the physiology and chemistry of living organisms and of dynamic biological systems such as those involved in the relationship between plant and soil. Thus, in studies of soil fertility and plant nutrition the use of radioisotopes is leading to the development of more efficient methods of application of fertilizers. It was found in an experiment conducted at the Radiotracer Laboratory of the Indian Agricultural Research Institute that in paddy the maximum uptake of phosphorus occurred when the fertilizer was applied at the ground surface. It was further observed that there is very little movement of phosphorus in soils, the usual range being 1/8 inch to two inches. Estimation of the phosphate fertility status of over 1,000 soils collected from all over India revealed that over 50% of our soils are deficient in phosphorus and would consequently benefit from phosphate fertilization.

Isotope studies are also leading to the development of more efficient insecticides and fungicides. Radioisotopes are of particular value in studies of the metabolism of minerals including micronutrients or trace elements, which though required in only extremely minute amount, are essential for plant and animal health. But the most outstanding contribution made by radiotracer technique is in the elucidation of the mechanism of photosynthesis, the process by which green plants utilize energy from the sun to convert carbondioxide and water into sugars. These sugars are then converted by the plant into starches, fats, amino-acids and proteins. This process is the very foundation of agriculture but the efficiency of utilization of solar energy in this process in our crop plants is of the order of only one or two per cent. We can therefore hope with confidence that the fundamental knowledge or the mechanism of photosynthesis now becoming available for the first time through the use of radioisotopes would help us to devise means of increasing the efficiency of this process. So far, the main obstacle to progress in the field of biology has been the apparent impossibility of doing the experiments that would be most instructive but developments in atomic energy have removed this obstacle and we can expect much rapid progress to ensue.

Bacterial Cultures

I had mentioned earlier that radiotracer techniques have shown that many of our soils are deficient in phosphorus. In this connexion, the finding that the application of bacterial cultures may make a large quantity of insoluble and otherwise unavailable phosphates present in the soil available to plants is of great interest. The application of such "bacterial fertilizers" has become a common practice in Russia and experiments conducted at the Indian Agricultural Research Institute have also shown that the addition of "phosphobacterin" increases the yield of wheat, maize, berseem and several other crops by 10% to 20%, provided there is an adequate supply of organic matter in the soil.

Exciting new developments are also taking place in the chemotherapy of plant diseases, biological control of insect pests, formulation of new fertilizers and soil amendments, application of hormones and plant growth regulators and design of new implements and soil and moisture conservation practices. It is not possible to deal with these individually in a short article. I would, however, like to refer in conclusion to two developments where old ideas are finding new applications.

The first of them is the breeding of hybrid varieties. It has been known from the days of the mule and ancient Greek history that when two distinct varieties are crossed, the hybrid between them may be larger and more productive than either parent. This is referred to as hybrid vigour. While the principle is old, the development of a practical method of producing hybrids on a commercial scale is of recent origin. The exploitation of hybrid vigour has alone increased the yield of maize in the USA by 25%. More remarkable, however, is the way in which hybrid maize is produced as it constitutes a revolution in breeding practice. The classical method is to hybridize first and to select directly from the hybrid progeny those types which are most valuable. In the case of hybrid maize, selection accompanied by inbreeding comes first and hybridization comes afterward.

Finally, recent research in Japan and the USA on algae, which are one of the earliest inhabitants of the earth, suggests the possibility that fast-growing unicellular algae can be cultured on a large scale for food.

Bulletin Board

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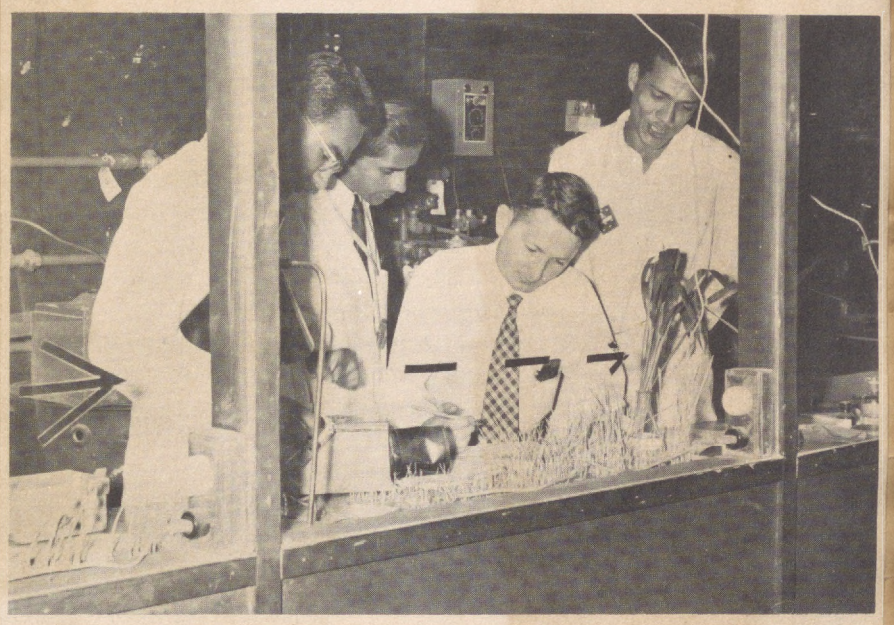
GAMMA FACILITY TO BE GIVEN TO INDIAN GOVERNMENT



Above - Prime Minister Nehru outside BNL facility at fair.
Below - J. Brewbaker with Indian scientists in laboratory of BNL radiation unit.

Pool type gamma irradiation equipment, designed and built at BNL, will be given to the Indian Government on a grant by the U.S. State Department under the Atoms for Peace program. The gamma facility, which employs 4750 Curies of Cobalt 60, was part of an A.E.C. exhibit in the U.S. Pavilion of the World Agricultural Fair held in New Delhi from December 1959 through February 1960. (Continued on Page 2)

Personnel from the Laboratory set up the facility in New Delhi and operated it during the exposition as a service unit for Indian scientists. Mr. O.A. Kuhl of the Nuclear Engineering Department directed the installation of the facility and Dr. J. Brewbaker of the Biology Department directed the operation of the equipment and consulted with Indian scientists in the use of the facility and its application to agricultural research. Dr. M.S. Swaminathan of the Indian Agricultural Research Institute at New Delhi was scientific liaison officer between the Indian and U.S. governments concerning the cooperative use of the source.

Please see next page also

THE HINDUSTAN TIMES WEEKLY
SUNDAY, AUGUST 21, 1960

Total attendance at the U.S. exhibit during the 80 operating days of the exposition exceeded 3 million people. On rare occasions it became necessary to close the gamma room for short periods because of the excessive crowds. About 25 special groups (faculty and students) visited the gamma facility for more detailed information on the equipment and its use. Among distinguished visitors to the facility were President Eisenhower, President Prasad of India, Prime Minister Nehru (two occasions) and Vice President Radakrishnan. The heads of the Indian National Agricultural, Physical, Medical, Statistical and Atomic Energy institutions and several Cabinet Ministers also visited the exhibit.

In this gamma facility the intense radiation from a Cobalt 60 source is used as a tool in research in various fields. The radiations of materials submitted by scientists at Delhi were performed in a water tank which measured approximately 10 by 18 by 10 feet deep. The pool-type facility is a relatively inexpensive, flexible and versatile research tool which permits the radiation of samples of various sizes and provides a transparent shield against the lethal gamma rays.

The gamma facility research program conducted during the exposition was extremely successful. Over 4700 samples representing more than 160 forms of material, mostly biological, were irradiated. The radiation chambers were designed so that radiations could be conducted as the crowd, averaging 37,000 per day, passed through the exhibit. The four Indian operators of the facility conducted experiments in an adjoining laboratory and worked many hours when the exhibit itself was closed. Dr. S.K. Majumder, who was at BNL for several years, was one of the operators of the facility. Almost 200 projects were submitted, including seeds or cuttings of major Indian crops, antibiotic-producing microorganisms and various laboratory animals and plant cultures. The scientists who worked with the facility, with rare exceptions agriculturalists, were drawn from 13 of the 14 Indian States and represented nearly all of the major agricultural and drug research institutions in India.

It is expected that the irradiation equipment and the Cobalt 60 will be installed at the Indian Atomic Energy Establishment located at Trombay.

Similar equipment, also built at BNL and operated by Laboratory personnel, will be exhibited in Cairo during the month of May.

A view of the Gamma garden at Pusa, with the tower housing the source of radiation and its hoisting mechanism in the fore ground.

PUSA'S GAMMA GARDEN FOR PLANT MUTATIONS

BY A STAFF CORRESPONDENT

The experimental garden for fundamental research in inducing hereditary changes in plants by atomic radiation, recently completed at the Indian Institute of Agricultural Research in New Delhi, will be formally inaugurated on August 25 by Mr S. K. Patil, Union Minister for Food and Agriculture.

Situated in an isolated corner of Pusa farmland, away from human habitation, is a spiral wall 12 ft. high and 2½ ft. thick enclosing an area of about three acres at whose centre a high energy source of Gamma radiation, 200 curies in strength, has been installed. Pellets of radioactive Cobalt 60 which emanate Gamma rays by atomic disintegration, have been put into a tube and attached to the lid of a thick walled lead cylinder which forms the base of the small tower-like structure at the centre of the 200-ft diameter garden. Electrically actuated by remote control, the source of radiation is lifted from the encasement and hoisted inside a shaft that connects the base to the head of the tower which houses the electro-magnetic lifting apparatus.

The height, to which the radiating source may be raised along the vertical shaft, can be controlled to the smallest fraction of an inch. Usually the source is kept at a height of four feet above the ground. The position of the source is indicated on a panel in the control room, outside the enclosure, from where the source is raised and lowered.

The circular area, enclosed by the wall is divided into fan-shaped sectors in which fruit trees, cereals, fibre crops, pulses, vegetables, flower and ornamental plants are being grown. Intensity of the Gamma radiation field at all points is mapped once every month so that the amount of rays absorbed by each plant is known. The intensity of radiation received by the plants decreases progressively as the distance from the source increases.

MAN-MADE EVOLUTION

Hereditary changes in plants and other living organisms are slow and rare in the natural course of events. Earlier research has proved that variations in genetical structure of living organisms can be speeded up by subjecting them to atomic radiation. This process of man-made evolution by inducing "mutations" or fundamental changes in the minute physical vehicles of hereditary characteristics known as "genes" can yield the plant-breeder a wide range of internal variations in any type of plant. Mutations are a random process, the results on inducing them are unpredictable but not unexpected. Most of the variations thus obtained are not of desirable characteristics but there are isolated specimens that fulfil the objective. These are selected, separated and propagated for seeds which are later distributed to farmers.

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THE STATESMAN, 25 AUGUST 1960

DELHI GAMMA GARDEN

Opening By Patil Today

By A Staff Reporter

The "Gamma Garden" of the Indian Agricultural Research Institute—the first experimental centre in Asia for the use of Gamma rays in agriculture—is to be opened today (Thursday) by Mr S. K. Patil, Union Minister of Food.

At a Press preview on Wednesday, reporters were taken round the three-acre garden in Pusa institute. All kinds of plants in the Gamma Garden are to be irradiated from the central source of 200 curies of a radioactive Cobalt 60 isotope encased in a lead container obtained from the Atomic Energy of Canada Ltd. Gamma rays are emitted from only six grammes of Cobalt 60 pellets in a capsule operated by a remote control mechanism made by the Atomic Energy Establishment, Trombay.

The centre is being opened primarily for the purpose of subjecting plants to doses of Gamma rays at different stages in the life-cycle of the plant. It is expected to be of interest to research workers in all branches of agricultural science as experiments will be conducted to irradiate a wide range of crop plants as well as fruit trees and ornamental plants. In addition, arrangements have been made to carry out irradiation of seeds, fungi and micro-organisms, insects and chemical solutions. It will also be possible to irradiate foodgrains and potato tubers with a view to undertaking studies on the use of radiation in the food preservation industry.

Experiments are already in progress and many varieties of plants and seeds, sent by research centres, such as cotton, sugarcane, and coconut are being subjected to radiation. It is proposed to develop a new kind of coconut plant which will mature and bear fruit earlier than the existing varieties. Experiments may be successful in eliminating diseases in sugarcane plants which will then have a higher yield of sugar. A better variety of long-staple cotton which will be disease-resistant is also expected to be developed.

Patil To Open Gamma Garden Today

BY A STAFF CORRESPONDENT

The Gamma Garden at the Pusa Institute will be inaugurated by Mr S. K. Patil, Union Minister of Food and Agriculture, on Thursday evening.

Dr M. S. Swaminathan, Controller of the Gamma Garden experiments, told newsmen on Wednesday that this experimental centre for use of Gamma Rays in agriculture is the first of its kind in Asia.

Dr C. Dakshinamurti, the Radiological Safety Officer, said all workers in the installation carry a strip of film and a pocket detection meter to indicate the radiation to which they are subjected.

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Earlier work at the Botany Division of the IARI has produced several useful mutations in wheat, cotton and other plants. Early flowering has been induced in plants of the wheat variety, N.P. 809 which is also resistant to rust. The change has been achieved in one generation by subjecting it to radiation, while conventional methods would have taken years to attain the same result. The touch of green on top of tomatoes has been eliminated by induced mutations. Attempts are also being made to improve the appearance of fruits and flowers.

CONTROLLED DOSES

In the Gamma garden at Pusa, plants, seeds and insects useful to man are being subjected to continuous radiation in controlled doses. It is a big step forward in fundamental research in gene mutations on a large scale by simultaneously subjecting a large number of plants to Gamma radiations.

While higher forms of life are sensitive to these radiations, the lower forms, such as plants, can endure large doses without any visible ill effects. Gamma rays from the 200 curies Cobalt 60 source can kill a man in a few minutes if he is near it. The element is the same which is used for Cancer treatment in destroying the diseased tissues.

There is a disc around the shaft in which the source moves up and down. This acts as a table on which seeds and insects, like silkworms and lac, and pests are kept and exposed to intensive radiation. The silkworms and lac insects may give higher yields while the sterilizing effect on biological tissues may offer a new method of pest control.

Foolproof safety measures have been devised to ensure that no one enters the Gamma field when the source is active. There are two entrances, one for the personnel and the other for vehicles. The locking system is electronically connected to the hoisting switchgear of the source. If the source is "on" the door cannot be opened to let anyone in.

"THE INDIAN EXPRESS" AUGUST 26, 1960.

"Gone are the days when any one could be a farmer. Today you have to know all about atomic energy and radiation!"

Dr M. S. Randhawa, Additional Secretary, Ministry of Food and Agriculture, speaking at the opening function of the Gamma Garden at IARI, Pusa on Thurs day evening.—Statesman.

ACCELERATING CROP IMPROVEMENT

S. K. Patil Opens Gamma Garden In Delhi

BY A STAFF REPORTER

Mr S. K. Patil, Union Food and Agriculture Minister, on Thursday opened the "Gamma Garden" at the Indian Agricultural Research Institute, Pusa, designed to accelerate crop improvement through the production of new varieties.

He said the opening of the Garden symbolized a significant milestone in the history of scientific research in agriculture in India.

Set in the scenic surroundings of the Institute, the Garden comprises a circular three-acre plot bound by a protective wall. A powerful 200-curie source of radioactive Cobalt-60, obtained from Canada, has been installed in a thick lead container in the centre of the Garden. The source can be raised or lowered automatically by means of a remote-control electronic mechanism placed in the control room. The mechanism was specially designed by the Atomic Energy Establishment, Trombay.

Mr Patil said that at this Garden a wide range of plants would be exposed to gamma rays emitted by radioactive cobalt. An atomic garden of this kind was a recent innovation and the one at Pusa was the largest of its kind in Asia.

The establishment of the Gamma Garden, Mr Patil said, was in consonance with India's desire to exploit atomic energy for peaceful purposes and her determination to forge ahead in the field of agricultural research and development.

PROFITABLE INVESTMENT

So far as the improvement of agriculture and food production was concerned, he pointed out, plant breeding was one of the least expensive and most profitable forms of investment because once an improved variety had been obtained, it represented a long-term investment which paid interest year after year in the form of increased yields and income for the farmer and better quality for the consumer. For intensive agricultural practices, new crop varieties, which responded well to high levels of fertilizer application, would have to be evolved. Until recently the success of a plant breeder in producing improved varieties of crop plants was dependent upon the variability occurring in nature. Lack of variability in a plant population would no longer be a limiting factor since in the Gamma Garden any amount of new variability could be created in all agricultural and horticultural plants. Already, the research carried out at the Institute on the effects of X-rays and radio-isotopes on wheat seeeds had led to the evolution of a new wheat variety named NP 836, which was suitable for cultivation in Bihar and West Bengal. The Gamma Garden would help in the intensification of this line of research and its extension to other crops such as fruit trees, he said.

Mr Patil said that the Garden would be available to research workers in different States and Universities of India. Several Central Research institutions had already planned to take up research on a variety of problems by using the radiation source.

Dr M. S. Randhawa, Additional Secretary to the Ministry of Food and Agriculture, and Dr B. P. Pal, Director of the Institute, speaking earlier, said that although the facility of a powerful Cobalt-60 radiation field was not available to them earlier, use of radio-isotopes was started at the Institute several years ago and some useful results had already been achieved in relation to the induction of mutations in plants, insects and disease-causing organisms. Research work through atomic energy in relation to agricultural problems, carried out at the Institute, had been favourably noticed abroad.

"THE HINDUSTAN TIMES" 26th AUG., 1960.

Mr S. K. Patil, Minister for Food and Agriculture, going round the Gamma Garden which he inaugurated in Delhi on Thursday. On right is Dr B. P, Pal, Director, Indian Agricultural Research Institute.

S. K. PATIL INAUGURATES GAMMA GARDEN

BY A STAFF CORRESPONDENT

Mr S. K. Patil, Union Minister for Food and Agriculture, said in New Delhi on Thursday that the advent of atomic energy in Indian agriculture would usher in a new era.

The importance attached by the Government to this new and potent research tool, was evident from the fact that both the Indian Council of Agricultural Research and the Department of Atomic Energy had set up special advisory committees for promoting and co-ordinating research in the field, he added.

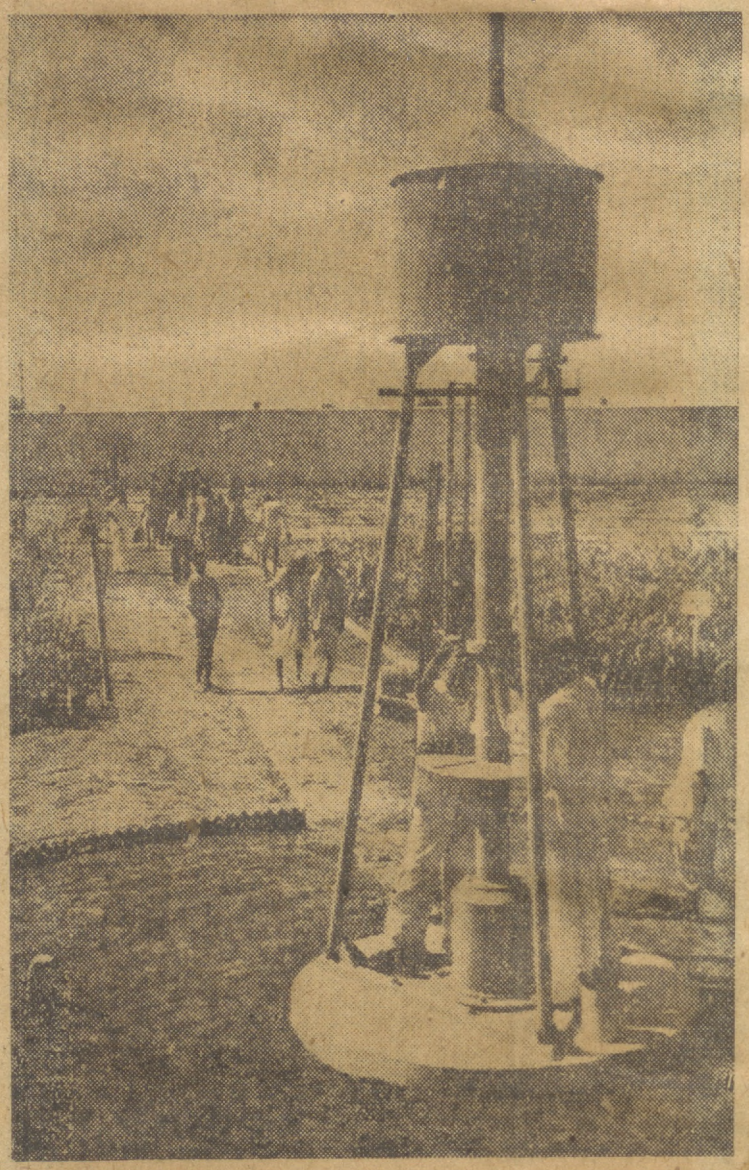
Mr Patil was speaking on the occasion of the formal inauguration of the "Gamma Garden" at the IARA in Pusa. He put down his name in the visitors' book—the first one to be written thereon—and switched on the electro-magnetic actuating mechanism for raising the source of gamma radiation from its protective shielding and turning on the radiation.

Plant breeding, he said, was one of the least expensive and most profitable forms of investment because once an improved variety was obtained it represented a long-term investment which paid recurring interest in the form of increased yields and income for the farmer and better quality for the consumer.

Earlier, Dr B. P. Pal, Director of the IARI, said that the Gamma Garden would be utilized by research workers from all over the country.

THE INDIAN EXPRESS
AUGUST 26, 1960.

ATOM FOR CROPS



Gamma Garden being given final touches before the official opening in New Delhi on Thursday.

ATOMIC ENERGY FOR PEACEFUL PURPOSES

Patil Opens Asia's First Gamma Garden

By Our Staff Reporter

DELHI, Aug. 25.

A NEW era in the field of agricultural research in the country was ushered in with the formal opening this evening of Gamma Garden—the only atomic garden in Asia and one of the few in the world—by Mr. S. K. Patil, Minister for Food and Agriculture.

Declaring open the garden at the Indian Agricultural Research Institute, Mr. Patil said that the establishment of the Gamma garden was in consonance with India's desire to exploit atomic energy for peaceful purposes and the country's determination to forge ahead in the field of agricultural research.

Described as India's "first outdoor laboratory" to use atomic energy for breeding better plants, the garden, which uses cobalt 60 as its source of radiation, is spread over three acres, divided into several sectors, each for a different crop.

At the centre of the garden stands a lead container with six grams of lethal cobalt in it. A remote control mechanism enables the cobalt to be raised up and down so that radio activity can be controlled.

Before the crops are exposed to radio activity, a bell is rung to warn the research staff that they should leave the garden, which is enclosed by a 12-foot high and three-foot thick brick wall which cuts out the radio activity.

MEDICAL CHECK-UP

The garden authorities will carry out periodical medical checkups to find out the extent of radioactivity absorbed by a research worker. The permissible dose is 200 milli-rontgens per week. An excessive dose is likely to result in cancer of the bone or of the blood. According to an official, the garden will prove to be a vital aid to botanical research.

A committee, headed by Mr. A. B. Joshi, head of the Botany Division of the Indian Agricultural Research Institute, has been set up to look after the maintenance of the garden.

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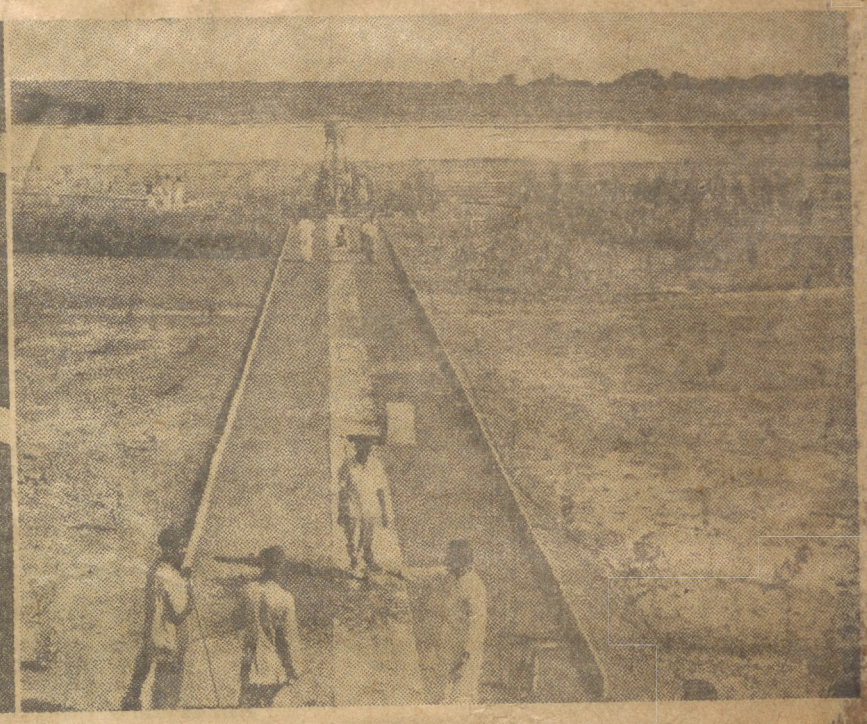
THE TIMES OF INDIA
AUGUST 26, 1960

MR. PATIL INAUGURATES GAMMA GARDEN



Mr. S. K. Patil, Union Food Minister, inaugurating the Gamma Garden at the Pusa Institute in New Delhi on Thursday; right: a view of the garden where atomic energy is utilised to induce changes in plants.

Contd.

Mr. Patil said: "There is little doubt that both for maintaining the tempo of agricultural production so as to keep pace with the growth of the population and for reaching the take-off stage from self-sufficiency to that of plentiful food supply, a continuous and ever-growing flow of new knowledge and better varieties of crop plants from our agricultural research institutions is absolutely essential. We can ensure agricultural research only through the provision of the most recent research tools."

He said that though the Gamma garden was primarily intended to provide the plant breeder with a new and potent research tool, it could also be put to good use by scientists belonging to other disciplines such as entomologist, plant pathologist and chemist.

He announced that the garden will be made available to research workers in the different States and universities of India.

ADVISORY COMMITTEES

Mr. Patil said that the importance attached by the Government of India to the use of atomic energy techniques in solving agricultural problems will be evident from the fact that both the Indian Council of Agricultural Research and the Department of Atomic Energy have set up special advisory committees for purposes of promoting and co-ordinating research in this field.

Welcoming Mr. Patil, Dr. B. P. Pal, Director, Indian Agricultural Research Institute, said that scientific aids were being fully utilised in all agriculturally-advanced countries and India, too, needed all the help "that science can give us to achieve our goal of self-sufficiency in food and in the raw materials required by our industries."

He said that the Gamma garden will improve the food plants, fruits and vegetables, and in fact, all kinds of plants.

Use Of Atomic Energy For Breeding Better Plants

HEREDITARY CHANGES BROUGHT ABOUT

By A Staff Reporter

PROGRESS in agricultural research could only be assured by providing the latest research tools, Mr. S. K. Patil, Union Minister for Food and Agriculture, said in New Delhi on Thursday while inaugurating the Gamma Garden at the Pusa Institute.

The Gamma Garden, laid out by the Indian Agricultural Research Institute, will be used for breeding better plants by utilising atomic energy to induce heredity changes in plants.

Mr. Patil said a flow of new knowledge and better varieties of plants from agricultural research institutions was essential if agricultural production was to keep pace with the growth of population.

Plant breeding, the Food Minister said, was one of the least expensive and most profitable forms of investment, because an improved variety represented a long-term investment which paid interest year after year in the shape of increased yield and income for the farmer.

Mr. Patil said the establishment of the Gamma Garden was in keeping with India's desire to exploit atomic energy for peaceful purposes and her determination to forge ahead in the field of agricultural research.

He said agricultural research must supplement other steps for increasing agricultural production, like community projects, irrigation works and seed multiplication schemes.

Until recently, Mr. Patil said, the success in breeding improved varieties of crop plants depended on the variability occurring in nature. But this would no longer be a limiting factor because the Gamma Garden could induce any amount of variability in agricultural and horticultural plants.

The Minister hoped that the garden would be put to good use by scientists, including entomologists, plant pathologists and chemists. He was happy that several central research institutions had already planned research on a wide variety of problems, using the radiation source installed at the Gamma Garden.

He said such research was bound to gather tempo because the Canada-India reactor at Trombay would soon make available an adequate supply of radioisotopes.

Earlier, Dr. B. P. Pal, Director, Indian Agricultural Research Institute, in his welcome address, said that India needed all the help that science could give to achieve self-sufficiency in food. The Gamma Garden, he hoped, would help improve food plants, fruits and vegetables.

Dr. M. S. Randhawa, Additional Secretary, Ministry of Food and Agriculture, stressed the importance of the Gamma Garden as an aid to plant breeding.

Mr. Patil operated the control panel of the Gamma Garden to mark its inauguration.

THE TIMES OF INDIA
THURSDAY, AUGUST 25, 1960

ATOMIC ENERGY FOR BETTER PLANTS

Formal Inauguration Of Gamma Garden Today

By A Staff Reporter

INDIA'S first "outdoor laboratory" to use atomic energy for breeding better plants, the Gamma Garden, will be formally inaugurated by Mr. S. K. Patil, Minister for Food and Agriculture, on Thursday at the Pusa Institute.

A party of newsmen was taken around on Wednesday to see what is claimed to be the only institution of its kind in Asia, with the exception of Japan. The circular garden, which uses Cobalt 60 as its source of radiation, is spread over three acres, divided into several sectors, each for a different crop.

At the centre stands a lead container with six grams of lethal Cobalt in it. A remote control mechanism, fabricated by the Atomic Energy Establishment, Trombay, enables the Cobalt to be raised up and down so that radioactivity can be controlled.

The lead casing ensures that while the Cobalt is in the normal position, radioactivity, which can be deadly in big doses, can be contained. Elaborate precautions have been taken against mishaps and to ensure that research workers do not expose themselves to radiation.

CONTROL PANEL

Entry to the garden is through two gates which are included in an electric circuit to ensure that the Cobalt 60 does not give out radioactivity when they are open. A control panel keeps a check on all operations in the garden. Before the crops are exposed to radioactivity, a bell is run to warn the research staff that they should leave the garden. The garden is enclosed by a 12-foot-high and three-foot-thick brick wall which cuts out radioactivity.

To deal with problems relating to the maintenance and use of the Gamma Garden a special committee, headed by Dr. A. B. Joshi, Head of the Division of Botany, Indian Agricultural Research Institute, has been set up. The control over the garden vests in a senior officer of the Division, Dr. M. S. Swaminathan, who also coordinates work done at the garden by various departments.

A Radiological Safety Officer has been put in charge of enforcing radiation protection measures and to supervise the maintenance of the instruments in the garden. Every research worker who goes to the garden must wear a special radiation badge, which measures radioactivity.

MEDICAL CHECK-UP

Besides, there are periodical medical check-ups to find out the extent of radioactivity absorbed by a research worker. The permissible dose is 200 millirontgens per week. An excessive dose can lead to cancer of the bone or of the blood.

The Gamma Garden is expected to be a vital aid to botanical research. The idea is to secure useful mutants by exposing plants to radioactivity. The process is much quicker than crossing, which may require several years to be completed.

Radio-activity induces heredity changes in plants, and through careful selection from the exposed plants better breeds can be evolved.

The Institute has recently evolved a new variety of wheat, N.P. 836, which has a high degree of resistance to rust and matures early. The variety, which possesses awns unlike its parent N.P. 799 has been bred with the help of radioactive phosphorous. The Institute hopes to step up this kind of work with the help of the Gamma Garden.

Although the garden is primarily meant for the use of the Institute, it will also accept irradiation work forwarded to it by research institutes in the States.

RESEARCH SCHEMES IN AGRICULTURE NEEDED

PATNA, Oct. 11.—Dr Punjabrao Deshmukh, Union Minister for Agriculture, addressing research workers of the Bihar Department of Agriculture here recently said that the crop breeder of the atomic age should direct his steps towards gamma gardens in the search for superior plant material which induced mutants are expected to throw out.

He thought that the approach to general improvement through selection and hybridization was, by and large, outdated because scientists had not only been using these methods for too long a period but also because there was little germ plasm left that had not been either used or discarded by breeders.

The current programme of research and plans for the immediate future had left him thinking whether there was sufficient evidence of the impact of newer discoveries and modern tendencies to solve problems.

In a country like India, he said, where the pressure of steadily increasing population was leading to the rape of the soil and its total destruction, one would expect new concepts or alternate husbandry.

He regretted that some of the modern methods in western countries which were no longer novelties in the places of their origin continued to figure in the research programmes in India. Even so, their application in the general agriculture of the country had been hardly felt.

HARDY SPECIES

Dr Deshmukh urged the need for directing efforts and research programmes to the problems of the "marginal lands" to which the community had been driven by the process of remorseless pursuit in its hunger for land, and more land.

Here, he said, was a vast field for the research and isolation of hardy species of flora that should be resistant to drought, flood, wind and salinity.

The food possibilities should be enormous if scientists could find species of even a few woodgrains that could fit into the inhospitable environment of the marginal land."

The agricultural scientist, he emphasized, had a wide vista for efforts along the Indian sea-board, the country's mountain heights, the low-lying swamps and bogs, the arid deserts and the wind-swept regions lying scattered almost everywhere.

The prospects, he stressed, were too bright for Indian scientists to remain indifferent or to dismiss them as being outside the realm of achievements. The Russian conquests of the steppes should be persuasive enough for our persistent researchers.

These thoughts had immediate application to the tasks before the Bihar Research Committee, a body of Government agricultural scientists, who held a three-day discussion here recently on an intensive programme for the next spring crops in the State.

Bihar is one of the major Indian States with a population of over 40 million people spread over an area of 42.8 million acres. The pressure on land is heavy, 23.83 million acres being the net sown area with a gross area of 29.78 million acres.

In course of the last several decades the percentage of the population depending upon land has been increasing so that today it was as high as 86 per cent of the total population.

A brochure circulated recently indicated that research workers had got into their stride by experimentally doubling the paddy production in recent years through improved varietals without additional cost to the peasantry and without disturbing their usual patterns of agriculture.

Bihar being principally paddy growing, the emphasis is on new varietals of paddy which had been able to increase the yield by ten to fifteen per cent per acre. In addition, there were flood resistant varieties which had survived waterlogging where ordinary varieties had perished earlier and given better yields.

Wheat, barley, pulses, as well as several cash crops, too, had recorded better yields under the research workers' guidance. Cotton is an important crop in North Bihar but the staple is short and with longer staple the yield per acre should be much higher.

By these accounts of expert agricultural research workers, Bihar had taken a leading part in the battle for self-sufficiency in food which the country was on the way to winning in the next Plan period.—NAFEN.

"Hindusta
AUG.

Shri S. K. Patil, Union Minister for Agriculture, delivering the inaugural address at the opening of the Gamma Garden at Indian Agricultural Research Institute in New Delhi, on Thursday.

THE SUNDAY STANDARD
SEPTEMBER 11, 1960

ATOMIC GARDEN
—A Fillip To Food Production

Delhi's Atomic Garden, the first of its kind in India, will serve as an impetus to agricultural production through the research conducted there.

Radioisotopes play a vital part in this research, helping scientists to assess a plant's intake of fertilisers, and effecting mutations or heritable changes in plants so as to improve yield and product.

Some of the projected fruits of this scientists' garden are described below

By ALFRED J. EDWIN

TO its many gardens—some several centuries old—Delhi has added a new one. It is the "atomic garden," an apt addition in this age of science and technology.

This garden, which represents a major advance in agricultural research, is located in the Indian Institute of Agricultural Research. A pioneer of agricultural research in the east, this institution has been the focal point of a series of fascinating experiments in recent years. Scientists here have been using the newest atomic aids to improve the quality of soil and to induce plants to change their age-old habits. Turning the red tomato redder, making the flowers change their colours, coaxing the awnless wheat to grow a "beard": It is nothing short of atomic juggle ry!

To the scientists and research workers, however, these developments mean much more, unfolding the promise of exciting new discoveries and extending the frontiers of knowledge.

FIRST UNIT

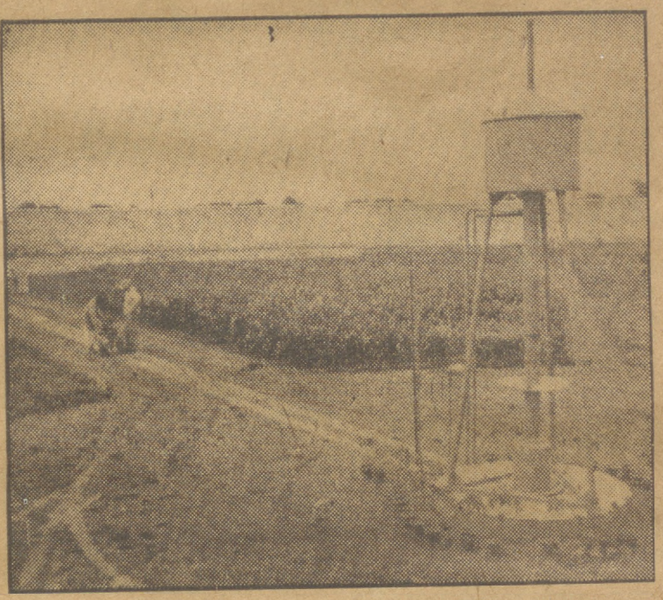
The "atomic garden"—in technical parlance, the Cobalt-60 Gamma Field Radiation Unit—is the latest device which is available to Indian scientists for using atomic energy in agricultural research. It is the first unit of its kind in India, though Dr. Homi J. Bhabha, our leading atomic scientist, has promised that Bombay is to have a much bigger "garden" of this type.

The "atomic garden" in Delhi is spread over three acres and has cost the institute two lakhs of rupees.

To understand the mysterious happenings in this garden, it is necessary to peep into the Atomic Age armoury of the agricultural scientist. And it is truly an armoury for his tools of research have been fashioned by the same processes which, in the hands of the militarist, could be diverted to the making of lethal weapons.

The use of radiation and radioisotopes — both by-products of atomic energy—is one of the most promising developments in the sphere of agricultural research. In fact, scientists are of the opinion that the impact of these two nuclear aids on food production and preservation may be as great as that of atomic power on industrial development.

Radioisotopes have found a number of uses in agricultural



A view of the Atomic Garden, Delhi.

research. The research value of radioisotopes is due, primarily, to the fact that they can be distinguished and traced easily because of their radioactivity. They give off radioactive "sparks" that can be detected with the help of special instruments. For instance, as they move through a plant, their progress can be traced.

A series of experiments based on this radiotracer technique have been conducted at the Indian Agricultural Research Institute with a view to assessing the uptake of fertilisers by different plants. The objective has been to find out the most efficient and judicious way of using fertilisers, which have been accepted as one of the best means of raising food production.

The ionizing radiation emitted by radioisotopes induces heritable changes in plants. These heritable changes, known to scientists as "mutations," occur spontaneously in nature but at very infrequent intervals. Radiation greatly increases the frequency of mutations and thus makes available to the plant breeder a wide choice for his selection.

EXPERIMENTS

The knowledge that radiation can be used to cause heritable variations in plants—and also animals—has been known to scientists for more than three decades. What is new is the scale on which radioisotopes have been made available from atomic reactors in different parts of the world. With the help of radioisotope supplies from abroad — mainly the United Kingdom and the United States — research work has gone on at the New Delhi institute for several years.

Useful mutations have been obtained in wheat, cotton, tobacco, potatoes and tomatoes. The aim has been to develop types of better quality and with higher yields. The atomic jugglery I mentioned earlier is, in fact, closely related to the economics of farming and market gardening.

The institute, for instance, had developed a type of wheat resistant to black, brown and yellow rusts. But it had no awns. Indian farmers, however, prefer the awned varieties in the belief that the awns (or "beards") save the grains from damage by birds. Radioactive phosphorus and sulphur came to the rescue of the agricultural scientists by producing beards by quick mutations, which otherwise would have taken a very long time.

In tomato, the institute's scientists have succeeded in producing a type which is red to the point where the fruit joins the stem, thus improving the market value of this vegetable which is in big and growing demand. In cotton, the aim has been to develop a variety which will yield a better crop than the normal type.

BOON

The institute's research programme received a fresh impetus four years ago when India's first atomic reactor, "Apsara," became critical. Within a short time radioisotopes became available in the country itself, not only saving foreign exchange but extending the scope of the research work. For instance, short-lived radioisotopes —that is, those isotopes which have a short radioactive life — which could not be imported because of the time involved could now be had from the Atomic Energy Research Establishment at Trombay.

And the setting up of the Gamma Garden is yet another stage forward in this programme. At the centre of the garden is the powerful Cobalt-60 radiation unit, operated by remote control from a safe distance. The device is a great boon, enabling the institute's scientists to extend their irradiation work on a much larger scale, and unfolding the promise of exploiting to the full the potentialities offered by atomic radiation.

What is more significant is that the giant India-Canada reactor, which became critical recently, has been designed as one of the world's most powerful producers of radioisotopes, including Cobalt-60. (The first Indian reactor, "Apsara," could not be used for producing this powerful radioisotope.)

This new source of Cobalt-60 is certain to play a very important part in taking India to the forefront of atomic research for peaceful uses. For instance, it will give a fillip to research at the institute aimed at using atomic energy for food preservation and pest control.

Both these branches of research are based on the sterilising properties of atomic radiation. By destroying micro-organism which cause deterioration in foodstuffs, radiation can help to keep fresh longer perishable items of food. It can also be used to extend the storage life of potatoes and other root crops by suppressing sprouting.

AIM

Detailed trials are, however, needed before these methods can be used on a commercial scale because radiation also causes changes which may be harmful. What promises quicker results is the use of radiation for the biological control of insect pests by rendering the insects sterile and thereby aiding the process of their extinction.

The technique can also be used to develop types of plants which can withstand the attack of disease-causing micro-organisms. Plant diseases which have received attention at the institute include the sugarcane red rot.

Such then is the range of the research work being done by the institute's atomic experts — work that has brought the newest scientific techniques to the aid of India's, indeed the world's oldest occupation. The scientists' garden has mysterious contraptions and unfamiliar devices but the aim is one which has been familiar to gardeners ever since the dawn of creation—to breed better and healthier plants.

Food Irradiation

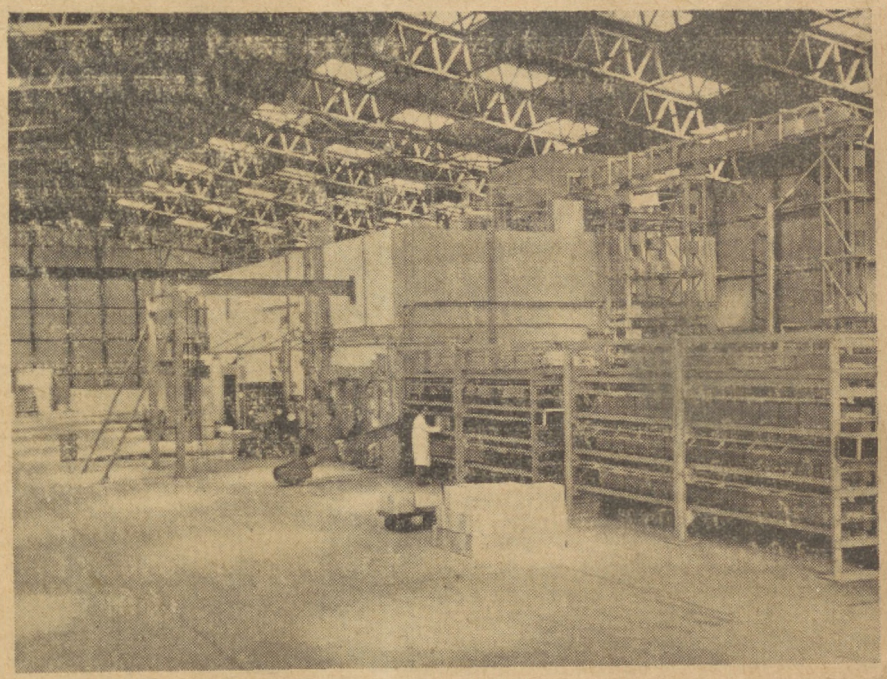
Among the more important potential applications of atomic energy in food and agriculture is the use of radiation in food preservation. Today many western countries are actively engaged in the development of this process and at least in the U.S.A. irradiated food are said to be on way to market. Nutritional studies conducted in certain laboratories are reported to have shown no harmful effects in the irradiated food except that it had a slight bad taste and change of flavour. It was, therefore, assumed that the food irradiated with radio-isotopes contained no residual radiation energy and that even if there was some, it had no adverse effect on the body.

However, recent researches conducted at the Indian Agricultural Research Institute, New Delhi, on the effect of irradiated food have yielded points for serious thought and caution. Dr. M. S. Swaminathan and his colleagues Drs. V. L. Chopra and S. Bhaskaran who have been studying for several years now the effects of ionising radiation on genetic factors have noted that cell division became abnormal in barley embryos cultured on media comprising irradiated potatoes, whereas a control culture of barely on unirradiated potato medium showed no abnormality. Following this significant discovery, his experiments were followed up by Prof. L. Ehrenberg of the University of Stockholm to find out the effect of feeding mice with irradiated potato and bread. To his surprise he observed that there was a fall in the red blood corpuscle content of the mice within 48 hours of the administration of such food. The experiment is still incomplete in so far as any further involvement of the metabolism has yet to be investigated; but the findings have undoubtedly established the necessity for further studies on the effects of irradiated food on biological systems.

Dr. Swaminathan referred to his researches leading to this discovery at a symposium on Nuclear Applications in Agriculture held recently in Rome, to which he was specially invited by the Italian Atomic Energy Commission to talk as a radiation expert on genetic problems. The symposium attended by about 200 experts from Europe and America considered in four sessions the problems and methodology of radio-isotope techniques in Animal Sciences, Agronomy, Genetics and Food Preservation. The last topic, the discussion on which was initiated by Dr. Einar Saeland, Deputy Director of the European Nuclear Energy Agency, evoked particular interest following Dr. Swaminathan's revellation at the genetic group discussion. Dr. Saeland opened his paper with a review of the report of OEEC (Organisation for the European Economic Cooperation) study group on Food Irradiation, set up more than a year ago.

Principle: The idea of food irradiation is to sterilise food material with a view to extend its life and preserve its freshness by killing micro-organisms, parasites and insects with ionising radiation. The principle is applied to different things in different ways. For example, food stuffs can be sterilized, as is done in canning industry, in order to conserve them permanently. Secondly they can be pasteurised, as in the case of milk; but here the food material is not rendered sterile, only the number of micro-organisms is substantially reduced. Thirdly, irradiation destroys insects and parasites living in food products during one or other of their life cycles. Grain moths and weevils are thus killed in their egg or pupa form before storage of foodgrains. Fourthly, since the growth processes of plant tissues are sensitive to radiation, it can be used for sprout inhibition. For instance, sprouting of stored potatoes and onions can be prevented and a large percentage of annual waste can be avoided by irradiating them before storage. Usually this sprout inhibition is done in certain countries with chemicals, but climate and other factors allowing, this can be achieved economically by irradiation. A particular attraction that radiation offers in these fields is that it involves no temperature changes during the treatment.

Research on food irradiation was started on a small scale about ten years ago. But what is the position today? What is the outlook that continued work can lead to such applications? According to the OEEC survey about 75 organisations in 14 European countries including Britain are either actively engaged in food irradiation research or are planning such activities. Out of these some 12 institutions are concerned with the development of radiation processing of meat products; and nine on radiation effect on sea foods. More than 20 organisations are reportedly doing research on fruit and vegetable products. The study of irradiation effects on food components is in progress or planned in more than 14 organisations and about 20 are involved in the study of microbial systems, insects and related problems. Approximately 56 irradiation sources are available in these 15 European countries for food research, of which 30 institutions are located in U.K. alone.



A food irradiation unit in U.K.

The OEEC study group, according to Dr. Saeland, came to two major conclusions. The first was the absolute necessity of finding a satisfactory solution to the problem of the wholesomeness of food—in other words, demonstrating the non-toxicity and nutritional adequacy of irradiated foods and satisfying the regulatory demands of food irradiation. The second conclusion was that the numerous variables connected with the choice of food products for irradiation, the type and purpose of

radiation treatment, the differing market conditions, etc., would necessitate different standards or criteria for each products, purpose or locality. Thus the group could give no overall answer to the question whether food irradiation is desirable and feasible. The answer, it said, must be sought individually for each particular item. The findings of the study group are interesting to India inasmuch as the Indian Atomic Energy Commission is engaged in a serious study of the potential application of irradiation in the field of food preservation in India.

The OEEC study group found that employment of irradiation process for sprout inhibition in potatoes was technically feasible and that an optimum dose of the order of 10,000 rads (one rad is equal to an energy absorption of a hundred work units, or ergs, per gram of tissue) would extend its normal 7 to 8 months storage period to 12 to 18 months.

Economic Benefits: The economic potential of the process is said to be immense. In France, for instance, where an estimated 2.3 million tons out of an average total production of 16 million tons of potatoes are spoilt annually by sprouting a radiation unit handling five tons per hour and working four months per year could treat potatoes at a cost of about 7.6 dollars per ton.

Another interesting application of radiation preservation at present proposed in Europe is the pasteurisation of fruit juices. Although much ground remains to be covered on the technical side, a specific study has been made in Austria where the production of fruit juice amounts to about 11 million litres annually and where, in addition, there is mass production of bottled fruit drinks and sweet wine of low alcohol content, which also need pasteurisation to delay post-fermentation in the bottles.

In the United States, irradiation of fruits and vegetables is carried on a much larger scale. The value of the annual farm production of five fruits selected for special study (strawberries, peaches, citrus fruits, grapes and tomatoes) in the U.S.A. totals some 990 million dollars and a large percentage of these are spoilt every year. Investigations into the economic aspect or irradiating these fruits have indicated that it is possible to extend the shelf-life of most of these fruits by 50 to 100 per cent with the help of radiation doses varying from 100,000 to 500,000 rads. However, in many cases, especially with tomatoes, adverse effects such as change of colour, softening of tissues etc. have been noted at relatively low doses.

Sprout inhibition in onion: (from L to R) unirradiated, mildly irradiated, heavily irradiated

It is suggested that surface irradiation as distinct from irradiation with penetrating rays would solve many of the problems connected with fruit pasteurisation. In this connection it is pointed out that use of isotopes emitting soft radiation, such as strontium-90 and promethium-147, might present specific advantages, especially in costs, if the difference between the shielding requirements of a cobalt-60 source and a strontium-90 source of the same strength is taken into account.

Fish: Studies conducted on the irradiation of fish indicate that it is technically feasible but much remains to be done to fix the optimum conditions of irradiation and species best suited for such treatment. Experiments so far carried out seem to indicate possible extension of storage time by five days or more. The The dose required appears to be of the order of a few hundred thousand rads only, since higher doses usually result in changes in flavour and texture.

On the whole, food irradiation seems to have a promising future, although more intensive research on fundamental radiation chemistry and radio-biology is essential to render practical application on a large scale feasible. Much of this work would be in the nature of what is called 'semi-applied research', but unlike pure basic research, it is undertaken with some practical problems or application in mind. For instance, the interesting work recently carried out on the possibility that a part of radiation energy is retained in irradiated substances, involves a problem of fundamental importance.

Unsolved Questions: The existence of stored energy after irradiating with ionizing radiation is known to most solid state physicists and reactor engineers. The most well-known is the effect in reactor graphite which caused the Windscale (U.K.) reactor accident in October, 1957. Can food grains exposed to large doses of radiation for the purpose of sterilisation also store energy which upon dissolution might have adverse results on the individuals consuming such grains? Is there a danger that substances capable of upsetting normal metabolic processes will be produced in irradiated food? These are some of the vital questions arising from the researches of Dr. Swaminathan and his colleagues for which answers have to be found before unrestricted sale and consumption of irradiated food can be considered safe.

WORLD VIEW

AMERICAN SPACE STORY

More than 400 persons crowded the village of Munger (Minnesota) recently. They turned out in response to telephone calls received by 300 persons in nearby Duluth.

"I am the Outer Space man from Mars," the voice on the telephone said. "I am going to arrive at 9-30 p.m. I will land on US Highway 2, seven miles west of Proctor. If you understand me please repeat."

Munger is seven miles west of Proctor and the crowd began to gather at 8 p.m. "We've never had so many people here at one time," an old-timer said, "but I doubt if anyone ever thought they were going to see the man from outer space. "We came out to see how many stupid people would come to see this thing," a woman said. "Of course we didn't expect to see any martians," another added.

Everyone was in a happy mood, scoffing and calling to one another. But whenever a photographer's flash gun went off the crowd would turn in the light's direction, just to make certain it wasn't a spaceman arriving.

Steven Carlson, 13, son of Dr. and Mrs. Theodore Carlson, Duluth told of seeing a "spot in the ground when it looked like someone shot off a small rocket." He also told of seeing a "great flash about five feet long and seven feet wide." The spaceman never did show up and an observer said in disgust: "Serves us right for being so stupid as to come out here."

NOT CRICKET

Prince Philip had a complaint. Visiting an architectural convention, he asked one architect what buildings he was working on.

The man mentioned a site in Victoria Street, adjacent to the Palace. "Ah," said the Queen's husband, "that's the one that interferes with my television when I want to watch the cricket test matches inside the palace."

THE STATESMAN, 14 JULY 1961

INDIAN DOCTOR HONOURED

NEW DELHI, July 13 (PTI) —The Alexander von Humboldt Foundation of West Germany has awarded a post-doctorial fellowship to Dr. S. Bhaskaran, senior research fellow of the International Institute of Science of India at the Botany division, Indian Agricultural Research Institute, New Delhi.

The award has been made on the basis of a world-wide examination conducted by the foundation.

Dr. Bhaskaran will leave India for Germany next month for doing research in radio biology at the nuclear reactor at Karlsruhe.

GERMAN FELLOWSHIP FOR INDIAN SCHOLAR

The Alexander von Humboldt Foundation of West Germany has offered a fellowsnip to Dr S. Bhaskaran, Senior Research Fellow of the International Institute of Science of India at the Botany Division, Indian Agricultural Research Institute, New Delhi, reports PTI.

The award has been made on the basis of a world-wide examination conducted by the Foundation.

Dr Bhaskaran will leave India for Germany next month for research work in radio biology at the nuclear reactor at Karlsruhe.

NEW SPECIES OF JUTE PLANT EVOLVED

BY A STAFF CORRESPONDENT

A new species of jute plant, which yields a strong white fibre, and at the same time has a wide adaptability to soil and climatic conditions and also a high degree of immunity to diseases and pests, has been evolved at the Indian Agricultural Research Institute in New Delhi.

The new plant has been obtained by the successful crossing of two species of jute plants, which were so far considered physiologically incompatible to hybridization.

One of the species is Olitorius, which grows on high ground, has a wide range of adaptability and is tolerably resistant to diseases and pests. It has a straight stem and produces the strong reddish Tossa fibre of commerce.

The other type, Capsularis, has its seeds in small roundcapsules. It has a white and fine fibre, which is rather weak. This species is resistant to floods and drought, but is susceptible to diseases and pests. An undesirable characteristic is the plant's tendency to grow several branches, which hamper the removal of the fibre and also affect its quality.

Earlier, attempts to cross the two species had resulted in shrivelled-up and under-developed embryos in seeds, which were lighter in weight and clour than the parent plants. Pods were formed in some cases, but they failed to germinate.

USE OF X-RAY

Success has now been achieved by grafting the two species on each other and subjecting Capsularis pollen to X-rays before artificial pollination of the Olitorius flowers. Well-developed seeds were obtained, which germinated to give a new jute plant with intermediate characteristics of both the parents.

The process is similar to the one used in surgery, according to which radiation is used to inactivate the antibody system prior to transplanting tissues and organs. Treatment of the pollen with X-rays has made difficult hybridization possible in the same way.

The new plant is a significant achievement, opening up great possibilities in the development of India's major dollar-earner.

THE STATESMAN, 2 AUGUST 1963

SCIENCE

LINK NEWS MAGAZINE June 18, 1961

(1) 'White' jute plant; (2) 'Tossa' jute; (3) branchless type of hybrid of (1) and (2); profusely branched hybrid of (1) and (2)

New Hybrid Jute

An ideal variety of jute plant is one with a high yield of strong, glassy white fibre comparatively immune to diseases and pests and which matures early. An additional desirable quality is its adaptability to different soil and climatic conditions (for instance, water-logging, drought and salinity). But the two main species cultivated in India lack many of these qualities.

The 'Tossa Jute' (Corchorus olitorius), popular in Bengal grows on high ground, has a wide range of adaptability, is fairly resistant to diseases and pests, is tall with few branches and has strong, reddish brown fibres. On the other hand, the 'White Jute' (Corchorus capsularis) is resistant to floods and drought, has a silky white fibre though somewhat weak, and is more susceptible to diseases and pests. An important point aginst this second species is that it branches profusely and hence its fibre is short and weak.

Normally it should not be difficult to cross the two species and evolve a hybrid which will have the desirable qualities of both. But intense efforts to this end by Indian and foreign botanists since the early years of this century have been unsuccessful. Investigations proved that the failure of seed-setting in this cross was not due to lack of fertilization, but was caused by the premature abortion of hybrid embryos. They thought, however, that by culturing these embryos in suitable media, hybrid seedlings could be raised.

The search for this suitable medium also proved futile for some time, but at last an intelligent hunch provided by immunological ideas in animal physiology put the scientists on the right track. Dr. M. S. Swaminathan of the Indian Agricultural Research Institute, New Delhi, was struck by the idea that if the tendency for allergy in animals, especially in men, arising out of the body's inherent resistance to foreign materials could be nullified by immunising it systematically, the same principle could be employed usefully in plant physiology. Subsequent experiments by Dr. Swaminathan and his colleagues proved his guess right and they recommended the use of reciprocal grafting, pollen irradiation and hormone application to overcome the incompatibility barrier in jute crossing. For the first time hybrid jute seeds were thus produced in 1959 and plants grown from the seeds have now been shown as a successful cross between the two species.

It is not so much the evolution of a new hybrid as the success of the cross that is significant. The hybrid that has been evolved may not be the ideal one and, in fact, may require further refinement by back-crossing or crossing with other species of jute plant. But a significant barrier has been overcome by the evolution of a technique which makes it virtually possible to cross any two species of jute plants. It can now be hoped that a new variety which will be an improvement over the parent species, and which will be suitable to any soil and climate can be evolved before long.

Suri Power Transmission

India has not many things to boast of by way of practical scientific inventions and discoveries though many new scientific ideas are known to have originated here. Pre-occupation with religion and philosophy diverted minds away from the cruder subjects of science. Bose, Raman and Bhabha are recent phenomena. The skeptics point in justification to the low output of original scientific material by the twenty-five and odd National Laboratories, housed in palatial buildings. They, the skeptics, allege that the amount and quality of work done are quite out of proportion to the huge sums being spent on them every year.

Almost the only silver lining in the cloud of skepticism in recent days is the invention of the Suri Power Transmission system by a young Indian railway engineer. This new transmission system has proved a far more valuable invention than it was thought to be at first. The latest reports indicate that patents for this invention have already been granted in Czechoslovakia, France, Italy, U.K. and West Germany. Many more countries are showing interest in the new contraption.

The new system relates to an improved method of power transmission in diesel locomotives. It is based on the use of one or more fluid lines of power transmission parallelly with one or more fluid mechanical couplers and with means for selecting any of these lines for the transmission of power from the input to the output shaft. It is simpler, lighter and more compact in design as compared to the conventional electrical or hydraulic systems fitted to existing diesel locomotives. On account of its simpler design the new Suri Transmission system is expected to effect considerable economy not only in the manufacturing cost but also on the operational costs. The saving in fuel alone is estimated at Rs. 6,000 per locomotive per year. Similarly, locomotives currently in use are only of 200 h.p.

THE TIMES OF INDIA
WEDNESDAY, AUGUST 23, 1961

GAMMA GARDEN

The Deputy Minister for Agriculture, Mr. M. V. Krishnappa, in reply to a question by Mr. Ram Sahai, said that crops like jute, cotton, jowar, maize and wheat, oilceed plants, vegetables and sugarcane were grown in the gamma garden at the Indian Agricultural Research Institute, New Delhi, during 1960-61. In the progeny of the cotton material, mutations affecting maturing period and hairiness had been noticed. In the case of wheat, some rust resistant and fully awned mutants had been obtained.

THE TIMES OF INDIA
SATURDAY, AUGUST 26, 1961

ATOMIC POWER FOR FARMING
Results Encouraging

Research conducted in the country on the application of atomic energy to agriculture has led to the production of better varieties of crop plants through the induction of mutations and the standardisation of improved fertiliser practices through radio-tracer studies.

It was disclosed at a meeting of the informal consultative committee of the Ministry of Food and Agriculture on Friday that seeds and flowers of a wide range of crop plants were being treated with gamma rays at the Indian Agricultural Research Institute, New Delhi.

Control of pests and disease and preservation of vegetables were other lines on which the institute was conducting research.

From among the mutations already induced, a new variety of wheat—NP-836—has been developed. In tobacco, a mutation leading to increased leaf-area has been obtained in the 'natu' variety.—I.N.S.

THE STATESMAN, 3 AUGUST 1961

ATOMIC ENERGY IN MEDICINE

ADVISORY COMMITTEE RECONSTITUTED

JAIPUR, Aug 2.—The Atomic Energy Department of the Government of India has reconstituted its Biological and Medical Advisory Committee, reports PTI. Dr R. Heiling, a heart specialist of Jaipur, has been appointed chairman of the new committee.

Dr A. R. Gopal Ayengar of Bombay is the member-secretary of the 11-member committee which includes Dr C. George (Madurai), Dr C. Gopalan (Hyderabad), Dr Jussawala (Bombay), Lt-Col S. K. Mazumdar of the Defence Ministry, Dr S. P. Ray-Chaudhuri (Banaras), Dr A. Sreenivasan (Mysore), Dr S. Swaminathan (New Delhi) and an Under-Secretary of the Department of Atomic Energy.

The committee whose functions are advisory will draw the attention of the Atomic Energy Department to the biological and medical aspects of atomic energy in which work needs to be taken up or developed further.

The committee will lay down procedures and precautions to be followed in handling radioactive substances with a view to safeguarding the health of the workers, patients and the surrounding population.

It will also advise the department on requests for equipment, grants-in-aid or the supply of isotopes and request from scientific workers in the universities and other institutions for biological and medical investigations and use.

The committee has been in existence since 1955 and is reconstituted periodically.

Science Notebook

NIGEL CALDER

Often when I am in a library looking through the specialist science journals, an oppressive weariness comes over me. Out of a hundred papers, reports, abstracts and letters to the academic editors, only a handful strike any spark in me; and not, I believe, simply because of ignorance on my part about the significance of the remainder. Indeed I suspect that if half of them were never published the loss to science would be imperceptible. It is a matter of some importance, because already well over 2 million research papers are published every year and the number is increasing rapidly. There has been a lot of talk among scientists about how to organise the handling and dissemination of such Himalayas of paper-work, and the whole business may be reformed within a few years. But what concerns me more is the waste of effort in research of which the boring report is only the symptom.

Many people are amazed by the present rate of scientific advance. I am thinking (though it does not amaze me) that, with 2 million papers a year, the rate of advance is pitifully slow. With so much scientific research going on, why are major developments significantly enlarging man's knowledge and capabilities to be counted in tens and hundreds, rather than thousands? What are all these chaps doing, in universities, government establishments and industrial laboratories, that their reports are uninteresting – not merely in presentation but in subject matter? Do they not have all manner of facilities, such as automatic instruments and electronic computers, undreamed of even 25 years ago?

The explanation is easy if you accept that only an elite of scientists matters, for the purposes of original discovery and invention; and that is a view which often appears to be uncomfortably near the truth. However, the contribution of the non-elite is indispensable, and I am sure it could be very much greater.

Occam had a Razor – and very important it has been, too, for the development of modern science. William of Ockham (in Surrey) lived three centuries before Newton, but his dictum was remembered. 'It is vain to do with more what can be done with less.' It was taken up by the early modern scientists in the paraphrased form, 'Entities (or hypotheses) should not be multiplied unnecessarily.' Occam's Razor has cut many a swathe through the undergrowth of intellectual extravagance; the complex theory must make way for the simple.

I should like to paraphrase the dictum again: 'Data (or paper) should not be multiplied unnecessarily.' You might call it Occam's Dustbin. Whereas the Razor is for the subtle surgery of ideas, the Dustbin is for dumping superfluous or unimportant experiments, actual or potential; and, in the alternative form, for purging from scientific literature the papers which should never have been written.

The sort of thing I have in mind? In the case of data, the practice which discerning scientists call 'stamp-collecting': you have a technique, or nowadays an expensive machine, and you just go on collecting information because it is there. You become more concerned with the mechanics of science than with its meaning. You may be an anthropologist studying the significance of ornaments in a tribe and have nothing to say about why the tribe is politically rebellious or why it refuses modern medicine. You may be measuring the scattering of a beam of atomic particles by a nucleus, making measurements which have never been made before but which are of precisely the same kind as thousands of other such measurements; and because you are simply justifying money spent on a machine which is now out of date you may be indifferent to the practical or theoretical importance of the measurements. Or you may, in the recent great enterprise of the International Geophysical Year, have amassed libraries of microfilm at the World Data Centres which is going to waste because too few people are bothering to make use of it.

In writing and publishing papers, you may be simply trying to increase your score. (A disturbing practice has grown up among the sociologists of science, of assessing a scientist's productivity by the number of papers which he turns out.) You may be trying to justify some research grant. Or you may be on a promising idea, and you rush into print before your work is complete because you are afraid that somebody else may beat you too it. This, as Professor Merton of Columbia has pointed out, shows that scientists accept the idea that discoveries are likely to be made independently by more than one research worker at roughly the same time. A consequence is that scientific literature contains many half-baked ideas – and corrections to previous papers.

It might seem that all this is an internal affair of science, of no importance to the outsider. Why should it matter to us if many research workers are forgetting the teaching which tells them that the high road to knowledge is by way of the shrewd question and the simplest experiment needed to answer it? A lesser reason is that the public is usually paying for the reasearch these days. More important is that Britain and the whole world are in urgent need of efficiently done science to help solve our economic problems. The slovenly thinking and misdirected effort which so much of the literature represents is corrupting science and by its volume is choking its lines of communication. Bring out the dustbins!

Indian Farming

OCTOBER 1960

NEW STATESMAN · 1 DECEMBER 1961

THE TIMES OF INDIA
WEDNESDAY, AUGUST 23, 1961

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Pusa's Atomic Garden will Produce

Economic Crop Varieties By

THE opening of the Gamma Garden of the Indian Agricultural Research Institute, New Delhi, on August 25, 1960, marks a new era in the history of crop improvement in India.

Towards the end of the last century, a famous Dutch scientist, Hugo de Vries, showed that new characters may arise in plants and animals suddenly and spontaneously and that the organism in which such a change occurs may then breed true for the altered characteristic. He called such a sudden heritable variation a mutation, and suggested that the mutations occurring in nature serve as the building blocks of evolution. It is a tribute to the vision and genius of de Vries that in addition to recognising the role of mutations in evolution, he predicted that it may be possible some day for man to induce at will mutations in all living organisms and that when this happens, the rate of progress in plant and animal breeding can be greatly accelerated.

Artificial Induction Of Mutations

De Vries's prediction came true when in 1927, two American Scientists, H.J. Muller and L.J. Stadler, showed that by exposing animals and plants to X-rays, mutations could be artificially induced in them. This was a discovery of such wide implications that Dr. H.J. Muller was awarded the Nobel Prize in Medicine and Physiology. Though mutations occur spontaneously in nature, the frequency of their occurrence is extremely low—perhaps once in every million individuals. Not only is the frequency of naturally-occurring mutations low but also, only an exasperatingly small proportion of these mutations are useful to the plant breeder. Thus, for purposes of plant improvement, little could be done apart from utilising the natural variation already existing in a crop and taking advantage of any favourable mutation that may occasionally arise. With intensive breeding, a stage is reached when the natural variation becomes quite insufficient for the further needs of the plant breeder. Hence, the discovery that radiations can bring about a hundred-fold increase in mutation rate has assumed a great significance in crop improvement work.

Genesis Of The Gamma Garden

For many years after the discovery of the mutation-inducing property of X-rays, scientists were looking for more convenient methods of exposing plants to radiations. X-ray machines could be installed only inside well-protected rooms and plant material had to be

A general view of the Atomic Garden at the Indian Agricultural Research Institu

THE STATESMAN, 21 MARCH 1962

Special Article

Inducing Mutations

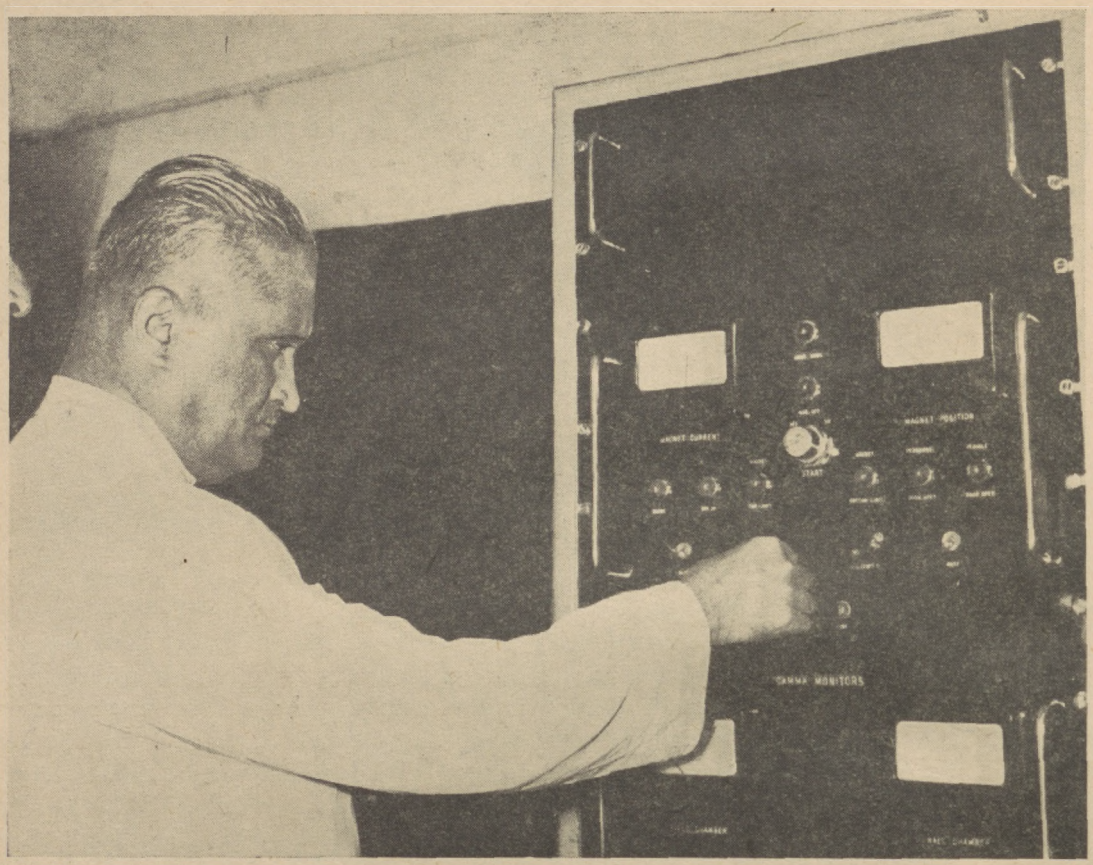
by
A.B. JOSHI *and* **M.S. SWAMINATHAN**
Indian Agricultural Research Institute
New Delhi

taken to such rooms for treatment. This was not only cumbersome but also imposed a limitation on the volume and type of material that could be handled. To achieve success in mutation breeding, it is necessary to work with large populations, since only a very small proportion of the induced mutants is of economic value. After the last world war, atomic reactors in which a wide variety of radio-active elements can be produced, were set up in several countries and this development gave the scientists of the Brookhaven National Laboratory in the United States a new idea as regards the installation of a radiation source of interest to geneticists and plant breeders. About eight years ago, they installed in the centre of an isolated area in Long Island, near New York, a radioactive cobalt source which, when raised from its housing through a remote control mechanism, subjected the plants and other material grown in the vicinity of the source to gamma rays (gamma rays are very similar to X-rays in their physical characteristics and in their action on biological organisms but in addition are more penetrating by virtue of their shorter wave-length). Thus was born the first "gamma garden" of the world. Such gardens have now been set up in several countries in Europe and the one opened on August 25, 1960, at the Indian Agricultural Research Institute, New Delhi, by Shri S.K. Patil, Union Minister for Food and Agriculture, is the largest of its kind in Asia. This Gamma Garden has incorporated in its design several unique features based on the experience drawn from the working of similar fields in the United States and Sweden.

Design Of Gamma Garden

The Gamma Garden of the Pusa Institute has an area of three acres, the whole of which has been encircled by a wall, three feet thick and 12 feet high, built with bricks on either side and earth compacting in the middle. The wall serves two purposes ; first, it offers a protective shielding so that no harm is done to the health of the individuals working at the outskirts of the garden and, secondly, it helps to regulate entry and work in the garden. Outside the brick wall, a barbed-wire fencing has also been erected to ensure that no unauthorised person enters the garden. The radioactive cobalt source is in the form of small pellets weighing about six grams in all. These pellets are inside an aluminium capsule and the capsule is welded to the lid of the lead container in which the radioactive cobalt is kept. The strength of the source is 200 curies ; the cobalt source, together with the lead

tute, showing plants grown in different sectors for being treated with gamma rays



Shri S.K. Patil raising the gamma source by pressing a button in the remote control panel

container, was purchased from the Atomic Energy of Canada Limited.

The radioactive cobalt source can be raised from the lead container by lifting the lid of the container. The lid travels through guide rods inside a thin aluminium tube and is lifted electro-magnetically by pushing a button in the control panel installed in a room 250 feet away from the source. The source can be raised up to about five feet from the ground, and as soon as it is taken out of the lead container, the whole garden receives gamma radiation. Plants are grown in concentric circles and the whole garden is divided into eight sectors, each sector being allotted to a specific group of plants such as cereals, pulses, fibre crops, vegetables, fruit trees, etc. Irrigation water is pumped through hydrants fixed at suitable intervals. Two radiation monitors, one fixed to the circular wall and another which is portable and can be moved radially, help to measure accurately the radiation doses received by the plants at different distances from the source. Plants very near the source receive the highest dosage, and those farther away, much less.

Irradiation Procedure

Space is reserved very near the source for pot-grown plants, since these can be taken in, irradiated with the required dosages and moved out. A tray is fixed to the aluminium tube through which the radioactive cobalt source travels when lifted from the container, and in this tray, seeds, insects, fungi, chemical solutions or similar material can be kept and subjected to heavy doses of gamma rays. Any desired dosage can be given by manipulating the duration of treatment and the distance from the source. Thus, this Gamma Garden is a versatile irradiation unit in which a wide range of plant material can be exposed to radiations at any desired stage in their life cycle. In addition to experiments in the field of plant breeding, studies can be undertaken on the induction of mutations in fungi and beneficial insects, control of insect pests through the use of the sterilising properties of radiation and the usefulness of irradiation techniques in the food preservation industry.

Adequate steps have been taken and special devices have been installed to ensure the health and safety of the personnel working in the Garden. A special Committee under the chairmanship of the Head of the Division of Botany has been constituted to deal with all problems relating to the maintenance and use of the Gamma Garden. This Garden will be available for experimental use to all the research

workers in the States and Universities of India. Interested workers should write to the Head of the Division of Botany, Indian Agricultural Research Institute, for particulars.

Induced Mutations And Crop Improvement

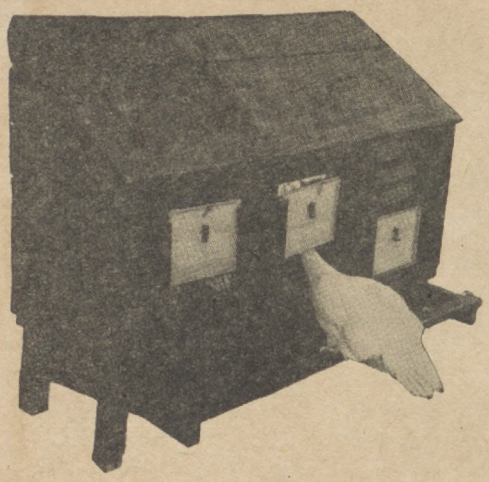
The establishment of the Gamma Garden will help to intensify the mutation research work which has been in progress since 1955 at the Indian Agricultural Research Institute in several crop plants. Mutants of considerable economic value have resulted from the work already done and a strain of wheat produced by irradiation, named N.P. 836, may soon be released for general cultivation. The artificial induction of mutations by radiations is only in its infancy, and much more work needs to be done before its potentialities can be fully explored and exploited. It is well worth doing so because the artificial induction of mutations provides the one hope for freedom from complete dependence upon nature for the genetic variations that are needed to improve our crop plants and adapt them to the ever-growing stringent demands of both the cultivator and the consumer. With this possibility in view and considering that plant breeding is one of the cheapest and surest ways of increasing food production, it may be justifiable to predict that the use of radiation to develop improved varieties of crop plants will in the long run rank amongst the more important contributions of atomic energy to human welfare.

A WORD TO CONTRIBUTORS

When describing a new variety, implement or chemical, kindly also indicate where readers could get it.—ED.

A close-up of the Gamma source with the seed tray and the monitor used for measuring radiation

(Photographs by H.K. Gorkha)



Trap nesting of birds

LET'S HAVE ONLY QUALITY CHICKS

by
N.S. GAREWAL
Poultry Development Officer
Model Poultry Farm, Delhi Cantt.

IT is all very good to talk of stepping up egg and poultry production, but we are not likely to go very far if we lose sight of quality.

The poultry industry is growing rapidly, but average egg production continues to be low and mortality high. The reason : we have not standardised production. It pays to produce only quality chicks and to multiply only these.

What we need is a National Poultry Improvement Plan, with uniform provisions and terms, for improvement of breeding and disease control standards. Such a plan should be chalked out by flock owners, and State and Centre poultry officials.

The reason for our low average egg production and increased mortality is that we have not standardized our production. The poultry industry has now started growing rapidly. A large number of eggs and chicks are being imported and mass production has started at practically all Government poultry farms and also at a few private poultry farms. If this production is allowed to go on haphazardly, we may not go far in the quality of our poultry products. It pays only to produce quality chicks and to multiply these only.

Even at this stage our Government poultry farms are not following real standardised production principles, *i.e.*, we have no national poultry improvement plan standards. It is the time when even the private poultry breeders should voluntarily co-operate in making the Government plans a success. Poultry officials should organise programmes of breeding, improvement and disease control standards under the name of 'National Poultry Improvement Plan' with uniform provisions and terms. The flock owners and the State and the Centre officials should sit together and fix up certain minimum requirements for breeding and disease control. The State agency should direct, supervise and do flock selection, testing for pullorum or other poultry diseases and hatchery inspections as to sanitation and other record keeping. All the participants should sign an agreement with the State agency to comply with the provisions of the plan and to meet its minimum requirements. They should undertake proper certification of the quality of their flocks or hatching products and maintain the required sanitation standard of premises and equipment. They must maintain proper records and submit them for official inspection as and when required. When they meet the minimum requirements, they may be allowed to use the emblem and the designs and description terms of the Plan, which are applicable in advertising their products. The prospective buyers should rely on these advertisements and buy products from these participants only, as these will be certified ones.

Breeding Practices

Improving the efficiency of production of eggs and poultry meat by better breeding practices will put the

Leg banding for identifying breeders

The Gamma Garden unit of the Botany Division of the Indian Agricultural Research Institute with experimental plants in pots ranged around.—Statesman.

PUTTING THE BEARD ON BEARDLESS WHEAT

I.A.R.I.'S GAMMA GARDEN RESEARCH

By A Staff Reporter

AMONG the wonders wrought by science is the revelation of the secrets of Nature and of the methods of doing in a short time what Nature achieves through aeons. Evolution under Nature progresses by

Botany Division grow and ripen.

The radiation unit consists of cobalt pellets. The superstructure of the unit seen from a distance looks like a diminutive, squat, conical-nosed rocket pointing skywards, resting on its take-off tripod. The tripod has a central shaft which runs down into the earth and contains the cobalt

would show the potentialities of this new research tool.

Several wheat varieties possessing resistance to rust have been bred at the Pusa Institute but some of them are not bearded. Indian farmers prefer the bearded varieties because birds dislike their tufts and consequently do less damage. While it will take many

WHEAT has been grown in India since the days of the Mohenjo-Daro civilisation. A native of the Middle East, this cereal attracted the attention of man who found he could make both leavened and unleavened bread from it. Thus, within a short time after man developed agriculture, wheat, with rice, became the most important among the plants brought under domestication.

The development of a great crop plant goes hand in hand with the development of a great civilisation. No wonder then that grains of a unique species of wheat found only in the area comprising the Punjab, North-West Frontier Province and Baluchistan, have been discovered in the Mohenjo-Daro excavations.

This species, called *Triticum sphaerococcum* botanically (right), is no longer under cultivation but is preserved in agricultural research institutions for some valuable characteristics it possesses. It has a short and stiff straw, ability to withstand drought and round grains ideal for milling. However, it has low potentialities for yield (giving only 5-10 maunds per acre) and high susceptibility to diseases, particularly rusts. With progressive evolution in agriculture, these wheats have been displaced by the species *Triticum aestivum*. Some of the new varieties bred at the Indian Agricultural Research Institute (I.A.R.I.), New Delhi, have a high degree of resistance to diseases, grains containing as much as 10 per cent protein and a high yielding ability (about 45 maunds per acre).

Mohenjo-daro wheat grown at the IARI

Old and New in Wheat

LEFT : A new Pusa wheat (highest yield 45 maunds per acre) side by side an old straitn. RIGHT ; Another Pusa variety with whiskers developed by subjecting seeds to atomic radiation. These whiskers on the ears keep the birds away.

Tougher, Richer, More Yielding (and Sometimes Bewhiskered Too)

Any time of the day or night, along India's highways and byways, you'll come across signs and messages gaily painted on the backs of T-M-B truck tail-boards. This one cheerfully says:

..phir milenge

"we'll meet again..."

Ahead of this driver lies an arduous journey over rough roads, steep gradients and marshy ground, but his reliable T-M-B overcomes these hazards without a protest! Soon he will be back again with his speedy, economical STAR to haul yet another load of fortune.

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THE STAR THAT HAULS A FORTUNE

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LINK
INDIAN NEWSMAGAZINE
Vol. 5, No. 3
August 26, 1962

SCIENCE

Genetics and Modern Life

By Dr. M. S. Swaminathan

Much has been said about the advantages of irradiation over conventional methods of preserving food. But in this article Dr. Swaminathan who has done some pioneering work on the genetic effects of irradiated food at the Indian Agricultural Research Institute, New Delhi, strikes a note of caution against its widespread use before further investigation.

Biological evolution is the most significant discovery concerning human experience. Our ancestors of some three or four billion years ago started as mere chains of the chemical combination known as nucleotides. These chains were primitive forms of what we now know as "genes" or the elementary determinants of hereditary characters. The genes, which are arranged linearly in filaments called chromosomes, have the unique property of self-duplication. Occasionally an accident, termed a mutation, takes place during the process of gene duplication and the result from the point of view of the organism could be either the loss or alteration of certain specific character.

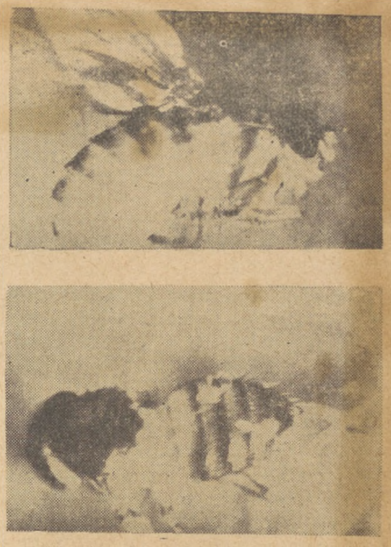
Such mutations do not occur in any directed manner but occur at random in all the genes. Most of such mutations are harmful to the survival of the organism and hence are weeded out under natural selection. A few which survive help the organism to evolve further. Thus, we can say that through billions of years of blind mutations, microbes muddled through and emerged as men. This process is not yet complete and for all we know will continue. May be, after a million years from now, some of the conspicuous morphological disharmonies in man (such as the crossing of respiratory with alimentary passages causing occasional choking and the placement of the optic nerve fibres of the retina in the path of the light instead of behind the retinal surface) will disappear.

Harmful Mutations: It is sometimes suggested that high-intensity radiation in primitive times greatly increased the mutation rate so that an extremely variable population was available upon which natural selection could operate. All biologists, however, know now that even a slight increase in the prevailing levels of radiation in the earth's environment would cause the occurrence of numerous harmful mutations that would be catastrophic to posterity. At the same time, the use of atomic energy in various walks of life—as a source of power, as a tool in medical, industrial and biological research—has become an integral part of the life of modern man.

Thus in learning to live with sources of radiation, it is important that we do not forget some basic facts which genetics has brought to light. For example, if a group of people are exposed to the now permitted occupational dose of only one-tenth of a roentgen (a unit of radiation) per week over a period of 30 years prior to their reproduction —a dose that adds up to a total of 150 roentgens per person—their children will inherit 15 times as many radiation-produced mutations as would be the children of a group that has been exposed only to the natural cosmic and terrestrial radiation. The wonderful world promised by the advent of atomic energy would be of no use to the generations derived from the reproductive cells carrying such mutations, since many of them may lack the capacity to laugh, hear, speak or imagine. Such genetic harm apart, it is well known that the individual receiving extra radiation might suffer in his own life-time from various forms of cancer.

Thalidomide: We envy life in the technologically advanced countries because it seems that people there live longer, experience less pain and are more happy. It seems probable from genetic studies, however, that in such countries mutations, a great majority of them detrimental to health, occur now in each generation in far greater number than the number of genetically handicapped persons who fail to survive or reproduce. This situation spells a genetic disaster which cannot be compensated for by any conceivable advances in medicine, education or technology. The recent lesson from the use of the sedative thalidomide should awaken us to the grim fate which awaits us if the reckless pursuit to make life easier continues.

Genes and chromosomes have the most precise, integrated and meaningful architecture which one can visualise. They respond to purposeful manipulation (as exemplified by the great successes achieved by plant and animal breeders) but are averse to interference with the balanced metabolic conditions under which they function and reproduce. We should, therefore, avoid all ill-considered remedies for our troubles such as the indiscriminate use of



A normal fruit fly (top), and a mutant fly with ill-developed wings caused by feeding with irradiated food

many "magic" drugs, antibiotics, X-ray diagnosis of pregnancy, etc. since they have unfavourable repercussions on the genetic material as well as on the development of the foetus. To achieve this objective we need, not only an enlightened public but also a well-informed medical profession. Seen in this light, the fact that genetics does not find a place in the curriculum of most of our medical colleges is a tragedy for us and even more, for our posterity.

Danger in Food Irradiation: The foregoing is not meant to convey that we should not enjoy the fruits of the atomic era. It is intended only to emphasise that our most basic job is education—education of the type which will tend to enrich our genetic heritage rather than damage it. When this is done, the harmful consequences of living with sources of radiation, numerous new chemicals, etc., can be minimised, if not altogether eliminated. This is clear from the fact that while 25 years ago many radiologists contracted cancer, few stand this risk today. We can effect further improvement in this situation if the compartmentalised minds of many professional scientists like chemists, physicists, engineers and biologists can be converted into integrated minds. To cite one example, nuclear technologists in several countries have proved beyond doubt the economic advantages of extending the storage life of food grains, meat, eggs, fruit juices, vegetables, etc., through exposing such articles to large doses of radiation. Hence, they have been recommending that the conventional methods of food preservation be replaced by this

P.T.O.

Contd. from backpage

new technique. However, my colleagues and I at the Indian Agricultural Research Institute, have observed that harmful mutations arise when the fruit fly (*Drosophila melanogaster* the classic test organism of geneticists) is fed with irradiated food. Caution is hence necessary before the sale of irradiated food for consumption is authorised. Otherwise the thalidomide story may be repeated.

Our education must be such as to incite the curiosity of the individual in understanding the physical and biological aspects of his own life. This can be achieved only if we teach genetics and physiology to all our students. It is well worthwhile doing so, more because we can thereby ensure that human well-being remains the sole result of all advances in science and technology. Also, with the spread of genetical knowledge many prejudices based on skin colour and other morphological traits as well as many incorrect social beliefs would vanish. Thus, men who blame their wives for not bearing sons would find out that if any one should bear a grudge it is the wife and not the husband since the sex of the child is determined by the father! The harmful effects of many of our marriage customs which facilitate inbreeding would also become widely known. This would provide a sound basis for building up an integrated nation of healthy, handsome and intelligent individuals.

Space : Next Step

Soviet scientists from all accounts are highly pleased with the results of their latest manned space flight experiment. Doubts and misgivings regarding the technical feasibility of placing separate spaceship components in orbits close enough to join them together later, if necessary; about the physical capacity of astronauts to endure long hours of weight lessness and their ability to work in that condition and about the harmful effects of continued exposure to space radiation—all these have been proved unfounded. The mathematical precision with which the two spaceships were successfully placed in near and almost identical orbits removed surviving fears about the unforeseeable difficulties involved in an orbital rendezvous, the next essential step to man's progress in space. The two astronauts stood well up to the severe G-forces that occur during blast-off and landing and did all kinds of routine work expected of them—eating, sleeping and excercises—during the rather long spell of weightlessness.

It was presumed that any alteration of the gravitational force (weight) to which all life on earth is accustomed and by which all physiological mechanisms are conditioned, would severely affect the normal functioning of the organism. The argument was that since the flow of all body fluids is affected usually by their own weight, in a state of zero-gravity, the balance of such things as the heart and the arterial pumping stresses, or those contributing to human equilibrium, would be upset resulting in serious consequences. All these assumptions were belied. Not only did the cosmonauts feel easy and normal to a great extent, but they left their seats, unstrapped themselves and carried out a number of scheduled assignments. As regards radiation hazards from continued exposure, nothing has been observed so far to indicate a serious threat to warm-blooded life in the space environment.

Reassured of these most difficult and uncertain aspects of space exploration, Soviet scientists are planning 'more daring spectacles' in the 'neighbourhood of the earth'. Ivan Artobolevski, a member of the Soviet Academy of Sciences, disclosed recently that the next step would be to experiment in free manoeuvres in space, change of orbits, group navigation and the setting up of a flying platform high above the earth. The launching of the Cosmos VIII satellite last Sunday, within two days of the space twin's landing, indicates the new tempo of space activity. Speculation in Western scientific circles says that the latest Soviet unmanned satellite is on a journey to Venus. Even the most chauvinist among American scientists now concede that they are far behind in the race to the moon.

The Russians, however, do not minimise the difficulties and dangers inherent in the various lunar exploration programmes. The main problem they, like the Americans, face is how to land a man safely on the moon's surface and bring him back to earth alive. Both direct ascent to the moon and various orbital rendezvous techniques are being studied, but so far no decision about any particular method has been made public.

According to their estimates, a direct ascent to the moon requires a 50-100 ton capsule to be lifted into space by a huge "Mastodon" rocket weighing several thousand tons and standing 300 ft. high. About 100 tank cars of liquid fuel would be required for this rocket and the launching pad alone would cost billions of roubles.

A plan for a lunar launching from water has certain attractive features, but there are equally big hurdles in its way. One is how to get the 'Mastodon' to the launching pad. Rail and truck transport are ruled out. Scientists are now considering assembly of the first stage on a barge. This stage alone would be 150 ft. high and 50 ft. in diameter. The barge would be floated to the launching area where other stages would be assembled on a second stage. The second barge would be used eventually as the launching pad. Assembling the entire rocket on the launching pad is considered less reliable than completing the assembly in the factory.

WORLD VIEW

VERY BASIC

There are 12 basic words in the English language. They make up a quarter of all the reading, writing and talking done by the average Englishman. The words listed in 'Key Words to Literacy' by J. McNally, senior educational psychologist in Manchester, and W. Murray, a Cheltenham headmaster are: A, Of, The, And, I, That, If, Was, He, Is, To, and In.

The booklet says that with a further 20, they make up, on the average, more than one-third of the total words used in juvenile and adult reading. These 20 are: All, Are, As, At, Be, But, For, Had, Have, Him, His, Not, On, One, Said, So, They, We, With, and You.

TALL AUGEAN

Scrubbing away the dirt of 30 years from the 102-storey Empire State Building of New York has started. It will take six months, 3,000 gallons of limestone coating, 300 gallons of paint —and a lot of nerve.

FLATTENED CROOK

A crook who held up a supermarket in Leandro, California, drove away and threw his gun out of the window to get rid of the evidence. As it hit the ground, however, it went off, and punctured his tyre. He was caught.

GETTING WISER

An American commentator says: In the first year of high school, a girl's motto is 'mother knows best'. With her Leaving Certificate, it is 'death before dishonour'. In the first year at university, it becomes, 'nothing ventured, nothing gained'. And, just before graduating, 'Boys will be boys'.

GRAND TOTAL

The 256 in-patients treated for alcoholism at Pretoria's Castle Carey clinic last year were drinking an average of 479 bottles of liquor a day among themselves. According to the clinic's annual report, their daily consumption in bottles alone, not including casual drinks at bars and clubs, was an average of a bottle and a half of spirits each.

The total was made up of 338 bottles of brandy, 41 of whisky, 44 of wine, 26 of gin, 10 of vodka and 20 of beer or stout.

Cultivation of new strains of hybrid maize

By our Special Correspondent

New Delhi, Oct. 4—A group of Delhi farmers and newsmen were today told that nearly two lakh acres of land in India would be sown this year with high yielding hybrid maize seeds produced at the Indian Agricultural Research Institute.

The four hybrid varieties: 'Ranjit' for south Rajasthan, Gujarat and Maharashtra; 'Deccan' for peninsular India; Ganga 1 and 101 for the Indo-Gangetic plains evolved after crossbreeding between the local and the U.S. varieties have become extremely popular with the peasants. The institute is unable to meet the entire demand for better seeds.

As against the average national yield of 7.5 maunds per acre, the hybrid maize produces up to 120 maunds. The farmers, who were taken round the institute's experimental farms, showed keen interest in the various hybrids grown there ranging from the popcorn varieties of the Himalayan regions to the high yielding Ganga 101.

The sorghum and forage cultures also show great promise. A large variety of seeds for experimentation has been imported from the U.S. with the assistance of the Rockfeller Foundation. The 'Improved Ghana" variety of 'bajra' is the product of intensive breeding work carried out for several years in materials introduced from Ghana. In addition to yielding 23 per cent more grain as compared to the best local variety, it is associated with bigger and more compact heads. It takes only 40 days to flower.

The hybrid jowars have been developed from male sterile stocks obtained from the U.S. Attempts at present are directed towards breeding hybrids which are white seeded and tend towards pearliness. If such hybrids can outyield the locals, they will be preferred by the farmer in areas where yellow and chalky seeded varieties are grown. Large quantities of hybrids have been distributed in different regions to identify the most promising one for large scale testing and release.

New jute hybrid to raise output

By our Special Correspondent

New Delhi, Oct. 4—After 58 years of research, the Indian Agricultural Research Institute has found the answer to the problem of increasing jute production without extension of the area under cultivation.

A new hybrid jute fibre has been evolved by cross breeding Tossa with white fibre. It has the quality of the Tossa fibre and the adaptability of the white variety and its yield is nearly twice that of the ordinary fibre.

The white fibre accounts for nearly 60 per cent of the total area under jute cultivation in the country. It is proposed to introduce the hybrid variety first in West Bengal. Its extension to other jute-growing States will depend upon the results of the field trials.

Pest-resistant cotton plants

By a Staff Correspondent

New Delhi, Sept. 22—Long stapled cotton plants, possessing a high degree of resistance to pests, have been developed at the Indian Agricultural Research Institute.

By a painstaking process of selection, elimination and inbreeding of cotton plants subjected to radiation in the Gamma garden, pest resistance has been indirectly induced by developing a strain with hairy stems and leaves.

Jassids, a type of pest that live on the sap they suck from cotton plants, are kept away from reaching the plant surfaces by the hairy growth.

The Jassid resistant strain has been developed at the botany department from Mescilla Acala, a Peruvian cotton plant with staples measuring an inch in length. Most of the commonly grown Indian cottons have staple lengths ranging from 1/2 to 7/8 inch.

Attempts are being made to develop mutations (hereditary changes) conferring Jassid resistance in Sea Island cotton which has 1¼ inch long staples.

भावी समृद्धिका प्रतीक

दिल्लीके पूसा संस्थानका 'वनस्पति लोक'

कृषि अनुसंधान संस्थान, पूसाके कृषि विशेषज्ञोंने आज किसानोंको अपना आश्चर्यजनक "वनस्पति लोक" दिखाया। इसमें संदेह नहीं कि अनाजों के जो नये बीज यहां अनुसंधान कार्य से तैयार हो रहे हैं उनमें भारतकी भावी समृद्धिका स्वप्न निहित है।

एक-एक बालिश्तकी गेहूंकी लहलहाती बालियां आनेवाले कलकी खुशीका संदेश देती प्रतीत होती थीं। गेहूं, जौ, चारा तथा अन्य फसलोंकी जो उन्नत किस्में यहां पैदा की गयी हैं वे सफलताकी सूचक हैं।

तीन वर्षमें

अनुसंधानसे तीन वर्षके भीतर गेहूं की इतनी उन्नत किस्में तैयार की गयी हैं कि प्रकृतिको इस कार्यमें हजारों वर्ष लगते।

हरा चारा

गर्मियोंमें खासतौरपर पशुओंके लिए हरे चारेकी समस्या हमारे देशमें सदा बनी रहती है। लेकिन कृषि विशेषज्ञोंने वैज्ञानिक विधियोंसे हरे चारेकी कई ऐसी किस्में निकाली हैं जिनसे गर्मियों भर दुधारू पशुओंको बराबर हरा चारा मिलता रहेगा। बरसीम एक ऐसा ही चारा है। एक बार बोकर छह मास तक लगातार यह बढ़ता रहता है।

अधिक उपज

गेहूंकी नयी किस्मोंसे प्रति एकड़ ३० मन गेहूं नवम्बरमें बोकर प्राप्त किया जा सकता है। जबकि इससे पूर्व के महीनोंमें इसी भूमिसे मक्काकी फसल ली जा सकती है। किसानोंने बड़ी रुचि के साथ यहांकी फसलोंको देखा।

THE TIMES OF INDIA
FRIDAY OCTOBER 5 1962

INDIAN AGRICULTURE HAS BRIGHT FUTURE

I.A.R.I. Develops New Strains Of Grain

By A Staff Reporter

A visit to the experimental farms of the Indian Agricultural Research Institute at Pusa inspires confidence in the future of agriculture in the country.

In just over a decade, the Botany Division of the institute has achieved encouraging results. The emphasis is, of course, on hybridization, the latest trend in agriculture. Groups of farmers and newsmen, who were taken round the farms on Thursday, were impressed by the tremendous possibilities of increasing the yield per acre of various foodgrains through the use of new varieties of seeds developed by Indian scientists in collaboration with foreign experts.

The most rewarding research has been in the field of maize breeding. Through painstaking experimentation, the institute has developed four superior maize hybrids the seeds of which have already been distributed all over the country for cultivation. Pride of place goes to Ganga Hybrid Makka 101 which has given a yield of 90 to 125 mds. per acre as against the average yield of 7.5 mds. per acre under ordinary conditions and 24.2 mds. per acre by the use of fertilisers. Ranjit Hybrid Makka is the next best, yielding 80 to 90 mds. per acre. The other seeds developed are Deccan Hybrid Makka and Ganga Hybrid Makka 1. While the Ganga hybrids are suited for the Indo-Gangetic plains, Ranjit Hybrid is meant for southern Rajasthan, Gujarat and Maharashtra and Deccan Hybrid for regions in the south.

These hybrids have some attractive features. The grain is hard which the Indian farmer likes. Another advantage is that they yield more fodder because unlike the ordinary variety the stalk of these breeds is still green at the time of harvesting.

POPULARITY WITH FARMERS

Judging from the demand, these hybrids have become extremely popular. Last year the institute produced 6,000 lb. of these hybrid seeds which were all sold out. This year the production is expected to be 24,000 lb.—enough to cultivate two lakh acres of land.

Research is going on for still better maize hybrids. As many as 160 other hybrids are under test. The scientists at the institute are also conscious of the demands of industry. They have developed soft, white-grained hybrids suitable for the production of starch, pharmaceutics, cosmetics and confectionery.

Besides, the scientists have also succeeded in producing a variety of popcorn, though not of the best quality. Sweet varieties imported from the U.S.A. have been crossed with the indigenous varieties to produce the sweet hybrid.

The latest achievement, however, is the development of the "Improved Ghana" variety of bajra, named after the country from where the parents of the breed were imported. This is not a hybrid as it has been developed through open pollination. The average yield of this variety is 20 mds. per acre, 23 per cent. more than the yield of the local variety. The heads are twice as big as of the local variety and its grains contain 12 to 14 per cent. protein. The breed, which can grow in soil of low as well high fertility, takes only 40 days to flower. In the Kanjhawala Block farmers have already taken to this variety. Though hybrids of bajra are being developed, a strain has not been developed so far for large-scale cultivation.

Similarly, promising hybrids of jowar are also being developed for distribution. A new hybrid, the result of crossing between the U.S. variety and Indian breeds, has given a yield of as much as 4,000 lb. per acre as against the average Indian production of 300 lb. per acre. More than 4,000 types of Indian and exotic jowar have been collected for hybridization at the farm.

Corn of the best maize breed, named Ganga Hybrid Makka 101, developed at the Indian Agricultural Research Institute.

MILESTONE IN *MAIZE & MILLETS*

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By A Sta...

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The Seed of Plenty

Pusa Research Yields New Varieties

Scientists of the Pusa Institute in the capital have just evolved new varieties of millets and maize. These hybrid strains, when adopted on a wide scale, will play a big part in the vital task of increasing our food output.

The Indian Agricultural Research Institute, (to give the full name of the Pusa Institute) has done extensive work on breeding new varieties of cereals. Some time ago (May 27 issue) Yojana *carried a brief account of the research done in wheat. The Institute is now happy to have developed varieties of* jowar, bajra *and maize which will prove a boon to our farmers.*

Hybrid Jowar, Bajra, Maize

Jowar (*Sorghum vulgare*) is the second most important food crop of the country in terms of area, next only to rice. In terms of quantity wheat and *jowar* have a neck-and-neck race. Favourite of the Marathas, *jowar*, although called a coarse grain, is also popular with peasants in many other parts of the country. In 1961-62, it was grown in 43 million acres, the production being 7.7 million tons.

By crossing a U.S. variety with Indian strains I.A.R.I., has now developed hybrid *jowar*. Though the plants are somewhat shorter they bear bigger heads with larger grains. The yield from these varieties is 50 maunds per acre *or double that produced from the best of the familiar varieties*.

Maize was first introduced into our country from America about three centuries ago. Though as a food crop it comes after rice, *jowar*, wheat and *bajra*, it is the staple food of a large number of people particularly in the hilly areas. The production in 1961-62 was nearly 4 million tons of grain, the average land under the crop being about 11 million acres.

Visiting the farm attached to the IARI early in October, I had a glimpse of the hybrid maizes ready for harvest. The plants were tall, the cobs bigger and the grains more compact. I gathered that four varieties suitable for different parts

Pictures:
Shivaram Singh
Text:
Kali Biswas

much as 4,000 lb. per acre as against the average Indian production of 300 lb. per acre. More than 4,000 types of Indian and exotic jowar have been collected for hybridization at the farm.

had been sown only in August. The grains of 'Improved Ghana' are bold and compact and contain 14 per cent protein. The average yield of this hybrid is 25 to 30 maunds per acre as against 10 to 12 maunds from local varieties.

Seeds of the hybrid strains of maize, *jowar* and *bajra* will be multiplied on a large scale for distribution by the National Seeds Corporation being set up by the Government.

Those who are interested in the improved strains may get the seeds from the Head of the Botany Division, Indian Agricultural Research Institute, New Delhi.

The activities of the Institute are not confined to evolving new cereal varieties. The welfare of cattle being intimately related to our agricultural prosperity, it carries out research in fodder also.

One of the new fodder grasses in the country is Napier or Elephant grass(*Pennisetumperpureum*), a South African variety introduced some years ago. By crossing *bajra* with Napier grass the Institute has now produced a new variety called "Pusa Giant Napier". This hybrid is six to seven feet high and yields 254,000 pounds per acre as against 123,000 pounds that the ordinary Napier grass yields. The Pusa Giant also contains about 50 per cent more protein and 16 per cent more sugar than Napier grass.

of the country had been evolved and released for cultivation. They are: *Ganga Hybrid Makka 101* and *Ganga Hybrid Makka-1* for the northern plains, *Ranjit Hybrid Makka* for southern Rajasthan, Gujarat and Maharashtra and *Deccan Hybrid Makka* for the peninsular parts. Ganga 101 yields as much as 50 maunds per acre with the aid of fertilisers as against only 30 maunds per acre from KT 41—the best local strain produced so far. The hybrids also produce more fodder. A white grain variety, rich in starch, has also been grown at the Institute. It will have industrial uses.

Bajra (*Pennisetum typhoideum*), which is another of the important crops of the country, is a native of Africa. It is now grown in all parts of India except Assam. The average annual area under *bajra* is about 27 million acres, the production in 1961-62 being 3.5 million tons of grain. The Institute has now released a new variety of *bajra* called 'Improved Ghana'. It is an early variety and takes only 80 days to grow. The crop which was ready for harvest in the Institute's fields in the first week of October

The photographs show (top, from left to right) a general view of hybrid jowar grown in IARI fields, the jowar earheads from a closer range and a full grown Makka Ganga 1 being examined. (Bottom, extreme left) a view of the Pusa Giant Napier grass and (left) the compact earheads of hybrid bajra "Improved Ghana".

The Hindustan Times

Monday, February 11, 1963

Indian vice-president of Genetics Congress

By a Staff Correspondent

New Delhi, Feb. 10—Dr M. S. Swaminathan, head of the Botany Division in the Indian Agricultural Research Institute, has been selected as a vice-president of the International Congress of Genetics to be held in September at Scheveningen, the Netherlands.

This is the first time that an Indian geneticist has won this recognition.

पूसा इंस्टीट्यूट की नई देन (२)

साल में फी एकड़ ३,७५० मन

चारा देने वाली पूसा जायंट नेपियर घास

–विनय कुमार भटनागर–
सह-संपादक, 'सेवाग्राम'

भारतीय कृषि अनुसंधान संस्था (पूसा इंस्टीट्यूट) ने चारे के लिए दो नई किस्मों की घासों का पता लगाया है जिनसे साल में फी एकड़ ३,७५० मन तक चारा मिल सकता है।

इनमें से एक है पूसा जायंट नेपियर घास। यह घास नेपियर या हाथी घास और अफ्रीकी बाजरे के संक्रमण से तैयार की जाती है। नेपियर घास भारत में काफी प्रचलित है। इस शताब्दी के शुरू में यह घास अफ्रीका से भारत लाई गई थी। सिंचित और अच्छी मिट्टी वाले इलाकों में यह घास खूब लगाई जाती है और अच्छा चारा देती है।

पर नेपियर घास को पानी की बहुत जरूरत पड़ती है और इसकी पत्तियां और डंठल कड़े होते हैं, इसलिए इसकी कीमत कम उठती है। नेपियर को बाजरे से संक्रमण करने का उद्देश्य एक ऐसी किस्म तैयार करना था जिसे पानी की कम जरूरत पड़े और जिससे चारा भी अधिक मिले।

पिछले तीन सालों से पूसा में पूसा जायंट नेपियर घास पर कई परीक्षण हुए जिनमें चारा दुगुना मिला। साल में लगभग ३,१७५ मन चारा मिला जबकि साधारण नेपियर से लगभग १,५९० मन चारा मिला। यही नहीं जैसा कि ऊपर की तालिका में बताया गया है पूसा जायंट नेपियर की फसल साल की चारों फसलों में बरसात, सर्दी, बसंत और गर्मियों में क्रमशः ५०, २५, ७५ व १७० फीसदी अधिक रही।

परीक्षणों में घास की बरसात के अलावा एक पखवाड़े में दो बार सिंचाई की गई और फी एकड़ लगभग १½ मन अमोनियम सल्फेट दी गई।

	चारा फी एकड़ मनों में			
	बरसात	सर्दी	बसंत	गर्मी
पूसा जायंट नेपियर	७३७½	१२५	४३७	१,८७५
नेपियर	५००	१००	२५०	६८७

इसके अलावा नई घास में कई विशेषताएं हैं जैसे—

१. पूसा जायंट नेपियर में नेपियर से १५० फीसदी प्रोटीन और १६ फीसदी शक्कर अधिक होती है जिससे इसका चारा अधिक पौष्टिक हो जाता है।

२. नेपियर के पत्ते कड़े होते हैं पर पूसा जायंट नेपियर के पत्ते मुलायम होते हैं।

३. उगते समय और बाद में पूसा जायंट नेपियर के डंठलों में काफी रस रहता है और इसके डंठल देर तक हरे रहते हैं। इसलिए नेपियर की तरह कटाई की जल्दी नहीं रहती।

४. नई घास जल्दी उगती है।

५. पूसा जायंट नेपियर की जड़ें साधारण नेपियर से लगभग ५० फीसदी अधिक होती हैं जिससे भूमि को अधिक जैविक तत्व मिलते हैं।

६. पूसा जायंट नेपियर में उर्वरकों की मात्रा बढ़ाने पर यह ३,७५० मन तक पैदावार दे सकती हैं जबकि साधारण नेपियर घास में उर्वरक की मात्रा बढ़ाने से विशेष असर नहीं पड़ता।

उत्तरी व पूर्वी भारत में चारे के लिए ज्वार और मक्का की फसल का इस्तेमाल किया जाता है। इन इलाकों में पूसा जायंट नेपियर लगाया जा सकता है। १½ से २ फुट की चौड़ी कतारों में जड़ें या कटे डंठल लगाए जाते हैं। शुरू में काफी सिंचाई की जरूरत होती है। २-३ हफ्ते तक हफ्तावार और बाद में १०-१२ दिन के अंतर से पानी दिया जाए।

पूसा जायंट नेपियर में नत्रजनीय खादें देनी चाहिएं। १५-२० गाड़ी कंपोस्ट की खाद के साथ १½ मन अमोनियम सल्फेट चार बार में तीन महीने के अंतर से दिए जाएं।

अगर पौध फरवरी-मार्च में लगाई गई हो तब मई के बीच यह पहली कटाई के लिए तैयार हो जाती है। उसके बाद की कटाइयां ४५ से ५० दिन तक की जा सकती हैं। कटाई ४ से ५ इंच ऊपर करनी चाहिए।

पिछले साल पूसा इंस्टीट्यूट के जोधपुर, कोटा, आगरा, बालूगढ़ (उ. प्र.), मेरठ, देहरादून, लखनऊ, पटना, हरिनघटा (पश्चिम बंगाल) वर्धा, पालमपुर (पंजाब) के केंद्रों के पूसा जायंट नेपियर घास परीक्षण के लिए दी गई। इसके अलावा यह घास आस्ट्रेलिया, सिक्किम और ताईवान भी भेजी गई। गर्म क्षेत्रों के लिए यह बहुत उपयोगी पाई गई।

घास की इस नई किस्म को तैयार करने का श्रेय पूसा इंस्टीट्यूट के बौटिनी डिवीजन के श्री बी. डी. पाटिल को है जो पिछले १४ साल से घास विज्ञान में लगे हुए हैं। पूसा इंस्टीट्यूट में वह १९५८ से हैं। श्री पाटिल घास विज्ञान का अध्ययन करने १९५९ में इंगलैंड व अमेरिका गए थे।

पूसा जायंट नेपियर के बीज व पौध अध्यक्ष बौटिनी डिविजन, भारतीय कृषि अनुसंधान संस्था (पूसा इंस्टीट्यूट), नई दिल्ली-१८ से मिल सकते हैं। ५० वर्गफुट क्षेत्र के लिए ३ सेर के पार्सल भेजे जाते हैं जिसे बाद में एक एकड़ में लगाया जा सकता है। ●

४० दिन की पूसा जायंट नेपियर घास और नेपियर घास का तुलनात्मक अध्ययन

पूसा के बीजों से गेहूं की पैदाव

दिल्ली के किसान पूसा के उन्नत बीज इस्तेमाल कर पैदावार बढ़ा रहे हैं। दिल्ली में ७०,००० एकड़ में गेहूं की खेती होती है। किसान सी ५९१, सी २८१ और एन. पी. ७१८ का इस्तेमाल करते हैं।

हाल में पूसा इंस्टीट्यूट ने गेहूं की दो नई किस्में—एन. पी. ८२३ और एन. पी. ८२४—निकाली हैं जिनसे पैदावार और अधिक बढ़ी है। पूसा इंस्टीट्यूट के कार्यकर्ता और विशेषज्ञ दिल्ली के गांवों में गए और उन्होंने नई किस्मों का प्रदर्शन किया। खेतों में प्रदर्शन इंस्टीट्यूट के विशेषज्ञों की देख-रेख में होता था। प्रदर्शनों में कई चीजें देखी गईं, जैसे गेहूं की उन्नत किस्में, अग्रोसन जी. एन. से उपचारित करने का परिणाम, दीमक के खिलाफ बी. एच. सी. का उपयोग, खर-पतवार नष्ट करने के लिए २, ४-डी का प्रयोग।

गांवों में पहले एन. पी. ७१८ लोकप्रिय थी, पर पूसा की नई किस्मों एन. पी. ८२३ और एन. पी. ८२४ की फी एकड़ उपज क्रमशः २४ और २३.९ मन हुई, जबकि एन.पी. ७१८ से २१.७ मन हुई। १० गांवों में सी २८१, एन. पी. ८२४ व एन. पी. ८२३ का तुलनात्मक अध्ययन किया गया। फी एकड़ औसत उपज इस तरह थी—एन. पी. ८२४ से २०.६ मन, एन. पी. ८२३ से १९.६ मन और सी २८१ से से १८.६ मन। इस तरह एन. पी. ८२४ और एन. पी. ८२३ सी २८१ से बेहतर साबित हुईं। प्रदर्शनों का किसानों पर बहुत असर पड़ा।

उन्नत किस्में ८२३ व ८२४

इसके अलावा अलग-अलग

पूसा के उन्नत

गेहूं को कजरापिल्लू

—दुर्गाशंकर त्रिवेदी—
रोटला, झाबुआ (म. प्र.)

रबी की फसलों को "कजरा-पिल्लू" कीड़ा बहुत नुक्सान पहुंचाता है। ज्यों-ज्यों सर्दी बढ़ती है, त्यों-त्यों इसका हमला बढ़ता जाता है। कहीं-कहीं सितंबर में यह पैदा हो जाता है और मार्च में जब गर्मी शुरू होने लगती है तब यह नजर नहीं आता गेहूं के अलावा यह चना, मटर, आलू पर भी लगता है। यह छोटे और नर्म पौधों के तनों को खा जाता है।

कजरापिल्लू जितना अनाज खाता नहीं, उससे ज्यादा खराब करता है। चूहों की तरह य कुतरता ज्यादा है। दिन के समः भूमि की दरारों में छिपा रहत है और सूरज छिपने पर निकलत है। यदि इसके काटे पौधों क देखें तो लगेगा जैसे किसी ने चाः से काट दिए हों। ताजे कटे पौध के पास यदि जमीन खोद क देखें तो कीड़ा वहीं छिपा मिलेगा कभी-कभी एक रात में पूरा खे साफ कर देता है।

दीवाली कह न बन

—महावीर प्रसाद अग्रवाल—

दीवाली की रात आती है तो घर-घर के आले दीवारें और कंगूरे मिट्टी के छोटे-छोटे दीपों से जगमगा उठते हैं। अंधेरा दूर हो जाता है। शहरों में बिजली की रंगीन रोशनी होती है। अब तो कई गांवों में भी बिजली की रंगीन रोशनी होने लगी है। आज के गांव भी उन्नति की दौड़ में आगे बढ़ रहे हैं। धीरे-धीरे दीपकों की रोशनी मिट रही है और बल्बों की रोशनी बढ़ रही है।

गांवों में जैसे-जैसे बिजली आएगी, इन मिट्टी के दीयों की कीमत घट जाएगी। डर है कि कहीं दीपावली बल्बावली बन कर न रह जाए।

आज जमाना उन्नति कर रहा है। हमारे गांव भी आगे बढ़ रहे हैं। किन्तु गांवों की दीवाली यदि शहरी दीवाली बन गई तो यह ठीक न होगा। उन्नति का

पूसा के बीजों से गेहूं की पैदावार बढ़ी

दिल्ली के किसान पूसा के उन्नत बीज इस्तेमाल कर पैदावार बढ़ा रहे हैं। दिल्ली में ७०,००० एकड़ में गेहूं की खेती होती है। किसान सी ५९१, सी २८१ और एन. पी. ७१८ का इस्तेमाल करते हैं।

हाल में पूसा इंस्टीट्यूट ने गेहूं की दो नई किस्में—एन. पी. ८२३ और एन. पी. ८२४—निकाली हैं जिनसे पैदावार और अधिक बढ़ी है। पूसा इंस्टीट्यूट के कार्यकर्ता और विशेषज्ञ दिल्ली के गांवों में गए और उन्होंने नई किस्मों का प्रदर्शन किया। खेतों में प्रदर्शन इंस्टीट्यूट के विशेषज्ञों की देख-रेख में होता था। प्रदर्शनों में कई चीजें देखी गईं, जैसे गेहूं की उन्नत किस्में, अग्रोसन जी. एन. से उपचारित करने का परिणाम, दीमक के खिलाफ बी. एच. सी. का उपयोग, खर-पतवार नष्ट करने के लिए २, ४-डी का प्रयोग।

गांवों में पहले एन. पी. ७१८ लोकप्रिय थी, पर पूसा की नई किस्मों एन. पी. ८२३ और एन. पी. ८२४ की फी एकड़ उपज क्रमशः २४ और २३.९ मन हुई, जबकि एन.पी. ७१८ से २१.७ मन हुई। १० गांवों में सी २८१, एन. पी. ८२४ व एन. पी. ८२३ का तुलनात्मक अध्ययन किया गया। फी एकड़ औसत उपज इस तरह थी—एन. पी. ८२४ से २०.६ मन, एन. पी. ८२३ से १९.६ मन और सी २८१ से से १८.६ मन। इस तरह एन. पी. ८२४ और एन. पी. ८२३ सी २८१ से बेहतर साबित हुईं। प्रदर्शनों का किसानों पर बहुत असर पड़ा।

उन्नत किस्में ८२३ व ८२४

इसके अलावा अलग-अलग जगह के प्रदर्शन-स्थलों में फसल लेकर आंकी गई। इससे निम्न परिणाम निकले। एन. पी. ८२३ से २५.६६ मन, एन. पी. ८२४ से २०.९८ मन, एन. पी. ७१८ से २१.५ मन और सी २८१ से २०.६ मन फी एकड़ फसल मिली।

एन. पी. ८२४ पकने में समय लेती है और पौष्टिक तत्वों की अधिक जरूरत पड़ती है। जिन लोगों के पास पानी की भरपूर सुविधा है और जो अच्छी खाद दे सकते हैं, वे इस किस्म से अच्छी पैदावार ले सकते हैं।

एन. पी. ८२३ में कई गुण हैं। इसकी बालियां लंबी होती हैं, पकने में समय कम लेती है और पैदावार काफी होती है। इसका दाना भी श्रेष्ठ होता है पर इसे जरूरत से ज्यादा बढ़ने न दें, वरना दाने गिर जाएंगे।

प्रदर्शनों से पता चला है कि पूसा की नई किस्में अपनाकर किसान बहुत पैदावार बढ़ा सकते हैं। ●●●

पूसा के उन्नत गेहूं की बालियां

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भारतीय अनुसंधान में परमाणु शक्ति का योग

—एम० एस० स्वामीनाथन

(अध्यक्ष : वनस्पति विभाग,
भारतीय कृषि अनुसंधान शाला, नयी दिल्ली)

परमाणु के विकिरण से अपार शक्ति की प्राप्ति आज के युग की एक महान् सफलता है। इस शक्ति का उपयोग कृषि तथा सम्बन्धित कार्यों में होने से एक नई सभ्यता और अनुसंधान की नई-नई सम्भावनाओं का उदय हो रहा है। कृषि अनुसंधान के वे कार्य जो वर्षों में पूरे होते थे, वे इस शक्ति के उपयोग में कुछ दिनों में पूरे होने लगेंगे, ऐसा वैज्ञानिकों का विश्वास है।

कृषि अनुसंधान में परमाणु शक्ति का उपयोग कृत्रिम रेडियो आइसोटाप्स के द्वारा शुरू हुआ है। बम्बई के निकट ट्राम्बे में परमाणु रिएक्टर की सहायता से रेडियो आइसोटोप्स तैयार किये जाते हैं। भारत में इनका उपयोग भूमि की उर्वरा शक्ति, कीट-नियंत्रण तथा फसलों की नई-नई किस्में तैयार करने की दिशा में किया गया है।

किस मिट्टी में कौन-कौन से पोषक तत्व किस-किस मात्रा में हैं और कौन-सी मिट्टी में कौन-सी खाद की जरूरत है अथवा किस मिट्टी में कितनी गहराई में कौन से उर्वरक को डाला जाये, इन सब समस्याओं के समाधान के खोजक के रूप में रेडियो आइसोटाप्स का प्रयोग भारत में इस समय हो रहा है। भारतीय कृषि अनुसंधान शाला में इस दिशा में जो खोजबीन हुई उससे हम इस महत्त्वपूर्ण नतीजे पर पहुंचते हैं कि भारत की ५० प्रतिशत भूमि में फास्फोरस तत्व की कमी है, जबकि अभी तक हमारे वैज्ञानिकों का विश्वास था कि हमारे देश की भूमि में फास्फोरस की कमी नहीं है। इसी सिलसिले में रेडियो आइसोटाप्स की सहायता से इस बात की भी खोज की गई है कि किस प्रकार की भूमि में कौन-सी खाद कितनी गहराई में कब डालनी चाहिए। इस सम्बन्ध में वैज्ञानिक इस परिणाम पर पहुँचे हैं कि एक ही भूमि में अलग-अलग फसलों की अलग-अलग किस्मों के लिए अलग-अलग मात्रा में खाद की जरूरत होती है। उदाहरण के लिए धान की कुछ किस्मों में उर्वरकों का प्रभाव उस समय अच्छी तरह होता है, जबकि उर्वरक की ऊपरी तल पर प्रयोग किया जाये और गेहूं की फसल से उस समय अच्छी उपज प्राप्त हो सकती है, जबकि उर्वरक को दो इंच गहरा डाला जाए।

रेडियो आइसोटाप्स का दूसरा महत्त्वपूर्ण गुण किरिणीयन (Irradiation) है, जिसका कृषि प्रजनन अनुसंधान में विशेष महत्त्व है। इस गुण के कारण रेडियो आइसोटोप्स, पौदों के तन्तु कोषों में प्रवेश कर जाते हैं और फिर अगली पीढ़ी पर प्रभाव डालते हैं। आज से ३० वर्ष पूर्व एक अमेरिकन अनुवंश की विद् प्रो० एच० जे० मुल्लर ने इस दिशा में अनुसंधान करके पता लगाया था कि जीव के जानदार कोष में विकिरण से वंशानुगत

> 卐 रेडियो आइसोटोप्स की सहायता से नर किट को नष्ट करते हैं जिसके कीट प्रजनन की प्रक्रिया बन्द हो जाती है और कीट की वंश वृद्धि रुक जाती है! इस सिद्धांत का उपयोग अमेरिका में काफी समय से होता आ रहा है। वहां के प्रयोगों से बहुत से महत्वपूर्ण परिणाम प्राप्त हो चुके हैं। भारत में इस दिशा में जो कार्य हो रहा है वह आरम्भिक स्थिति में है। उसके महत्वपूर्ण परिणाम प्राप्त होने में अभी समय लगेगा। 卐

U.S. farm leaders being shown new strains of wheat at the Indian Agricultural Research Institute.

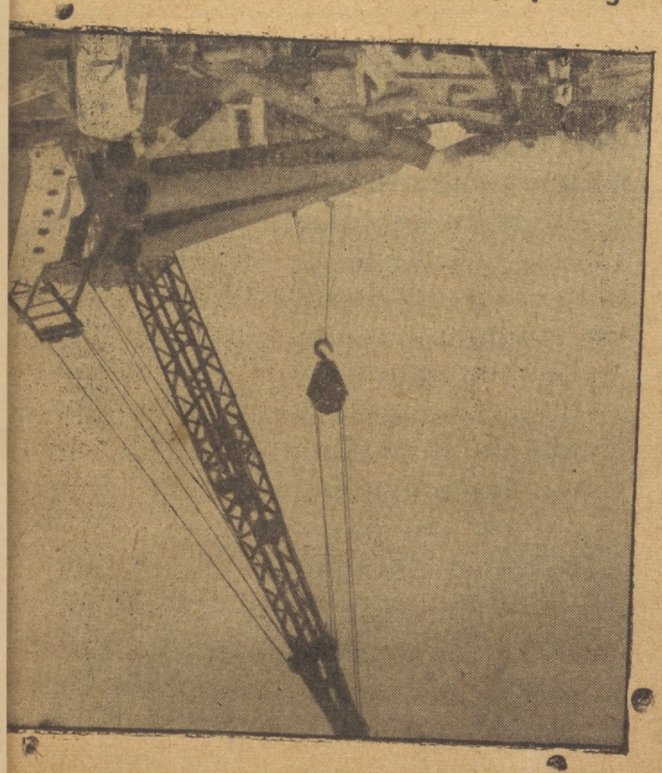
की प्रक्रिया बन्द हो जाती है और कीट की वंश वृद्धि रुक जाती है। इस सिद्धान्त का उपयोग अमेरिका में काफी समय से होता आ रहा है वहां के प्रयोगों से बहुत से महत्वपूर्ण परिणाम प्राप्त हो चुके हैं। भारत में इस दिशा में जो कार्य हो रहा है। वह आरम्भिक स्थिति में है। उसके महत्वपूर्ण परिणाम प्राप्त होने में भी अभी समय लगेगी।

इसके अतिरिक्त ट्राम्बे में खाद्य सामग्री के परिक्षण की दिशा में अनुसंधान कार्य हो रहा है। जहां रेडियो आइसोटाप्स के विकिरण की संभावनाओं के उपयोग की दिशा में परीक्षण चल रहे हैं। जिस समय इन वैज्ञानिक अनुसंधानों के नतीजे प्राप्त होंगे, उस समय खाद्य विज्ञान परिक्षण विज्ञान में एक नये अध्याय का श्रीगणेश होगा।

सारांश यह है कि कृषि अनुसंधान की दिशा में परमाणु शक्ति के

है और जिसकी उपज भी अधिक होती है। इसी प्रकार जो गेहूं, तम्बाखू, सरसों और तिल की उन्नत किस्में विकसित करने की दिशा में प्रयत्न किये जा रहे हैं। ट्राम्बे में परमाणु शक्ति संस्थान में धान की ऊंची उपज देने वाली खाद में उत्तम किस्म को विकसित करने की दिशा में प्रयत्न चल रहे हैं। भारतीय कृषि अनुसंधान शाला नई दिल्ली के गामा उद्यान में विभिन्न फसलों के बीजों के हजारों नमूने से नई नई उन्नत किस्में निकालने के लिये प्रयत्न किये जा रहे हैं। आगामी कुछ वर्षों में ऐसे आशाप्रद परिणाम प्राप्त होने की संभावना है जिससे कृषि प्रजनन की उलझी हुई बहुत सी गुत्थियां सरलता से सुलझ जायेंगी और प्रजनन विज्ञान में प्रजनन इन्जीनियरिंग का उदय होगा।

जिस प्रकार रेडियो आइसोटाप्स, का उपयोग फसलों की नई नई किस्में विकसित करने में किया गया है उसी



विकिरण से नया बीज क्षेत्र

विकिरण प्रक्षेत्र के बरोनी क्षेत्र में नई पैदावार गुणोकरण की क्रियाएं

Genetical changes induced by Gamma radiation to improve a wheat variety interest farmers who visited Pusa Institute on Wednesday.

Farmers keen on new crop techniques

By a Staff Correspondent

New Delhi, March 6—About 120 farmers, from five Community Development blocks around the Capital, today moved about in the test fields of Pusa Institute's botany division keenly examining the new varieties developed through research.

The occasion for the visit was a "field day" organized by the Botany Department to demonstrate to the cultivators the results obtained in crop improvement and to introduce them to new varieties.

Coriander, saunf and linseed that have been adapted for cultivation in Delhi climate attracted much attention.

Fodder crops like the Egyptian clover and Pusa giant Napier, which have a high yield, evoked much interest among the farmers, who are perpetually faced with fodder shortage.

The hybrid maize-wheat rotation which has been proved to be the most productive form of crop rotation, with yields of 30 mds per acre of wheat and 70 mds of maize grain from the same field, was explained to the farmers

FARMERS DAY AT PUSA OBSERVED

From Our Own Correspondent

SAMASTIPUR, Mar. 5:

Farmers Day was observed at the Botanical sub-station, Pusa the other day. Dr. S.V.S. Shastry acquainted farmers with the object of the function.

Inaugurating the function Mr. J.C. Mathur I.C.S., Commissioner of Tirhut Division said that Pusa Institute was doing enormous research work. For the better propagation of the achievements of the research it was very essential that the farmers should oftenly attend the botanical station. The need of the hour was to give a practical shape to the research work he added.

Other speakers included Dr. Saligram Singh and Mr. Nandkishore Singh. The farmers were taken round the botanical farm.

An exhibition of the products of the botanical station was a special feature.

The Hindustan Times

tion of visitors was one in which experiments were being made to assess the possibilities of the sunflower as a source of oilseeds, beetroots for sugar extraction, and oats as a breakfast food. Oats grown in this country being only fit for fodder, porridge meal is imported and Indian manufacturers are on the lookout for Indian oats suitable for the breakfast table such as the variety grown here on an experimental basis. Its yield per acre is claimed to be 30% more than wheat and prices are comparable, while the nutritive value of oats is much higher, including its straw.

The efforts of the botany students of the Institute to do their bit during the national emergency could be seen in their seed multiplication two-acre plot on which they grow the three varieties of the IARI's approved wheat seeds. This they do in their spare time without assistance from the staff or the labourers of the Institute.

Metal pipes to hold tents were being fitted along the field devoted to the study of the three kinds of rusts that blight crops in this country. Under the tents humidity will be created under controlled conditions for the germination of rusts.

Opposite, the horticulture plot produced a splash of colour. Here mutation studies are under way for the benefit of the horticulturist in this country, who until now has imported new species from abroad. Efforts put in here, therefore, are expected to save foreign exchange.

A spiral of smoke from the oeen-air kitchen set up behind a trailer towed by a tractor was a pleasant surprise, especially for the foreign visitors who got busy with their cameras photographing the couple of village women cooking chapattis and rotis. But for the paper plates serviettes, the neatly tied little bags of flour, the "coke" bottles and the women students of the Institute, it could have been a village scene.

THE STATESMAN, 7 MARCH 1963

Dr R. L. Paliwal, senior maize breeder of the Indian Agricultural Research Institute, listens to a query by a visitor at the "Field Day" exhibition of the Botany Division of the Institute on Wednesday.

INCREASING YIELD AND VARIETY

I.A.R.I. Experiments On Display On Field Day

BY A STAFF REPORTER

VISITORS, including foreign agriculture scientists, tramped through experimental fields of new wheat, barley, oats, linseed, berseem (Egyptian cloves), ajwain, coriander and other crops to find waiting for them, at the end of the hike, an agricultural display at the "Field Day" on Wednesday of the Indian Agricultural Research Institute.

The visitors were shown a variant of berseem developed by the Institute to meet the fodder needs of this country. The per acre yield of this variety is considerably higher than the green fodder generally sown at present. It grows prolifically during the summer months when the fodder scarcity is at its height and is extremely responsive to fertilizers and is, therefore, a better cash crop than sugarcane, the per acre return being Rs 2,000 as compared with the average of Rs 1,500 fetched by cane.

At the mutation garden could be seen the results of the manipulation now possible for the agricultural scientist using the new tools of radiation and X-ray. Here were ears of corn shorn of their beards, others to which beards had been added, ears with grains increased or decreased, the shape of grains changed, stalks shortened or lengthened, resistance to disease, response to fertilizers, and chemical content improved.

A plot which attracted the atten-

FROM PUSA TO MEERUT

AN agriculturist who feels his fellow-farmers can do much for the nation during the Emergency is Bikram Singh. He comes from Chobla, a village in the Jani block of Meerut district in Uttar Pradesh. He owns about two acres of land. Though employed in the Mines and Fuel Ministry in the capital he goes to his village, about 60 miles away, every week and spends his time in his small farm. Even though his farm is run by his two younger brothers Jai Dhrat (37) and Dharm Vir (33) he is there to help and guide them.

Always on the look-out for new ideas, Bikram Singh grew hybrid maize for the first time in 1961. The results were encouraging. Last year he cultivated the crop (Ganga 101 variety) for the second time on a two-bigha plot and the yield was 18 maunds of grain, an achievement which made some of his neighbours sit up and take notice.

I saw two specimens of cobs that Bikram Singh had grown and they were big and full and compact. For his work, Bikram Singh won a prize at the agriculture section at the Nauchandi Mela. "But they didn't award me any certificate, you know. Instead, they gave me *thalis* and vessels," said Bikram Singh with a smile.

Bikram Singh wanted to follow up his success. With the help of the Indian Council of Agricultural Research he managed to get 24 lb. of an even better variety of hybrid maize (Ganga 101) from the co-operative seed farm, Ludhiana, in April 1962. He applied two maunds of ammonium sulphate and 112 lb. of super phosphate to his two bighas and sowed the seed on June 24. The crop was ready three months later, yielding nine maunds (grain) per bigha (as against three maunds normally) or 45 maunds per acre. Even his first experience had been so encouraging that Bikram Singh felt like sharing it with other farmers. This he promptly proceeded to do. He gave demonstration at three places explaining to the farmers how they could increase the yield of maize. Among those interested were Jaswant Singh, a farmer of Chobla, and Jaggan Singh and Ram Charan Singh of village Dhanauri in Moradabad district.

Jaswant Singh owns three plots measuring three bighas. He had watched the results of first experiment. Last year he also raised maize and applied two maunds of ammonium sulphate and 112 lb. of super phosphate. The first two plots were sown on June 24 and the third on July 10. The first and the third plots yielded crop after three months and the second after two months and a half. The yield was seven maunds per bigha or 35 maunds per acre. This was his first cultivation of maize.

Jaggan Singh brothers own two bighas of land. They applied two maunds of ammonium sulphate only. The crop was ready after three months, yielding 11½ maunds (cobs) per bigha or 57 maunds per acre.

"What do you think is responsible for this high yield? Do you attribute it wholly to the use of improved seed and fertilisers?"

"Not exactly. Crop rotation is an equally important factor. For instance, after harvesting the *rabi* crop the field was irrigated and five to six cartloads of farmyard manure were mixed with the soil. Then *lobia* or cowpea was sown. After *lobia* was

Left corner: PROTAGONIST of this story. Below: WITH ideas he combines power

Farm Experts Have Glimpse Of

A COLT grows in Chobla Photographs: K. B.

taken out, the soil became ready for growing maize, for it became rich in nitrogen. Moreover, this *lobia* fetched me Rs. 23 which I spent for fertilisers. Crop rotation is the best method of obtaining maximum result. Of course, there are other things also, such as line sowing, application of both ammonium sulphate and superphosphate, and sowing at the proper time."

"And what about irrigation?"

"Of course that is essential. In fact, those who depend on canal water alone can hardly expect good results. If I have been successful it is because of my assured irrigation water from the tube-well. Farmers who have followed my example also have bullock-drawn Persian wheels."

FARMING is a passion with Bikram Singh rather than a mere pursuit. Realising the importance of power, he took out a connection in 1957 and began running a rice-hulling machine. In 1959 he got a tube-well installed for irrigating his fields. Now he uses power alternately and runs four different machines for grinding flour, hulling rice, cutting chaff, sharpening knives and also carding cotton. In fact Bikram Singh wants to start some small-scale industry, and has applied to the State Director of Industries. The site has been inspected although there hasn't been progress since.

Bikram Singh's activities are not confined to cereal-growing or small industry only. He also has an orchard. Although only an acre in size he has planted 20 *Dussehri* mango trees which he bought from the State Agriculture Department and 15 of *desi* varieties. The trees were in flower when I visited Chobla. Besides, there are guava, papaya, *chikoo* and *amla* trees. What impressed me most was the sugarcane (C0419) and wheat (NB824) varieties he had grown in his orchard. The sugarcane stalks were thick and rose more than seven feet in height. The growth of wheat crop was also vigorous. An orchard, Bikram Singh said, involved labour and had an assured income. "I sell the mangoes. I also make mango grafts and sell them for Rs. 3 each. In 1961 I had an income of Rs. 300. After ten years I expect Rs. 2,000 from my garden."

BIKRAM Singh tries out new ideas. He is not enamoured, however, of poultry farming as "it involves risks". He took me to the other side of his orchard and showed me two little creatures which I had little expected in an orchard. A pair of colts frisking in the open yard! "I bought the pair for Rs. 22. One was a month old and the other was only 24 days when I bought them. They have grown on goat's milk and farm waste. They are now worth Rs. 90." What did he propose to do with these creatures? He might use them for his own cart or sell them later at a higher price, he said.

Bikram Singh's holding is not big. What he has in imagination and enthusiasm. "I keep in touch with the agricultural officials", he said, "and take their advice on the latest methods of cultivation. And I also encourage fellow-farmers to follow my example."

Farmers are now required to produce more food grains. What do they require for this purpose? Have adequate steps been taken to meet their needs? Not at least in Chobla. Pointing to a canal nearby a farmer told me, "This is the main distributary, known as the Timakia Rajbaha. On its water depends the cultivation of thousands of acres of land. Now, do you find any drop of water in it?" As far as I could see, the canal was dry. In fact the canal presented a striking contrast. On one side the fields cried out for water. On the other side, the side on which I stood, lay the fertile land of Bikram Singh. Said Bikram Singh, "Farmers are prepared to do anything for increasing the yield. They are ready to follow the example of successful farmers. But they are poor. They can't all afford to have tube-wells. They want irrigation water. Give them what they need and watch the results." As another farmer commented, how good it would be if the people of the Irrigation and Agriculture Departments saw eye to eye!

Scientific Match Makers Who Work for Plenty

THEY are right. Irrigation remains a problem. But it is not the only problem. There is considerable scope for irrigated lands to keep increasing their yields. Bikram Singh is just one example of how this can be done. True, he has a tube-well to water his fields at the right time, but he could not have produced nine maunds of maize per *bigha* had he not used improved seeds. The hybrid maize he raised was evolved at the Botany Division of the Indian Agricultural Research Institute (IARI), Pusa, and released for cultivation.

Several varieties of hybrid wheat, *jowar*, *bajra* and fodder grass have already been evolved at IARI (see *Yojana* of May 27, 1962 and October 28, 1962) and the Institute is continuing this work so that farmers can have many more varieties to choose from, to suit different soil and climatic conditions. By subjecting seeds

to atomic radiation in the Gamma Garden of the Institute (*Yojana* November 12, 1961) and adopting other methods of variation, the IARI scientists have just announced the evolution of 14 new varieties. They answer a number of requirements—high yield, high protein content, resistance to rust disease, etc. Some of the varieties mature earlier, while others are suitable for late sowing. The Institute has also tried out a *maize-wheat rotation pattern* which is expected to produce 40 maunds of wheat per acre.

When used extensively these varieties will substantially increase wheat production in the country.

The Institute organised a Farmers' Day early in March and I was happy to see hundreds of farmers flock to the place to view the wonder wheats. They came from Daryapur, Outandi, Boana, Putkalan, Narela and several other villages around Delhi. Research scientists led by Dr S. P. Kohli, the Institute's Wheat Breeder, and Mr Amir Singh, Seed Testing Officer, explained to them the characteristics of each variety. The farmers moved round the fields and subjected the crop to expert scrutiny. Later they filled in a questionnaire supplied to them. The questions were simple: (1) Which variety did the farmer like and why? (2) What would be his estimate of approximate yield of each variety? and (3) Was there any aspect of a given variety he did not like?

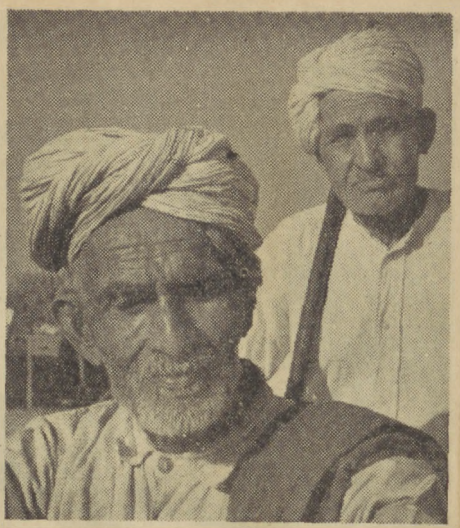
In true peasant manner, the farmers expressed their scepticism and signified their approbation only after their questions had been satisfactorily answered. Some felt the ear-heads, counted the grains and measured the height of the plants. A few examined the size and shape of each grain. Not all could take an immediate decision. "I like NP-824", said Mammon. He comes from Boana, six miles from Delhi, and owns eight acres of land. After some time he said, "No, not NP-824. I have finally selected NP-830." What was the reason? "The ear-head of NP-830 is longer and contains as many as 20 to 22 grains in a single row", he replied. "Moreover", observed Dharma, with the unmistakable look of a seasoned farmer,

MAMMON of Boana village, intent on knowing more about the new wheat. (Left) Dr. S.P. Kohli and Amir Singh explaining how to fill in the questionnaire

"this variety is good for late sowing. My fields get flooded during the monsoon. This crop might give me better results."

A man thoroughly impressed was Pob Singh. He comes from Putkalan, nine miles from Delhi. He has 35 *bighas* of land where he grows wheat, *chana*, *jowar* and *bajra*. "I get only 3 to 4 maunds of wheat per *bigha*", he said, "let me try all these varieties and increase the yield".

Those who came to see the wheat



POB SINGH, an old farmer from Putkalan Photographs: T.S.N.

saw many other crops also—such as Bersheem or Egyptian clover, used mainly as fodder in north India. Two new varieties (T-526 and T-724) have been evolved which yield 30 to 40 per cent more green matter. Two varieties of oats also attracted attention. Among other crops demonstrated were new varieties of linseed, barley, coriander, fennel and *ajawain* as well as hybrid maize and *bajra*.

It normally takes some time before the extension agency can introduce the new varieties in the field in the various parts of the country. But interested farmers are welcome to write to the Botany Division of IARI directly.

Kali Biswas

PROGRAMME ON THE FERTILISER FRONT

THE Fertiliser Corporation of India signed a contract for Rs 11.9 crore with a group of Japanese firms for setting up a fertiliser factory at Gorakhpur, U.P., out of Japanese yen credit. The factory will start production in 1967.

A fertiliser factory has gone into production at Magarwara in Unnao district, U.P. It will produce 60,000 tons of superphosphate a year and 50 tons of sulphuric acid a day.

A private fertiliser factory, with a capacity of 52,000 tons of ammonium sulphate per year, has started production at Ennore near Madras.

Farm Experts Have Glimpse Of 'Brave New World'

By A Staff Reporter

Scientists at the Indian Agriculture Research Institute let a group of farm experts on Wednesday into the mysteries of their "brave new world".

As in Aldous Huxley's fantasy, they waxed eloquent on mutations, fertility, sterilisation and stability. They are engaged, like Mr. Huxley's characters, in producing new breeds and at a faster pace.

Their brave new world, however, is not peopled by human beings; it consists of crops and plants.

In the extensive farm land behind the Botany Division of the institute, the scientists have successfully produced new and better varieties of wheat, barley, fodder and other crops.

WITHIN THREE YEARS

In respect of wheat they have created within three years species which nature takes thousands of years to produce. They have been able to do so by using gamma rays from the radio-active cobalt source installed at the IARI Gamma Garden.

Among the varieties is a "mutation garden" wheat species, 'sphaerococcum', which was cultivated in the Indian sub-continent during the Mohenjo Daro civilisation.

A wheat variety (NP 836), produced through the mutation breeding technique, has already been released for cultivation in Bihar. Several other mutations of good grain quality and higher yield are on trial.

Experiments are also being conducted on maize-wheat rotation which is described as one of the most productive in the world. Here the maize crop gives on an average 70 maunds per acre and wheat crop 30 maunds.

The IARI scientists have also been able to produce a number of superior strains of barley possessing resistance to disease and high yielding potentiality.

LOW AVERAGE YIELDS

Barley is used in the human diet and in the malting and brewing industry. Diseases like rust, loose-smut, covered smut and helminthosporium have hitherto been responsible for the low average yields of the crop.

To reduce the import of milling oats for preparing the breakfast food—India imports 900 tons of oats every year—a variety imported from Australia has been successfully grown at the institute. This is suitable for both breakfast food and fodder. A good crop is capable of yielding up to 60 maunds of whole oats and 400 maunds of green fodder per acre.

In linseed new varieties have been created to withstand attacks by diseases like rust and wilt. The breeding of varieties for disease resistance was started for the first time in India at the institute by crossing high yielding local types with disease resistant foreign varieties received from Australia and the U.S.A.

FODDER SHORTAGE

To solve the perennial problem of fodder shortage IARI scientists have developed the Pusa giant napier and gian berseem.

The former is a cross between cultivated bajra and napier or elephant grass. It is a perennial crop, propagated by root slips or stem cuttings. Under proper manuring and irrigation it yields 300,000 lb. green fodder per acre.

It grows practically all the year round except in November, December and January. As a commercial cash crop it can yield a better profit (Rs. 2,500 per acre) than sugarcane (Rs. 1,500 per acre).

A scientist at the institute remarked that this opened up a new avenue for the development of the dairy industry in the country.

Giant berseem is a new fodder legume developed at the institute. Berseem or Egyptian clover has, since its introduction in India in 1904, established itself as the main winter fodder crop in irrigated tracts of North India.

The emergency has been responsible for the creation of a "students' plot" for seed multiplication. Here everything is done by students of the institute.

An improved sorghum hybrid (left) developed by the Indian Council of Agricultural Research using an American sorghum (right) as the female parent.

DOUBLE-YIELD JOWAR HYBRIDS FOR FARMERS

Successful Experiments By I.C.A.R.

BY A STAFF REPORTER

HYBRIDS of Indian and American origin will be shortly introduced all over the country to increase the per-acre yield of sorghum (jowar) by over 100%.

These hybrids have been developed by the Indian Council of Agricultural Research under a scheme financed by the Rockefeller Foundation and the all-India programme is being co-ordinated by the Botany Division of the Indian Agricultural Research Institute.

Jowar is a self-pollinating plant —that is, it has both male and female elements in the plant itself. It is, therefore, a highly inbred family, which, by successive marriages into the same stock, is denied the opportunity of acquiring more desirable characteristics.

It was felt, however, that the jowar's yield capacity could be improved. Consequently the Indian Council of Agricultural Research constituted an ad hoc committee in 1960 to improve jowar yields through the development of high-yielding hybrids.

The committee recommended utilization of an American sorghum known as Kafir 60. This, like other sorghums, has both male and female elements, but the male element is sterile. It grows well under Indian conditions and was therefore selected for the hybrid sorghum project.

A LONG SEARCH

This entailed a protracted and systematic search for a male partner for Kafir 60. In the search the differences between the uses of sorghum in the USA and India had to be kept in mind. In America sorghum seeds are used as cattle feed; its grain quality is therefore not as good as jowar's. In India the grain is used for human consumption while the stalk is used as fodder. The search, therefore, had to be confined to such male partners as were capable of producing progeny capable of yielding grain of acceptable quality and straw comparable with existing jowars.

The search started in 1960 with about 7,000 male specimens. After two years' study it was recognized that only about a 100 male parents could yield a potential hybrid of acceptable quality. These males were crossed with the female sterile parent. The resulting hybrids were tested along with the local improved varieties in all the jowar-growing States in 1962. The results were highly encouraging.

Finally, on the basis of these results, 12 hybrids, found suitable in most respects, were chosen for further large-scale experiments. On the basis of the tests, hybrid jowars will now be released to farmers in the summer season in Madras and Andhra Pradesh and for the rest of the country for the rabi sowing in a few months' time.

The improved seeds have recorded a yield of as much as 6,000 lb per acre under favourable conditions. The average per-acre yield of jowar is 300 to 700 lb. Hybrids can, therefore, substantially increase the per-acre yield. The National Seed Corporation will take up the multiplication and distribution of the hybrid jowar seeds.

Tailor-made for the kisan, the jowar hybrid is expected to be popular in Madras, Andhra Pradesh, Mysore, Maharashtra, Madhya Pradesh, Gujarat and parts of Rajasthan and Uttar Pradesh. About 42 million acres are under the crop.

Uncertain political futur

A research worker examining stalks of the new variety of wheat developed at the Indian Council of Agricultural Research farm.

Better wheat through radiation

By a Staff Correspondent

New Delhi, March 14—Several "bearded" radiation-induced varieties of wheat have been developed at the Botany Division of the Indian Agricultural Research Institute.

The botanists at the Institute have been able to grow bristles on the low-yielding varieties of wheat with the help of X-Rays. They expect a five to 10 per cent increase in the annual yield from these varieties.

Farmers as well students today thronged the research farms of the Institute on the Field Day" of the Botany Division. Besides the radiation-induced varieties, scores of new types of plants were on display.

In co-operation with the Rockefeller Foundation the Institute has launched an ambitious programme of wheat breeding for a high fertilizer response. The Institute is cross-breeding the Sonora 63 and Sonora 64 varieties of wheat with indigenous ones.

New wheat, maize strains will boost production

By a Staff Correspondent

New Delhi, Jan. 6—Intensification of agricultural production by crop rotation with improved varieties of wheat and hybrid maize has been recommended to cultivators by the Indian Agricultural Research Institute.

The new high-yield strains of wheat and maize, being grown under observation in the Botany Division of the Pusa Institute for the last three years, have responded well to intensive cultivation in irrigated fields.

Improved varieties of bajra and jowar specially developed for intensive cultivation in rotation with wheat or paddy, are recommended by agricultural experts to boost production from the next crop.

The wheat varieties NP 718 and NP 836 are deemed suitable for growing in rotation with paddy. By choosing a judicious combination of specified strains and adopting timely cultural and manuring practices the yield of cereals can be greatly increased, experts say.

Hybrid maize seeds are available from the National Seed Corporation in Krishi Bhavan. Wheat seeds may be obtained from the Institute.

The Evening News

New Delhi: Saturday, March 14, 1964

he Exhibition of Recent Artis
ed in New Delhi on Tuesda
h Vaughan; (middle) Wom
ichards; and (bottom) Tham

Wild li

A lot of
gou

By Our

THE view that plenty of
to provide succulent
pressed by Mr. F. C. Badh
logical Park Council, at th
inaugural function today
the Ninth Wild Life Week

The function was held in t
Delhi Zoological Park, where film
on wild life will be screened f
the zoo visitors every evening t
October 7.

The films have been loaned
the Governments of the U.S. a
Canada.

While other speakers at the fun
tion, including Dr. Ram Subh
Singh, Minister for Agricultu
stressed the need for preserving wi
life in the country, Mr. Badhw
said that immediate steps shou
be taken to curb the activities
wealthy poachers who freqlent
indulged in the luxury of killi
game out of season.

He said that both luxury hote
and discriminating eaters were re
ponsible for large-scale massacre
precious wild life.

Game farms

He suggested the opening of gam
farms in different parts of the cou
try to breed various varieties
wild life in a big way.

Lithographs sho
exhibits strikin

By Our Art Critic

NEW DELHI, Oct 1.—The B
tish High Commissioner, Sir P
Gore-Booth, opened this even
an exhibition of lithographs
contemporary British artists
art publications at the Fine A
Gallery.

The exhibits comprise prints
artists working in a variety
styles covering almost all sha
of modern movement, illustrat
as many possible variations
the medium as lithography
capable of.

Besides single prints by Her
Moore Paul Nash, Graham S
therland and John Piper th
are several striking works
Ceri Richards, Fobert Macbry
Robert Colquhoun and of youn
painters.

Lithography for its spon
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nial to the new outlook of
than the strict technique of c
per plate.

Those works which are
stract, tending more to be g
metric than fantastic, are ma
ed by tonal areas of sensitive
'alisation and colour creat
lives of shape and colour. Th
which are compromises betwe
reality and fantasy are evocat
and not daring in their startl
colour effects.

Better examples

Robert Macbryders "Yell
Still Life" Jankel Adler's "La
scape" and William Scott's "Qu
with Boats" are some of the bet
examples of geometric lyric
while Miller's "Girl with Fi
and "Bird Cage" and South
land's "Maze" represent levels
dreams in colours that are var
in patterning.

A few books on art are also
display which include a book
Souza, British Painters ser
Modern Sculptors and ma
other books on Indian art.

New approach i
painting

By Our Art Critic

NEW DELHI, Oct. 1.—Dhi
Choudhury, who teaches art at
Women's Polytechnic, in New De
is a young painter trying to evo
a new approach to painting wh
combines mural with easel pai
ing.

Although he would like his pai
ings to be treated as murals, t
can be called so only by a lo
application of that term, becaus
mural by its very nature is a nar
tive composition leaving very li
room for the artist's subjectivity

Dhiraj's sixth one-man s
opened this evening at the Fine
Gallery. The exhibits comprise
large canvases.

The nature of his approach
painting is such that he can
altogether do away with figu
although he shows a canvas, nu
bered 12, which is made up
colour areas conceived as archit
tural shapes. All the rest h
figures that range from traditio
stylised ones to Husainesque mas

DWARF WITH HIGH WHEAT YIELD

Mexican Varieties Grown At Research Institute

BY A STAFF REPORTER

Some outstanding varieties of Mexican wheat—dwarfs but with yields as high as 6,000 lb per acre—grown successfully for the first time in India, were shown to visitors at the Indian Agricultural Research Institute, in New Delhi on its Field Day on Saturday.

The short stature of the plant is a distinct advantage under high fertility conditions because stems do not "lodge", that is bend and break, as easily as do the tall Indian varieties. The Mexican Dwarf, as it is called in the Institute, is also immune from fungus diseases like 'rust' to which Indian varieties are particularly susceptible.

The Institute hopes to cross the Mexican varieties with Indian ones and evolve within a short time hybrids that will be a harmonius blend of all the desirable characteristics. For this purpose, the Institute is growing no fewer than 16 varieties—four of them Mexican and the rest India's best. Each is cultivated under 40, 80 and 120 lbs of nitrogenous fertilizers.

Visitors also saw on the Institute's lush green research plot of some 80 acres, improved varieties of barley, oats, oil plants and maize in different stages of experimentation. Some were under nylon nets, some had their grain in cellophane wrapping to prevent pollination.

There was a new sugar-beet with a sugar content of 17.9%—the average sugarcane has only 12 per cent—and with less proneness to disease and pest trouble. This could be grown in the north-eastern parts of this country where there is now no sugarcane. The advanced use of technology was also in evidence. Development of bird-resistant "beards" in wheat through radiation, for instance, and the doubling of the leaf area of fodder crops through the use of chemicals.

Indian Express
Sunday, the 15th. March 1964.

Indian Express 15-3-64

Mexican wheat under cultivation at Pusa

By Our Staff Reporter

NEW DELHI, March 14—At Pusa grow many a plant of hope. The case of Indian agriculture, however, does seem to be an entirely lost one.

The experimental wheat and other crops at the Botany Division of the Indian Agricultural Research Institute here have nearly reached the fruition stage and if red-tape and inefficiency do not smother their extension and application India might come out of its agricultural impasse soon enough. If Mexico with similar subtropical climate and traditional farm backwardness could come out of the bog, India might as well make an all-out effort.

Dwarfed variety

India possesses the resource potential. A quarter of the total Indian crop area under wheat cultivation (33 million acres), which has assured irrigation facilities, can be made to produce enough Food to wipe out the current deficit of the order of one-third of the total Indian wheat production. Heavy use of fertilisers combined with the available irrigation facilities holds the promise.

The dwarfed variety of Mexican wheat with plenty of beard or bristles around the seeds has a greater response towards fertiliser intake. Against the normal Indian wheat crop intake of about 30 pounds of nitrogenous fertiliser per acre, the Mexican variety can absorb as much as 140 pounds of the fertiliser per acre thereby increasing the yield three to four-fold.

Sonora 63 and 64 are two of the many medium dwarfed and bearded varieties under experimental cultivation at the Pusa fields which are likely to prove most acceptable to the Indian farmers. They are neither too pygmy nor too tall to lie lodged (slapped down) by gusty winds. Against the normal Indian yield of about 1,000 pounds per acre, they promise to yield over 5000 pounds of wheat an acre.

The man behind the promised bushels is Dr Norman E. Borlaug of the Rockefeller Foundation of the USA. Tall, Creying and handsome, he today walked through the institute farms explaining to the experts and the lay observers the secrets of the crop plant which he has been tending to increasing fruition for the last ten years in Mexico.

Farm worker

A farm hand coming from the little town of Cresco in the Iowa State of the US, he graduated from Minnesota University in forestry. Interest then shifted to plant pathology and he worked as a biochemist for some time. World War II intervened and he was out of both forestry and agriculture.

The return of peace marked his coming back to agriculture when he joined the Rockefeller Foundation's agricultural wing where he has been working for the last 20 years. The second half of this period has brought him to his Mexican success and he is happy not only for having helped Mexico tied over food shortage but equally happy for having trained a bunch of young Mexican scientists who would discover newer pastures on their own.

In fact it was his field day which the Pusa Institute celebrated today.

The institute is also sowing oats (not wild), barley, jowar, bajra and a whole range of Indian crop varieties, and is conducting experiments to induce mutations by atomic radiation for greater quantitative and qualitative yields.

The Hindustan Times
Sunday, the 15th. March '64

Better wheat developed

Hindustan 15-3-64.

By a Staff Correspondent

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Dr. N. E. Borlaug exhibited at the IARI on Saturday the new strains of dwarf wheat.—TOI photograph.

New Variety Of Wheat Grown At Pusa Institute

By A Staff Reporter

Scientists at the Indian Agricultural Research Institute, Pusa, New Delhi, have succeeded in growing a variety of dwarf Mexican wheat. The new research could be an answer to the problem of food shortage in the country.

On Saturday the scientists took a party of newsmen round the institute's wheat fields to show the new crop. The seeds were a gift from a renowned Mexican biologist, Dr. Bourlaugh, who had developed the dwarf wheat two years ago. Dr. Bourlaugh was present at the institute when the newsmen were told of the new development.

The yield from this variety of wheat is between 5,000 and 6,000 lb per acre. It can also stand extreme weather condition better than other varieties.

The "food scientist" from Mexico was a very happy man on Saturday. He has already succeeded in helping the Mexican farmers increase their foodgain yield by 300 per cent. by the use of new strains of seed and intensive cultivation. Now he eagerly looks forward to the day when the Indian farmer will enjoy the benefits of the "wheat gift" from Mexico.

Dr. M. S. Swaminathan, head of the wheat development division, told newsmen that the new dwarf wheat was airmailed by the Rockefeller Foundation to India from Mexico last year. The freight alone cost $3,000. The wheat turned out to be rare gift. Trial crops were grown at various places in the country. The wheat had shown a "liking" for Indian soil.

Several radiation-induced varieties of wheat had also been developed at the institute, he said.

Award for scientists

NEW DELHI, March 24 (PTI) —The Shanti Swarup Bhatnagar memorial awards for outstanding work in different scientific fields for the years 1960 to 1962 were announced here today.

The awards, as approved by the governing body of the Council of Scientific and Industrial Research, are:

1960: Physical sciences—Dr. M. G. K. Menon; chemical sciences—Dr. T. R. Govindachari; biological sciences—Prof. T. S. Sadasivan, and engineering sciences—Shri H. N. Sethna.

1961: Physical sciences—Prof G N. Ramachandran; chemical sciences—Dr. (Smt.) Asima Chatterjee; biological sciences—Dr. M. S. Swaminathan; medical sciences—Dr. R. B. Arora.

1962: Chemical sciences—Dr. S. C. Bhattacharya; engineering sciences—Shri M. M. Suri. Recommendations for physical and biological sciences for the year will be made by the judging committee later.

The awards carry a cash prize of Rs. 10,000 each.

"The Hindustan Times"
March 25, 1964

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The Awards carry a cash prize of Rs 10,000 each.

"Statesman"
April 4, 1964.

COURSE IN SEED TESTING

TRAINEES GIVEN CERTIFICATES

By A Staff Reporter

The need to educate cultivators about the importance of using good seed was emphasized by Mr A. D. Pandit, Special Secretary in the Ministry of Food and Agriculture, in New Delhi on Friday.

Mr Pandit was giving away certificates to successful trainees of the fourth course in seed testing and certification at the Indian Agricultural Research Institute.

Urging these working in various seed farms and research laboratories to be extremely careful in their job because negligence might shake the faith of cultivators in good seeds, Mr Pandit said that the recipients of certificates should also propagate the technique of "seed industry".

Dr M. S. Swaminathan, Head of the Botany Division of the Institute, expressed the hope that the trainees would not use the certificates merely as vehicles for promotions, but would do something for the "seed industry."

"Statesman"
June 25, 1964

U.S. RESEARCH GRANTS FOR INDIANS

Grants for five research projects to be conducted by Indian scientists in India were announced on Thursday by the U.S. Agricultural Research Service. The grants, totalling Rs 13,47,858, are made from Food for Peace Funds (PL 480), says a USIS Press release.

Dr A. S. Kahlon of Punjab Agricultural University, Ludhiana, will receive a grant of Rs 2,86,893 for a study of the impact of changing conditions on grain marketing institutions and the structure of grain markets in Punjab.

Dr D. S. Athwal, also of the same University, will be the principal investigator for the genetic evaluation of grain and the fodder quality of small grains. The grant for this project is Rs 4,33,672.

The investigation of soil structure, as influenced by organic matter, will be conducted at the Indian Agricultural Research Institute in New Delhi and will be in the charge of Doctors N. P. Datta and T. D. Biswas. The grant will run for five years and is for Rs 1,33,200.

Another grant, for Rs 1,72,755, will finance the study of acids in insect tissues. Dr (Mrs) Radha Pant of the University of Allahabad will be the principal investigator.

The fifth grant, for the study of certain properties of pollen, is for Rs 3,21,338 and will run for five years. The principal investigators will be Doctors M. S. Swaminathan and A. T. Natarajan of the Indian Agricultural Research Institute, New Delhi.

Statesman. 25/6/64

"The Hindu"
June 25/1964

NEW WHEAT STRAINS

RESEARCH WORK AT WELLINGTON

(FROM OUR CORRESPONDENT)

OOTACAMUND (Tamil Nad).

Not many in the South are aware of the work being done at the Wheat Breeding Sub-station of the Indian Agricultural Research Institute at Wellington in the Nilgiris in evolving various strains of rust-resistant wheat.

As a result of systematic work for the past ten years, three new varieties of Khapli wheat, two varieties of bread wheat and three varieties of barley have been released for cultivation in the Nilgiris and other areas in the South. When these varieties are grown all over the Nilgiris and Palani Hills, rust infection in wheat will be considerably reduced.

In recognition of the national importance of some of these improved strains the Madras Government has included the wheat variety, called the Khapli, in the list of crops to be cultivated by villagers on a subsidy basis under the "Gramasahayak scheme". This will greatly help in popularising cultivation of improved strains of wheat in the State.

EXPERIMENTAL GROWTH

Apart from its usefulness as a research centre for the breeding of rust-resistant wheat, the Wellington sub-station has also become a centre where experimental wheat material can be grown during the summer months. Thus, seeds harvested at Delhi and other places in the North are sent to Wellington in May and sown here immediately. Seeds from these plants will be harvested in September-October and sent back to different stations in the north to be grown there in October-November. In this way research work on this crop is being speeded up and a new strain produced within half the time taken before the establishment of the Wellington sub-station.

Within five or six years of making a "cross", a new variety can be released for cultivation. Such acceleration in the tempo of breeding work is essential since it has been found that most of the earlier wheat varieties do not respond even to the application of more than 30 lbs. of nitrogen per acre.

STEPS TO INCREASE YIELD

If the average yield of wheat has to be raised from the present level of 800 lbs. per acre, it is considered essential that varieties which can utilise profitably larger levels of soil nutrition are made available as quickly as possible. By breeding dwarf varieties which do not lodge even when heavy doses of fertilizers are applied, wheat production can be revolutionised.

The Indian Agricultural Research Institute has already taken up this work, using some dwarf wheat varieties from Mexico as parents.

This station has recently acquired some additional area of land from the military authorities. A modern glass house for experiments has also been constructed. Much credit must go to Dr. M. S. Swaminathan, Head of the Division of Botany, Indian Agricultural Research Institute, New Delhi, and Dr. Srinivasan, who was in charge of the sub-station for more than five years.

YOJANA October 27, 1963 Page 17

Amazing Maize

The work of the Botany Division of the Indian Agricultural Research Institute (IARI) in breeding better varieties of crops has earlier been noticed in *Yojana*. The Division has now come out with new gifts for our farmers.

On a Field Day recently arranged for farmers of the neighbouring villages IARI gave demonstrations of three new strains of maize. The first is Hybrid No. 218. It takes three months to mature and its yield is higher than Ganga Hybrid Makka 101. Since it matures ten days earlier than Ganga 101 it releases the land for cultivation of Rabi wheat. The second is Ganga Safed Hybrid Makka No. 2 —a white-grained variety, preferrred particularly by the people of Bihar and Rajasthan. The third is High Starch Hybrid Makka, also white-grained, suitable for making industrial starch. The last two hybrids have been released for cultivation; the first requires some more experimentation. It takes about three years of trial before a hybrid can be released.

THE STATESMAN, 2 OCTOBER ., 1964

NEW FORMULA

THE TIMES OF INDIA
FRIDAY, OCTOBER 2, 1964

203

STORY OF A GIANT AND A DWARF: Page 2

EIGHTH YEAR 6

YOJANA

REKHA ($7\frac{1}{2}$) and Ashok ($5\frac{1}{2}$) tower over full-grown wheat stalks in Pusa Institute, Delhi. The field has been sown with a new Mexican dwarf variety, called Sonora, which gives a yield eight times larger than the average yields in our country. The Sonora wheats have helped to increase the national average of wheat in Mexico from 800 pounds per acre to 2,000 pounds in a mere seven years. The man responsible for this miracle is plant scientist Norman E. Borlaug, left. On page 2 is an account of a talk with Dr Borlaug.

MARCH 29, 1964 25 NAYE PAISE

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Gamma Garden formed
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al new strains of maize,
bajra, cotton oilseeds, ve-
and fodder crops have
olved in the department
hybridization.
Botany division serves as
in co-ordinating centre in
ntry for research on
maize, jowar and bajra.

The M.A.S.U. feels very proud that one of the old alumni of the Madras Agricultural College, Coimbatore has won distinctions of international recognition and takes this opportunity to wish him more and more prosperity in his Scientific ventures.

ABOUT YOJANA

Yojana seeks to carry the message of the Plan to all sections of the people and to promote a more earnest discussion of problems of social and economic development.

It is issued every other Sunday in two separate editions, English and Hindi.

The Advisory Board of the journal consists of the Minister of Information and Broadcasting (Chairman), Mr. S. K. Dey, Dr. Ram Subhag Singh, Mr. T.N. Singh, Mr. Shriman Narayan, Mr. C.R. Pattabhi Raman, Mr. Akshaykumar Jain, Mr. Nawab Singh and Mr. T.P. Singh.

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OVER TO YOU

DUTY OF INTELLECTUALS

PROF. V.K.R.V. Rao's call to intellectuals to participate in the affairs of the country and to take a broader perspective and long-range view of its problems is the best call which could be made under the present circumstances. The intellectuals are capable of performing many valuable tasks such as:

(1) Discovering elements which produce order out of chaos in a given society;

(2) Discovering and utilising elements which promote overall progress once order is restored.

(3) Creating a specified type of society in a given time after order is restored and rate of progress is correctly measured in the initial stages.

Tasks 1, 2 and 3 are interrelated in the sense that the seeds of 3 are sown in 1 and 2. Therefore in order that the intellectuals may participate in the affairs of the country and take a broad perspective and a long-range view of its problems the following conditions should exist :

(a) They should be given accurate specifications of the society which is to be created. Once given the specifications should not undergo a radical change. Too many changes cause waste of resources without any advance being made.

(b) They should be given a patient hearing and protected from uninformed criticisms of ignorant people.

(c) All research work should be controlled by the following disciplines :

(i) It should deal with Indian conditions only.

(ii) It should declare its objectives.

(iii) It should set forth the methods of implementing its findings in the practical fields.

Difficult problems like defence, production, education, administration etc. will be solved only when firm decisions on goals are taken and understood by all.

Bhilai R. M. AGARWALA

TREAT THEM AS OUR OWN

IN his presidential address to the recent seminar on the Employment of the Scheduled Castes and Scheduled Tribes (*Yojana*, February 16), Prof. V.K.R.V. Rao has dwelt at length on the abnormal conditions in which the members of these two communities live and the many handicaps from which they suffer. The seminar made some valuable recommendations which, if implemented, would place the communities on a new footing.

But recommendations apart, what is needed now is a change of attitude on the part of the majority community. As Prof. Rao observes, "The mentality of the caste Hindu must change and he must shed from his inner self the deep-rooted inhibitions and social prejudices that he has inherited from the past."

But the question is—will the Hindus care to abolish the social prejudices ? Where is the guarantee ? Of course our Constitution has abolished untouchability and also given equal rights to every citizen. But as you have aptly commented in your editorial, ".....law can be law only if it is enforced."

The fact is we have to prove our changed attitude by treating the members of the Scheduled Castes and Scheduled Tribes as our own. We have to give concrete examples by giving them equal social rights. We have to invite them to our festivals and social functions. It is only by giving them similar status we enjoy in our society that we can win them over. Unless each one of us takes a pledge to that effect there is little chance of their social uplift. Mere allotment of land to the landless or reservation of few posts in Government service or private undertakings will not be of much help.

Lucknow O. P. SHARMA

IN THIS ISSUE

NEXT FORTNIGHT

World Health Day Feature

★

Development and Disparities-II

Tarlok Singh

★

Plant Introduction

—Its Role in Farming

A CORRECTION

The sentence in the 10th line from below in column 2 page 15 (A Plan to Lift Eastern U. P. — *Yojana*, March 15) should read "The fully employed labour force forms 84.4 per cent of the *labour* population" and not "84.4 per cent of the population" as printed.

YOJANA

Fortnightly Journal Published on behalf of the Planning Commission Chaitra 9, 1886

THE THIRST FOR POWER

e recent developments in power e rarely spare a thought for what in the field of power proper. Yet ctricity has been making remark- last three years. Within the five an, in fact, more power production stalled than was installed in the od preceding.

lectric power station in India was r of 130 kilowatts at Darjeeling ent into production in 1897. A or of 1,000 kW. came up at Calcutta mudram power station in Mysore Sixty-four years after the produc- gan in India, the installed capacity one up to only 5.58 million kilo- figure is going to be 12.50 million uring the Third Plan period alone, g more than doubled.

our development that despite this is shortage of power everywhere. xpanding. Our factory production h more every year. At this com- put is doubled in seven to eight nes live on electricity. A single requires as much power to run le city. Also, our farmers have ore electricity for pumping sets. villages want more lights in homes re is a widespread thirst for power.

demand for power is going to grow n Energy Survey Committee. This onsisted of some famous experts, y 1981, a mere fifteen years after d Plan, the installed capacity has ion kilowatts.

fold increase in a mere 15 years, ery, more engineers and, of course, ey. Much of the machinery will come from within India—mostly from the Heavy Electricals plants at Bhopal, Hardwar and Hyderabad. Our bold technical education programmes will also ensure a sufficient supply of operatives. But large sums are at present being spent on getting foreign technical advice. We should certainly develop our own expertise in this line—and this is beginning to happen.

Putting up generation sets is only one part of the power story. Equally important is it to see that the benefits flow far and wide. This is best done if we can develop a single power system for the entire country. Some progress towards such an ideal all-India grid is being made through the formation of regional electricity boards.

There are to be five of these regional boards in the country, and four have already come up. Each board consists of a group of neighbouring States with common economic interests. It will co-ordinate the power programmes of the States and see that there is an agreed policy on transmission lines and sale. Andhra, Kerala, Madras and Mysore have joined hands to form the southern region board. Bihar, Orissa and West Bengal are members of the eastern region board. Delhi, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan and U.P. constitute the northern region board. The fourth board, for the north-east region, came into being this month and it comprises Assam, Manipur, NEFA and Tripura. The western region board will soon follow. Although these boards are only advisory in character they will still help the development of the water and energy resources of each region in an integrated way. They will also see that the most economical use is made of what has been installed.

The enormous increase in the power needs in the next sixteen years has just been indicated. The question will obviously be asked: what are we doing to meet it? What is being done in Third Plan has been indicated—namely that the national installed capacity is being doubled. The remedial action that the Mid-Term Appraisal had suggested has been taken—so that by 1966 the installed capacity will be 12.5 million kW. As for the Fourth Plan, there has been energetic forward planning. More than 120 hydro-electric projects are being investigated, and they have a total capacity of 17 million kW. Investigation has in fact been completed on 30 of these projects. Besides these hydro-electric schemes there will be power projects based on coal, lignite, oil and nuclear fuel.

There should therefore be every confidence that the power battle will turn out for the good.

Dr. Norman E. Borlaug stands amidst the Sonora wheats in Pusa and explains his "triple formula"

NEW DWARF VARIETY WHICH WILL HELP OUR IRRIGATED LAND TO

TREBLE WHEAT YIELD

If Mexico Can Do It, So Can India, Says Noted Expert

MEXICO is half way round the world from where we are, but Mexico and India are alike in many ways. Like ours it is a land of mountains and the monsoon, of poverty, widespread illiteracy, and dependence on agriculture. And now both countries have a bond in their determination to develop into modern societies.

The two countries are believed to have had links long before Columbus and Vespucci, Cortes and Balboa crossed the Atlantic and found the New World. In later centuries a number of Mexican things made their way to India through the Europeans. Two ready examples are maize and chillies. Yes, chillies. Although our love of chillies is celebrated, these little cones of fire came to us from Mexico.

A vivid example of the progress being made by Mexico as a developing country is provided by what has been happening in its wheat-fields.

Until very recently the average yield of wheat in that country was one of the lowest in the world—only 700 to 800 pounds an acre (as in India). Today the average is 2,000 to 3,000 pounds. This trebling of the yield was achieved in a mere seven years!

And the man most responsible for this startling result is DR. NORMAN E. BORLAUG, who heads the Wheat Improvement Programme of the Rockefeller Foundation in Mexico.

Dr. Borlaug was recently in India for a brief second visit and I had the good fortune to meet him. A leading Indian scientist described Dr. Borlaug to me as an unsung benefactor of mankind—and one who did not like to meet pressmen. I half expected to meet a Schweitzer-like figure (and to interview a patriarch is not an easy job), or one of those men who act like porcupines. But I found a lean, fast-talking man in whom there was no trace of self-importance.

"If Mexico can do it, you certainly can do it in India," Dr. Borlaug said.

"And how did you do it in Mexico?" I asked.

Dr. Borlaug explained the triple formula of new farming.

• *First, the right plant type* which is in harmony with the soil of a place, is able to draw up the nutrients, and can resist the diseases prevalent in the region.

Secondly, correction of the tiredness of soil. No matter how excellent the plant breed, there will be no gains as long the soil has not been replenished with nutrients. This is specially true of India where land has been exploited continuously for many centuries. And such replenishment can come only through chemical fertilisers. Green manure alone cannot do it, for growing of green manure means taking land away from the regular crop.

Thirdly, water management. Water is a limiting factor because unless it is adequate, the first two factors will not yield results by themselves. And a quantity of water that may have been enough at particular level of fertiliser application may not be enough when a larger dose is applied.

"What prospects are there of this triple formula succeeding in India?" I asked.

"Very good chances. Your farmers have come to accept the need for fertiliser. I believe the demand is much ahead of the supply. But they are still used to thinking only in terms of small quantities, say 15

COVER PICTURE showing Rekha and Ashok with the dwarf wheat is repeated at left. At right is an Indian variety. It may be taller but it 'lodges', that is, it falls down. Also the Indian varieties yield much less and can't take more fertiliser. The dwarf Sonora wheats, on the contrary, can take up to 150 lb of fertiliser an acre and yield 6,000 pounds instead of the normal Indian 800. They are ideal for our Package Programme districts, through which we are hoping to reach self-sufficiency in agriculture. The musical name Sonora comes from the place in Mexico where they were evolved. The dwarfs, however, have one drawback. They do not yield much straw for cattle fodder. But Pusa has already given to farmers the giant Napier and Berseem to take care of the need.

Report by
SHARADA
PRASAD

Pictures by
T. S.
NAGARAJAN

THE STATESMAN, 2 OCTOBER ., 1964

NEW FORMULA TO DOUBLE CROP YIELD

IARI EXPERIMENT A SUCCESS

By A Staff Reporter

By rotating kharif and rabi crops and by application of fertilizers in a well-irrigated land, a farmer with a three-acre plot can double the yield and expect an annual income of Rs 3,000. Besides, he can have plenty of fodder to feed his pair of bullocks. This has been demonstrated by the plant introduction and botany division of the Indian Agricultural Research Institute which held its field day on Thursday.

The division has set up a three-acre "intensive demonstration block" For the last three seasons bumper kharif and rabi crops have been harvested. This year's yield includes 2,500 kilogram of maize and 2,400 kilogram of jowar, each sown in a one-acre plot and 900 kilogram of bajra sown in a half-acre plot. The rest of the half-acre plot yielded 40,000 kilogram of "giant Napier grass"—a high productivity fodder grass.

The 1963-64 rabi crop yielded 19,700 kilogram of produce which included 3,500 kilogram of wheat grown in a one-and-a-half-acre plot and 15,000 kilogram of peas sown in a half-acre plot.

SPECIAL HYBRIDS

Eight hybrids of maize to serve the needs of the different parts of the country have also been released. The Ganga three variety has been released specially to make hybrid wheat-maize rotation possible. Another special hybrid—Hi-Starch Makka—has been released to fulfil the needs of industries. Seed of these hybrid varieties can be had from the National Seeds Corporation of the Government of India.

Under a programme initiated in 1960 with the help of the Rockefeller Foundation, an "outstanding" jowar hybrid has been evolved. Hybrid jowar can yield up to 4,000 kilogram of grain per hectare and between 5,000 and 10,000 kilogram of fodder per hectare

Hybrids of bajra, cotton and jute are also being developed which will enhance the yield considerably.

The botany division of IARI, assisted by experts of the Rockefeller Foundation, is the co-ordinating centre for research in wheat, maize, bajra and jowar.

THE TIMES OF INDIA
FRIDAY, OCTOBER 2, 1964

Hybrid Varieties Of Maize & Cotton

By A Staff Reporter

The Indian Agricultural Research Institute exhibited to farmers from all over the country on Thursday high-yield hybrid varieties of maize, jowar, bajra, cotton and jute.

The farmers witnessed how an acre of land treated with fertilisers could produce as much as 75 maunds of maize. The scientists at the Institute have also bred a new variety of maize known as Ganga 3 and a special hybrid called Hi-starch makka has been released for industrial purposes. The hybrid seeds are produced and sold to farmers by the National Seeds Corporation.

The Botany Division of the Institute is now working on some "prolific hybrids" which will have three to four cobs per plant instead of the one or two produced by hybrids so far released.

101 2.10.64

"Times of India" Oct. 5, 1964.

New Varieties Of Crops Evolved

ACHIEVEMENT OF FARM INSTITUTE

The Indian Agricultural Research Institute has developed some new varieties of high yielding crops by utilising gamma rays.

The crops developed in recent years are mutants of wheat, paddy, barley, tomato, tobacco and cotton. Experiments on many more are still in progress at the "gamma garden" attached to the botany division of the institute.

Atomic radiations are known to induce genetic changes in plants. Experiments to evolve crops to suit Indian conditions by utilising this property in atomic energy were started in the institute in 1953, but it was not until the 'gamma garden' was set up in 1959 that scientists could produce new varieties of crops.

In the case of wheat, which was the first to be tackled in the garden, scientists were able to develop a variety described as "with horns" from a hornless variety.—PTI.

101 5.10.64

"Gamma Rays" help raise crop yield

NEW DELHI, Oct. 4 (PTI) — The Indian Agricultural Research Institute has developed some new varieties of high-yielding crops with the utilisation of "Gamma Rays."

The crops developed in recent years are mutants of wheat, paddy, barley, tomato, tobacco and cotton. Experiments on many more are still in progress at the "Gamma Garden" attached to the Botany division of the Institute.

Atomic radiations are known to induce genetic changes in plants. Experiments to evolve crops to suit Indian conditions by utilising this property in atomic energy were started in the Institute in 1953, but it was not until the Gamma Garden was set up in 1959 that the scientists could produce new varieties of crops.

In the case of wheat, which was the first to be tackled in the garden, scientists were able to develop a variety described as "with horns" from a hornless variety.

The high-yielding wheat seeds were released to the farmers two years back and all over the northern Indian large-scale cultivation of the new variety was going on.

Possibly of more importance and perhaps more interesting was the development of dwarf varieties of paddy and barley. The first one had already been released to Government farms in Northern India and seeds would be made available to all cultivators in two years. Barley had been developed only recently and farm cultivation would start during the next kharif season.

The dwarf variety of paddy and barley were capable of utilising high levels of nitrogen cultivation unlike the parent varieties which, because of their tall and weak straw, lodged heavily when fertilizers were applied. Stems of the dwarf varieties were short and thick.

In cotton, a jassid resistant variety was developed in the strain "Mescilla Acada" but availability of the new variety for commercial cultivation would take some time.

A scientist attached to the Gamma unit said that it took only two years to bring about genetic changes in plants by utilisation of Gamma Rays. By conventional methods, he added, it would take at least eight years before an improved variety could be developed.

The main difficulty was that 80 per cent of the experiments did not produce the desired result. Even in the remaining 20 per cent, the ultimate selection would fall only on one or two varieties in view of the climatic, and soil conditions in India.

The scientists said that the research work did not aim at only evolving new varieties. The yield should be higher, and the crops should be able to stand high fertilizer input.

Explaining the methods adopted, he said that seeds and plants were exposed to Gamma Rays frequently for a number of days in the Gamma Garden, which was secluded and protected area.

The "200-Curie Cobalt 60" Gamma unit in the Garden emitted Gamma Rays at the rate of 10,000 Roentgen (Unit of Energy) per hour.

Recently, the Institute has installed a 3,600 Curie Gamma cell. Apart from facilitating acute irradiation experiments, the new unit is being used for irradiation of medicines also by many pharmaceutical firms in the country.

The Gamma Garden formed only a small part of the Botany division of Iari.

Several new strains of maize, jowar, bajra, cotton oilseeds, vegetables and fodder crops have been evolved in the department through hybridization.

The Botany division serves as the main co-ordinating centre in the country for research on wheat, maize, jowar and bajra.

The Madras Agricultural Journal 51(5)
May, 1964

BHATNAGAR AWARD.

We are very glad to report that Dr. M. S. Swaminathan, B. Sc. (Ag.), M. Sc., Ph. D. (Cambridge) has recently been awarded the BHATNAGAR MEMORIAL PRIZE for outstanding work in Biological Sciences for the year 1961. Dr. Swaminathan passed out of the Agricultural College, Coimbatore in the year 1947 with high distinctions. He was elected as the Vice-President of the International Genetics Congress held at the Hague in 1963, and this is the first instance of an Indian to be given this honour since the inception of the Congress. He had also the privilege of being the Chairman of the Brookhaven National Symposium on "Neutron Irradiation" in October 1963.

The M.A.S.U. feels very proud that one of the old alumni of the Madras Agricultural College, Coimbatore has won distinctions of international recognition and takes this opportunity to wish him more and more prosperity in his Scientific ventures.

pounds an acre. They have to be convinced that much larger quantities can be applied. And you must ensure more water to farmers willing to put in more fertiliser. Don't forget that 25 per cent of your wheat-fields have irrigation. This is a great advantage."

"What about the first point of your triple formula—the right type of seed?"

"I was coming to that—for the three have to be balanced. Two alone can't do the trick. When more water and fertiliser are given, the plants grow tall, and tall stalks are more likely to lodge. When the wind blows, they fall down under the weight of the ears. That is why in Mexico we evolved dwarf varieties that do not lodge. Mexico, as you know, is far less blessed with water than India. All the more reason why really high output must be obtained from the irrigated areas. I said the average yield has gone up to 2,000 to 3,000 lb. in seven years. The yield in nearly three-fourths of the irrigated land is much more. And this was achieved through higher fertiliser use and the adoption of the dwarf varieties. You see those varieties around you in the Pusa Institute."

"How did the Mexican farmers react? Did they go along with you?"

"Farmers everywhere live close to the soil. If you can demonstrate on their own plots what can be done, they will readily shed their distrust. It is no use laying out your demonstration on government farms. Their attitude will be: the government might do it, the government has money, but we won't be able to. If you can prove something on their own plots, you will see that they become enthusiastic...That is how it was in Mexico. At first we could not convince the farmers of the importance of fertilisers. (You are in a much better position, having passed that stage.) Then they resisted the idea of high dose of fertilisers. They thought it would poison the soil. But in the end, the results won them over."

"You said the three factors can't be separated. Once the right plant types have been found, isn't the rest of the job the administrator's? What more need would be there for the scientist?"

"I agree that administrator has a big responsibility. It is he who has to put together the scientific parts. But you cannot say that the work of the agricultural scientist ends at a particular stage. Let me give just one reason. A plant variety has to be disease-resistant. But disease organisms keep changing. They are out to defeat man. When we are asleep they are at work. They go through 300 generations in just one year—and can evolve new characteristics through genetic changes. There has therefore to be a continuous research programme. What was good at one period may no longer be adequate even in the same place."

"At the risk of repeating myself may I ask what makes you feel confident that India can achieve what Mexico has achieved?"

"As I said, you have a high proportion of irrigated land. You have a growing fertiliser industry. You have scientists. We in Mexico had no scientists at all when we started—although we now have a fine team. And then your farmers are already more receptive to ideas than the Mexican farmers were. I have infinite faith in the small farmer. All that is to be done is to light a few fires—and they will spread."

"Indian Express"
Oct. 5, 1964.

New types of seeds produced by irradiation

NEW DELHI, Oct 4 (PTI)—The Indian Agricultural Research Institute has developed some new varieties of high yielding crops with the utilisation of gamma rays.

The crops developed in recent years are mutants of wheat, paddy, barley, tomato, tobacco and cotton. Experiments on many more are still in progress at the Gamma Garden attached to the botany division of the Institute.

Atomic radiations are known to induce genetic changes in plants. Experiments to evolve crops to suit Indian conditions by utilising this property in atomic energy were started in the institute in 1953, but it was not until the Gamma Garden was set up in 1959 that the scientists could produce new varieties of crops.

In the case of wheat, which was the first to be tackled in the garden, scientists were able to develop a variety described as With Horns from a hornless variety.

The high-yielding wheat seeds were released to the farmers two years back and all over the northern India, large-scale cultivation of the new variety was going on.

Possibly of more importance and perhaps more interesting was the development of dwarf varieties of paddy and barley. The first one had already been released to Government farms in northern India and seeds would be made available to all cultivators in two years time. Barely had been developed only recently and farm cultivaiton would start during the next kharif season.

The dwarf variety of paddy and barley were capable of utilising high levels of nitrogen cultivation unlike the parent varieties which, because of their tall and weak straw, lodged heavily when fertilizers were applied. Stems of the dwarf varieties were short and thick.

The 200-Curie cobalt-60 gamma unit in the garden emitted gamma rays at the rate of 10,000 Rontgen (unit of energy) per hour.

The gamma cell in the middle of the garden was operated through remote control and the seeds and plants were kept around the cell at pre-determined distances.

Recently, the institute has installed a 3600-Curie gamma cell. Apart from facilitating acute irradiation experiments, the new unit is being used for irradiation of medicines also.

"Times of India"
Oct. 26, 1964.

Subramaniam Visits Agricultural Institute

The Botanical Division of the Indian Agricultural Research Institute raised bumper crops of maize, jowar, and bajra this year under the most adverse conditions at the institute's fields in Delhi.

This was achieved in a season when there was almost continuous rain.

Mr. C. Subramaniam, Union Food and Agriculture Minister, visited the institute on Sunday and expressed the hope that farmers would visit the institute's fields in large numbers and benefit from the work done by scientists there.—PTI.

THE SUNDAY STATESMAN, JANUARY 10, 1965

S. S. BHATNAGAR AWARDS

PRESENTATION ON THURSDAY

The Shanti Swarup Bhatnagar Memorial Award for 1960, 1961 and 1962 will be presented at a special function at the NPL Auditorium in New Delhi on Thursday by Mr M. C. Chagla, Union Education Minister.

The award carries with it prizes each of the value of Rs 10,000.

The following are the recipients in various fields of science and engineering:

1960: Physical Sciences—Dr M. G. K. Menon, Dean, Physics Faculty, Tata Institute of Fundamental Research, Bombay; Chemical Sciences—Dr T. R. Govindachari, Director, CIBA Research Centre, Bombay; Biological Sciences—Prof T. S. Sadasivan, Head of the Department of Botany, Madras University; Engineering Sciences—Mr H. N. Sethna, Atomic Energy Establishment, Bombay.

1961: Physical Sciences—Prof C. N. Ramachandran, Professor of Physics, University of Madras; Chemical Sciences—Dr (Mrs) Asima Chatterjee, Professor of Chemistry, University College of Science and Technology, Calcutta; Biological Sciences—Dr M. S. Swaminathan, Head of the Division of Botany, Indian Agricultural Research Institute, New Delhi; Medical Sciences—Dr R. B. Arora, Professor of Pharmacology, All-India Institute of Medical Sciences, New Delhi.

1962: Physical Sciences—Dr Vikram A. Sarabhai, Physical Research Laboratory, Ahmedabad; Chemical Sciences—Dr S. C. Bhattacharya, National Chemical Laboratory, Poona; Biological Sciences—Prof B. K. Bachhawat, Professor of Neurochemistry, Christian Medical College, Vellore; Engineering Sciences—Mr M. M. Suri, Director, Central Mechanical Engineering Research Institute, Durgapur.

योजना

योजना आयोग की ओर से प्रकाशित सचित्र पाक्षिक

आठवां वर्ष
24
13 दिसम्बर, 1964
(22 अग्रहायण, 1886)
25 पैसे

योजना

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योजना में जनसाधारण को योजना सम्बन्धी साहित्य से अवगत कराने, विभिन्न राज्यों और प्रदेशों में पारस्परिक सम्बन्ध बढ़ाने और भावात्मक एकता सुदृढ़ करने के लिए उपयोगी लेख, कहानियां, चित्र, कार्टून, कविताएं आदि प्रकाशित की जाती हैं। लेखों में व्यक्त विचार लेखकों के अपने होते हैं ।

सलाहकार मंडल

सूचना और प्रसारण मंत्री; सामुदायिक विकास, पंचायती राज और सहकारिता मंत्री; कृषि मंत्री; टी० एन० सिंह; श्रीमन्नारायण; अक्षयकुमार जैन; सूचना और प्रसारण मंत्रालय के सचिव; तथा योजना आयोग के सचिव

चन्दा

वार्षिक 5 रुपए--एक प्रति 25 पैसे

सम्पादकीय कार्यालय (टेलीफोन : 34380)

'योजना' (हिन्दी)

542--योजना भवन, नई दिल्ली--1

विज्ञापन तथा चंदा जमा कराने का पता

बिज़नेस मैनेजर, प्रकाशन विभाग,

पो० बा० 2011, ओल्ड सेक्रेटेरिएट, दिल्ली-6

इस अंक में

मुखपृष्ठ

भारतीय कृषि अनुसन्धान संस्थान द्वारा तैयार किए गए संकर बाजरे की नई फसल

पाठकों के पत्र

प्रिय महोदय,

करोड़ों रुपए योजनाओं पर खर्च करने का क्या परिणाम हुआ ? क्या समस्याएं हल हुईं ? उत्तर है नहीं । इसका मूल कारण है कि हमने अपनी स्वतन्त्रता का सही उपयोग नहीं किया । अपना स्वार्थ, केवल अपनी भलाई और अपना नाम, मान और धन कमाने की कमजोरी पर हम विजय न पा सके । लम्बे-चौड़े, करोड़ों रुपए के हस्पतालों में मरीज भरे पड़े हैं। दवाइयां बाजारों में भरी पड़ी हैं । मगर क्या वे उचित मूल्य पर मिल सकती हैं ? मरीजों के लिए निश्चित की गई धनराशि का पूरा-पूरा लाभ उन्हें नहीं मिल रहा है । तब क्या मरीजों का इलाज नहीं होता ? एक रुपए में पांच नए पैसे के बराबर । शेष 95 पैसे का इस्तेमाल होता है अपनत्व और जान-पहचान की भावना से प्रेरित होकर । यही हाल स्कूल और कालिजों का है । स्कूल और कालिजों में दाखिले उन्हें मिलते हैं जिनकी 'पहुंच' है । बेरोक-टोक अपनी स्वतन्त्रता का मनमाना उपयोग करने वाला प्रत्येक व्यक्ति नई बनने वाली चीजों को ऐसे बनाता और बेचता है कि उसके द्वारा गाहकों को कम फायदा हो और उसे तथा उसके परिवार को अधिक से अधिक फायदा हो ।

आज 1,000 रुपए तक की तनख्वाह पाने वाला आदमी निर्धन है । पर कुछ ऐसे भी हैं जिनकी लाखों और करोड़ों की दौलत के साथ भी हवस पूरी नहीं होती । जनता कहती है कि सरकार भ्रष्टाचार को दूर करे । सरकार कहती है कि जनता इसे दूर करे । प्रश्न यह उठता है कि सरकार को किसने और क्यों तथा किसलिए चुना ?

हवस, लिप्सा, मान तथा केवल अपने ही उत्थान की भावना के परिणामस्वरूप आजकल अधिकांश उलझनें पैदा हो रही हैं । एक कुशल सरकार का यह कर्त्तव्य है कि वह अपने तंत्र तथा लोगों के रवैये और मनोवृत्तियों का अध्ययन करे, उन कमजोरियों को दूर करे जिनसे मनुष्य अपने स्वार्थ के वशीभूत हो दूसरों का शोषण करता है । योजनाओं की सफलता के लिए मनुष्य के इस स्वार्थ को मिटाना, निर्मूल करना बहुत जरूरी है । *--रामप्रकाश उपाध्याय 'अंचल'*

प्रिय महोदय,

आश्चर्य की बात है कि आज तक हमारे नेता, विधायक तक भी लोकतन्त्र का असली अर्थ नहीं जानते । कोई कहता है इसका अर्थ विषमता का निवारण करना है तो कोई समाजवादी समाज रचना बताता है। इसका मुख्य कारण व्यावहारिकता का अभाव है । हम कहते कुछ हैं, करते कुछ हैं। बस यही वजह है कि लोकतन्त्र का अर्थ एक भारी समस्या हो गया है ।

मघवा अर्थ विड़ौजा (इन्द्र) । मघवा का अर्थ इन्द्र सीधे करने वाले लोग राजनीतिज्ञों में बहुत कम हैं । जो हैं भी उनकी आवाज में दम नहीं । क्योंकि व्यवहार शून्य राजनीति केवल भाषण, व्याख्यान, लेक्चर पर निर्भर है । हमारे भारतीय विधान में मतदाताओं में कोई भेद नहीं। मतदाताओं को गुण, अवगुण से कोई मतलब नहीं । एक डाकू, जनता को गड्ढे में डालने वाले दुष्ट, देशद्रोही के वोट की वही कीमत है जो देश के लिए सर्वस्व त्याग करने वाले की । यदि विधान में यह परिवर्तन कर दिया जाए कि वोट देने वाले में अमुक अमुक गुण होने आवश्यक हैं और वोट लेने वाले विधायकों में भी अमुक अमुक गुण होने चाहिएं, तब ही लोकतन्त्र को अच्छा मार्ग मिल सकता है । *--उदित मिश्र*

'योजना' के प्रतिनिधियों का दौरा

बरसात और बाढ़ में भी खेती की जा सकती है

दिल्ली के पूसा संस्थान की महत्वपूर्ण खोज

लेख : काली विश्वास

चित्र : टी० एस० नागराजन

भारतीय कृषि अनुसंधान संस्थान के प्रदर्शन खेत में ज्वार की बौनी और ऊंची फसलों का दृश्य

विज्ञान का यह काम है कि वह हर समस्या का हल ढूंढ़े । पर भारतीय कृषि वैज्ञानिक अपने देश के किसानों की विभिन्न समस्याओं को हल करने के लिए जो काम कर रहे हैं, उसका यथेष्ट प्रचार नहीं हुआ और, सच पूछो तो, इन वैज्ञानिकों के महत्वपूर्ण योगदान का लाभ हमारी सरकार ने भी नहीं उठाया है ।

इस तथ्य की ओर खाद्य और कृषि मंत्रियों ने हाल ही में राष्ट्रीय विकास परिषद की बैठक में ध्यान आकर्षित किया था । इस वर्ष बरसात में दिल्ली में और उसके आस-पास अप्रत्याशित रूप से भारी वर्षा हुई और किसानों ने शिकायत की कि वर्षा के कारण वे तबाह-बरबाद हो गए हैं । पर इन्हीं दिनों दिल्ली के पूसा संस्थान ने भी यह खोज निकाला था कि अतिवृष्टि और बाढ़ की स्थिति में भी किस किस्म की फसलें उगाई जा सकती हैं ।

पूसा संस्थान (जिसका पूरा नाम भारतीय कृषि अनुसंधान संस्थान है) हर साल दो 'क्षेत्र दिवस' मनाता है । इन दिनों किसानों को आमंत्रित करके यह दिखाया जाता है कि संस्थान ने क्या नई चीजें उगाई हैं और किन नई बातों की खोज की है । अभी-अभी अक्तूबर मास में जो क्षेत्र दिवस मनाया गया, उस दिन किसानों को यह बताया गया कि बाढ़ की स्थिति में वे अपनी फसलों की रक्षा कैसे कर सकते हैं; यही नहीं, उन्हें यह भी बताया गया कि ऐसी स्थिति में वे किस प्रकार संतोषजनक फसल भी उगा सकते हैं ।

अपने तीन एकड़ के खेत में पूसा संस्थान के वैज्ञानिकों ने किसानों को दिखाया कि बरसात के दिनों में वे संकर बाजरा, मक्का, ज्वार तथा चारे-भूसे के लिए घास आदि भी उगा सकते हैं ।

इस बरसात में, जब दिल्ली में जुलाई-अगस्त के दौरान लगातार पानी बरसता रहा था, एक बिना जुताई की और पानी से भरी आध एकड़ जमीन में 29 जुलाई को संकर बाजरा बोया गया । बाजरे की पौद तीन सितम्बर को विशेष रूप से तैयार किए गए ढूहों में बोई गई । इससे पानी निकालने में

सेम की जमीन में नया बाजरा

और खरीफ के मौसम में नई ज्वार

(पिछले पृष्ठ से आगे)

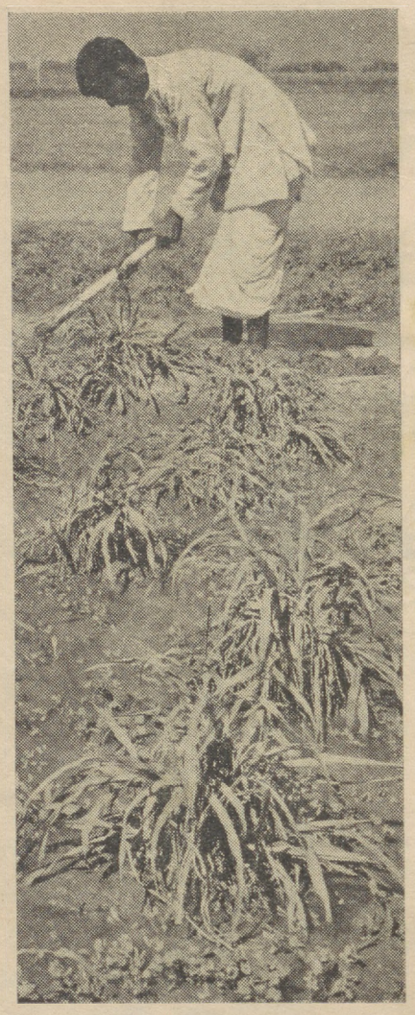
बड़ी मदद मिली । जब अक्तूबर के शुरू में मैं इस खेत को देखने गया, तो मैंने देखा कि खूब तगड़े पौधे उग आए थे और उनमें भरपूर दाना भी आया था । मुझे बताया गया कि फसल एक-आध सप्ताह में, यानी बुवाई के बारह सप्ताह बाद, तैयार हो जाएगी और उससे 3,000 पौंड प्रति एकड़ फसल प्राप्त होगी ।

संलग्न खेत में बौनी ज्वार बोई गई थी । इसका विकास एक अखिल भारतीय समन्वित कार्यक्रम के अन्तर्गत किया गया था । यहां भी ढूह बनाए गए थे । पौधे खूब विकसित लगते थे और 3,500 पौंड प्रति एकड़ उपज होने की संभावना थी । वैज्ञानिकों का विचार है कि देश में चार करोड़ एकड़ ज्वार की खेती वाली भूमि में से यदि एक करोड़ एकड़ भूमि में खरीफ के मौसम में यह किस्म उगाई जाए, तो इससे ज्वार के कुल उत्पादन में उल्लेखनीय वृद्धि हो सकती है ।

मक्का की एक नई किस्म 'गंगा–3' एक एकड़ खेत में उगाई गई । 'गंगा–101' की भांति ही, जो कि देश में काफी लोकप्रिय हुई है, इस नई किस्म से भी बहुत अधिक उपज प्राप्त होती है । इस किस्म का एक अतिरिक्त लाभ यह भी है कि यह अधिक जल्दी तैयार हो जाती है । यह किस्म अदल-बदल कर खेती करने के लिए सर्वोत्तम है और इसके बाद गेहूं की बुवाई की जा सकती है ।

भारतीय कृषि अनुसंधान संस्थान के वैज्ञानिक गत तीन वर्षों से अपने प्रदर्शन खेत में खरीफ के मौसम में संकर फसलें उगाते आ रहे हैं । ये वैज्ञानिक, किसानों के समक्ष जो प्रदर्शन करते हैं, उनसे यह सिद्ध हो गया है कि यदि एक किसान, जिसके पास 3 एकड़ भूमि है, साल-भर अदल-बदल कर फसल बोने की प्रणाली को अपनाए और उर्वरकों का इस्तेमाल करे, तो प्रतिवर्ष वह 3,000 रुपए कमा सकता है । इसके अतिरिक्त, उसे साल-भर के लिए चारे-भूसे की चिन्ता से भी छुटकारा मिल जाएगा । हाल ही में जो प्रदर्शन किए गए हैं, उनसे किसानों को यह पता चला है कि बरसात के मौसम में नम और सेम वाली जमीनों में भी किस प्रकार फसलें उगाई जा सकती हैं ।

भारतीय कृषि अनुसंधान संस्थान ने संकर मक्का, ज्वार तथा बाजरे का बीज तैयार किया है । राष्ट्रीय बीज निगम इस बीज को बढ़ा कर किसानों में वितरित करेगा । ●



बरसीम का खेत

निदेशक, प्रकाशन विभाग, सूचना और प्रसारण मंत्रालय, भारत सरकार, पुराना सचिवालय, दिल्ली-8 द्वारा प्रकाशित । कैक्स्टन प्रेस प्राइवेट लिमिटेड, रानी झांसी रोड, नई दिल्ली–1 द्वारा मुद्रित । **प्रधान सम्पादक : जोगेन्द्रलाल बिरमानी**

d Core & ic Sector

ING WON'T DO

hope that the economy would, unless something unexpected happened, begin to grow much faster than it has done so far.

Often the Memorandum repeats well-known propositions whose validity is obvious: For example, on page 3, we have this statement: "Every effort must be made to complete the projects that are far advanced; and utmost attention should be given to schemes and programmes that yield quick returns to investment". And again (page 22), "What needs to be recognised at this stage is that in the private sector, as in the public sector, all possible steps will have to be taken to ensure that the required resources are generated". The crucial question is, really, what these steps are to be and what the thinking of the Planning Commission is on this matter. We are told that "new institutions and instruments that can be utilised for promoting larger savings by the private sector.. are being examined". The Memorandum would have been more valuable if it had contained concrete policy recommendations instead of merely hinting at policy changes.

A Significant Change

One significant change of emphasis in strategy is discernible in the Memorandum. This, in my view, is a welcome shift. I refer to the pronouncement that we ought at this time to pay considerable attention to substantial increases in the output of basic consumer goods without giving up the objective of building up a viable base for industrialisation. What is more significant, and doubly welcome, is the recognition that "the State will have to move towards attaining a commanding position in the distribution of essential consumption goods" (page 7). The concrete steps to be taken in this regard, however, have yet to be worked out. But we find here the glimmering of a new philosophy of State policy in the context of a mixed economy.

By and large, our understanding of the concept of a mixed economy has been that of co-existence of the two sectors, public and private, each with a sphere of its own, requiring a mixture of two sets of policies: Direct State planning is largely confined to the public sector; mostly fiscal and monetary controls are to be used to regulate the private sector and the general state of the economy including the price level. Because of this dichotomy introduced in the concept of planning there has been inadequate plan effort in crucial sectors of the economy such as the basic goods sector which requires planning, that is supersession of the price mechanism, more than other sectors in any strategy of development.

The basic goods or essential goods sector must be planned fully and "insulated" to a certain degree from the rest of the economy irrespective of the formal division between the public and private sectors. This may be called the principle of insulation of the basic goods sector. Second, public sector units must find a place in certain sectors formally allotted to the private sector such as farming, house construction and banking. Thus, instead of existing alongside the private sector, public sector should be allowed to interpenetrate the private sector for strategic reasons in certain crucial areas. Third, a basic core-plan should be drawn up cutting across the divisions between public and private sectors, and between Central and State sectors, the responsibility for whose punctual fulfilment should be squarely laid on the Planning Commission itself. As it is, the Memorandum contains a comprehensive Plan with the responsibility of the fulfilment of its several parts so widely parcelled out that one has no means of knowing or ensuring that it will in fact be implemented.

The drawing up of a comprehensive Plan covering all sectors and

(Continued on Page 27)

YOJANA DEC. 6, 1964.

Yojana Staff Feature

Report by
Kali Biswas
Photographs:
T. S. Nagarajan

PUSA SHOWS FARMERS

A WAY OUT OF FLOODS

IT is the duty of science to find a solution for every problem. The work being done by Indian agricultural scientists to solve the numerous difficulties that beset our farmers is not known widely enough in the country and this work is certainly not being made use of by our own governments.

The Food and Agriculture Ministers drew pointed attention to this fact in the recent meeting of the National Development Council. The monsoon this year was unexpectedly heavy in and around Delhi. Farmers complained that they had been ruined. And yet about the same time the Pusa Institute in Delhi had already found out what particular variety of crops could be grown even in conditions of excessive rains and floods.

The Pusa Institute—the Indian Agricultural Research Institute, to give its full name—holds two Field Days every year. On these Field Days it invites farmers to come and have a look at the new things that have been grown and found out by the Institute. The latest Field Day, held in October, was a full-scale field demonstration on what the farmers could do, not only to retrieve their crops under the flood conditions but even to make use of these conditions themselves to grow a satisfactory crop.

On a three-acre demonstration plot, the Pusa scientists showed how farmers can grow highly

NEW BAJRA
for
WATER-LOGGED AREAS
and
NEW JOWAR
for
KHARIF SOWING

productive crops like hybrid *bajra* (*Ponnisetum typhoidum*), maize, *jowar* (*Sorghum vulgare*) and Giant Napier grass for fodder during the rains.

In this rainy season when Delhi had continued rains in July-August, hybrid *bajra* was sown on an unploughed, water-logged half-acre plot on June 29. The seedlings were transplanted on specially prepared rows of ridges on September 3. This helped in letting water out. When I visited the field in early October, I found the plants well grown, healthy and strong, with more tillers on each. The grains were compact. Being shorter in height the stacks were not likely to lodge. I was told that the crop would be ready for harvest in a week's time, that is in less than 12 weeks from the time of sowing, yielding as high as 3,000 lb per acre.

On an adjoining acre of land was grown a dwarf *jowar* hybrid developed under an all-India co-ordinated programme. Here also rows of ridges were made. The plants looked well developed and the yield was expected to be 3,500 lb per acre. Scientists feel that if introduced in the Kharif season in the total ten million irrigated acres out of 40 million under *jowar* in the country; this new variety would add substantially to the total *jowar* output.

The dwarf and the giant varieties of Jowar stand side by side on the demonstration plot at the Indian Agricultural Research Institute. The other two photographs on this page are of Bajra (left above) and Giant ~~Berseem~~ NAPIER (left). All the three are high yielding hybrid varieties evolved by the Institute.

Ganga 3, a new variety of maize, was grown on a one-acre plot. Like Ganga 101, already popular among the farmers in different parts of the country, this new strain is a high-yielder. The additional advantage is that it matures earlier. It is best suited for rotation, and can be followed by wheat.

Then there was Pusa Giant Napier grass grown on an adjoining half-acre plot. A cross of *bajra* and Napier grass, Pusa Giant Napier grass yields as high as 2 to 3 lakh pounds per acre.

Scientists of IARI have been growing the hybrid varieties of crops on the demonstration plot in the Kharif season for the last three seasons, besides also raising wheat, barley, peas and Giant Berseem during the Rabi season—all on rotation basis.

The demonstrations have proved that a farmer holding three acres of land with irrigation facilities can earn Rs 3,000 per year provided he follows the recommended crop rotation the year round and uses fertiliser. In addition, he would get fodder as the Giant Napier grass and the Giant Berseem rotation would ensure the supply for a year. The recent demonstration will also help the farmers in growing crops inwet and water-logged areas during the rainy season.

IARI has already released seeds of the hybrid strains of maize, *jowar* and *bajra*. They are being multiplied by the National Seeds Corporation for distribution to the farmers.

"Times of India"
January 16, 1965.

Picture shows the recipients of Shanti Swarup Bhatnagar Memorial Awards in New Delhi on Thursday. Among them were (l. to r.) Dr. M. G. K. Menon, Dr. T. R. Govindachari, Dr. T. S. Sadasivan, Mr. H. N. Sethna, Dr. (Mrs.) Asima Chatterjee, Dr. M. S. Swaminathan, Dr. R. B. Arora, Dr. Vikram A. Sarabhai, Dr. S. C. Bhattacharyya, and Dr. B. K. Bachhawat.

SCIENTISTS HONOURED

Chagla Presents Awards

From Our Correspondent

NEW DELHI, January 14.

THE Shanti Swarup Bhatnagar memorial awards, India's highest recognition of scientific merit, were presented by Mr. M. C. Chagla, Union Minister for Education, to 12 top scientists here today.

The awards, cash prizes of Rs. 10,000 are given every year to four scientists for outstanding work in physics, chemistry, medicine and engineering. At Thursday's function, awards won in 1960, 1961 and 1962 were given away.

Congratulating the recipients, Mr. Chagla said that a scientific spirit was essential for progress.

Unfortunately, scientific efforts were not given due recognition in India. The awards given by the Council of Scientific and Industrial Research were the first step in encouraging scientific research.

KRISHNAN FIRST RECIPIENT

Dr. Hussain Zaheer, Director of CSIR, said that the awards were instituted in memory of Dr. Shanti Swarup Bhatnagar. The late Dr. K. S. Krishnan, director of the National Physical Laboratory, was the first recipient of the award. All award-winning scientists have to be below 45 years.

The scientists honoured were Dr. M. G. K. Menon senior professor and deputy director (physics) at the Tata Institute of Fundamental Research, for his notable contribution in the field of physics of elementary particles and cosmic rays (1960).

Dr. T. R. Govindachari, director, CIBA research centre, Bombay, for working in the field of plant chemistry (1960) Dr. T. S. Sadasivan, Director, Botany Laboratory, Madras, for contributions to mycology and plant pathology. (1960) Dr. H. N. Sethna, Atomic Energy Commission, Trombay, for his outstanding contribution in designing and commissioning the plutonium plant, Trombay—1960.

HIGHEST RECOGNITION

The 1961 award winners are Dr. G. N. Ramachandran, Director of the centre of advanced study in physics, Madras University, for contributions to the study of protein structure, Dr. (Mrs.) Asima Chatterjee, Khaira professor in Chemistry, Calcutta University, for her work in the chemistry of natural products especially in the chemistry of alkaloids and coumarins, Dr. M. S. Swaminathan, head of the Botany Division, Research Institute of Medical Sciences, New Delhi, for contribution to cardiovascular pharmacotherapeutics.

The four scientists honoured for their work in 1962 are Dr. Vikram Sarabhai, professor, cosmic ray physics, Physical Research Laboratory, Ahmedabad, for contribution to cosmic ray physics, Dr. S. C. Bhattacharyya, Scientist, National Chemical Laboratory, Poona, for work on terpenes and related natural products, musk compound and analytical chemistry, Dr. B. K. Bachhawat, Professor of Biochemistry, Christian Medical College and Hospital, Vellore, for his work in biochemistry, and Mr. M. M. Suri, Director, Central Mechanical Engineering Research Instiute, Durgapur, for contribution to diesel locomotive engineering.

BHATNAGAR AWARDS PRESENTED

BY A STAFF REPORTER

Twelve distinguished scientists received the Shanti Swarup Bhatnagar Memorial Awards at a function at the National Physical Laboratory in New Delhi on Thursday.

"In a humbler way these are our Nobel Prizes", said the Education Minister, Mr M. C. Chagla who presented the awards. He expressed the hope the award winners would be accorded the same recognition the Nobel Laureates were given all over the world.

"We cannot build up a scientific society unless we give a proper status to scientists; so far we have not done so," he said. Though society realized that it benefited by the fruits of scientific research it forgot the toil, sweat and tears of the scientists, he added

Mr Chagla felt that there ought to be a scientific elite in the country. It was wrong to think that in a democratic society there should be no elite. An egalitarian society meant equality of opportunities not equality of talent, he said.

Congratulating the award winners, the Minister emphasized that they had not only helped to further scientific knowledge but had made a great contribution to the progress of the country.

Earlier, Dr S. Husain Zaheer, Director-General of the Council of Scientific and Industrial Research, said the awards were designed to encourage Indian scientists to greater efforts. It had been decided in 1963 that the awards should be given to four scientists in different branches of science every year and also to fix the age limit at 45.

The awards are for 1960, 1961 and 1952 and cover physical, chemical, biological, engineering and medical sciences.

THE AWARD WINNERS

The award winners are: Mr M. G. K. Menon, Deputy Director (physics), Tata Institute of Fundamental Research, Bombay; Dr T. R. Govindachari, Director, CIBA Research Centre, Bombay; Dr T. S. Sadasivan, Director, University Botany Laboratory, Madras; Mr H. N. Sethna, Engineering Group, Atomic Energy Establishment, Bombay (all for 1960); Dr G. N. Ramachandran, Director of the UGC Centre of Advanced Study in Physics, Madras University; Dr (Mrs) Asima Chatterjee Khaira, Professor of Chemistry, Calcutta University; Dr M. S. Swaminathan, Head of the Division of Botany, Indian Agricultural Research Institute, New Delhi; Dr R. B. Arora, Professor of Pharmacology, All-India Institute of Medical Sciences, New Delhi (for 1961); Dr Vikram A. Sarabhai, Physical Research Laboratory, Ahmedabad; Dr S. C. Bhattacharyya, National Chemical Laboratory, Poona; Dr B. K. Bachhawat, Professor of Biochemistry, Christian Medical College and Hospital, Vellore and Mr M. M. Suri, Director, Central Mechanical Engineering Research Institute, Durgapur (for 1962).

The award was given to Dr Menon for his contribution in the field of physics of elementary particles and cosmic rays, Dr Govindachari for his work on plant chemistry, Dr Sadasivan for mycology and plant pathology, Mr Sethna for the designing and commissioning of the plutonium plant in Trombay, Dr Ramachandran for his study of protein structure, Dr (Mrs) Chatterjee for her work in the chemistry of natural products especially in the chemistry of alkaloids and coumarins, Dr Swaminathan for his work on radiation genetics and mutation research and Dr Arora for his work on cardiovascular pharmacotherapeutics.

Dr Sarabhai was given the ward for his contribution to cosmic ray physics, Dr Bhattacharyya for his work on terpenes and related natural products, musk compounds and analytical chemistry, Dr Bachhawat for research in biochemistry and Mr Suri in the field of diesel locomotive engineering.

Each award carries a cash of Rs 10,000.

Patriot
Feb. 11, 1965

SYMPOSIUM: A five-day international symposium on the impact of Mendelism on agriculture, biology and medicine will be held in Delhi from 15 February to commemorate the centenary of Mendel's discovery of the laws of heredity, which led to the birth of the science of genetics. Union Food Minister Subramaniam will inaugurate the symposium.

Statesman
Feb. 12, 1965

SYMPOSIUM ON MENDELISM

By A Staff Reporter

An international symposium on the "Impact of Mendelism on agriculture, biology and medicine" will begin in New Delhi on February 15. It will be opened by the Union Food Minister, Mr C. Subramaniam.

The symposium, which will be attended by about 400 delegates, is being organized by the Indian Society of Genetics and Plant Breeding in collaboration with the Indian Council of Agricultural Research, the University Grants Commission, the Atomic Energy Commission, the International Union of Biological Sciences and the Rockefeller Foundation to celebrate the centenary of Mendel's discovery of the laws of heredity as well as the silver jubilee of the Society.

Patriot
Feb. 14. 1965

Genetics symposium

An international symposium to be held in New Delhi from 15 to 20 February will discuss various aspects of the application of modern genetical knowledge to accelerate the pace of agricultural production in India. The symposium has been organized by the Indian Society of Genetics and Plant Breeding.

Times of India
Feb. 13, 1965

Rice For Diabetic Patients

NEW VARIETY EVOLVED

"The Times of India" News Service

NEW DELHI, February 12: A variety of rice suitable for consumption by diabetic patients has been evolved at the Cuttack Rice Research Institute.

Because of its protein content almost double of what ordinary varieties of rice contain, it can be consumed by such diabetic patients who are averse to changing their food habits.

Dr. M. S. Swaminathan, Head of the Botany Division of the Indian Agricultural Research Institute, disclosed this to newsmen here today.

An international symposium on the "Impact of Mendelism on Agriculture, Biology and Medicine" is being held here from February 15. Dr. Swaminathan, Chairman of the Symposium Committee, said it was being organised by the Indian Society of Genetics and Plant Breeding with the assistance of the Indian Council of Agricultural Research, the Council of Scientific and Industrial Research, the University Grants Commission, the Department of Atomic Energy, the International Union of Biological Sciences and the Rockefeller Foundation to celebrate the centenary of Mendel's discovery of the laws of heredity as well as the silver jubilee of the Society. About 400 delegates, including some eminent foreign scientists, are participating.

APPLICATION OF GENETICS

The symposium will discuss the latest position on the application of genetics to crop improvement and will pay particular attention to the question of stepping up the yields of important crop plants in this country.

Topics relating to human and animal genetics, biochemical and molecular genetics and the teaching of genetics in schools and colleges are also to be discussed.

A science ballet is to be presented on February 20 on "the Secret of Life", showing how the first living molecules originated and how the genes within the living cells beget proteins.

Dr. Swaminathan said ancient India knew about transmission of character through heredity and that was why there was close inquiry into family traditions before marriages were fixed up.

Nobody, however, knew how the characters were passed on.

It was Mendel who, a century ago, first began a study with peas. The study of the law of genetics was pursued seriously only in 1900. It had now developed very much in its application to plants, particularly in the U.S.A. and Europe. It was now possible to raise 15,000 lb of rice per acre.

In India also, there had been development of hybrids in maize, jowar and bajra. Rust-resistant varieties of wheat had been evolved, which had resulted in an additional annual income of Rs. 40 crores per annum to the cultivator.

Certain new varieties of rice had also been evolved. In Madras, it had been possible to produce 5,000 lb of ADT rice per acre.

The law of genetics could be applied also in cattle breeding, as well as in medicine for human beings. It should be possible eventually to prevent ageing by making certain alterations in the number or structure of chromosomes.

The Economic Times
Feb., 13, 1965

Farmers Benefit By Research In Agriculture

From Our New Delhi Bureau

NEW DELHI, February 12.

The application of science and scientific research in agriculture during the last 13 years of planning had yielded substantial results. While the expenditure on agricultural research in evolving improved seeds in the various research institutes in the country had been of the order of Rs. 11 lakhs, additions to the incomes of farmers as a result of the use of these improved seeds had been estimated at Rs. 40 crores during this period.

Speaking to newsmen here today Dr. M. S. Swaminathan of the Indian Agricultural Research Institute said that it was not true that all expenditure on research had gone waste. He said it was difficult to assess the amount of benefits accrued through the use of improved seeds during the period. A rough estimate was made which indicated more than proportionate increase in benefits compared with the amount spent on research.

The Indian Society of Genetics and Plant breeding is organising an international symposium on the "impact of Mendelism on agriculture, biology and medicine" to commemorate the centinary of Mendel's discovery of the laws of heredity.

The symposium starting here on Monday is being organised jointly by the Indian Council of Agricultural Research, the Council of Scientific and Industrial Research, the Department of Atomic Research, the University Grants Commission, the International Union of Biological Sciences and the Rockfeller foundation.

The symposium will discuss the various aspects of the application of genetics to crop improvement with particular reference to stepping up yields of important crop plants.

Patriot.
Feb. 16, 1965.

MEDALS AWARDED TO NINE SCIENTISTS

NINE scientists, including three from Japan, were awarded gold medals by the Indian Society of Genetics and Plant Breeding for contributing "papers of high quality" to the Indian Journal of Genetics, reports PTI.

The awards, given in New Delhi on Monday by the Society's President, Dr B. P. Pal, were given for three subjects—plant breeding, genetics, and cytogenetics and cytology.

He said that the decision to award medals was taken at the Society's meeting last year and that it would be a regular feature.

The three Japanese scientists who got medals for their articles on genetics were Dr H. Morishima, Dr K. Hinata and Dr H. Oka.

For articles on plant breeding, the awards went to Dr A. B. Joshi, Dr S. Ramanujam and Dr P. N. C. Pillay.

Dr M. S. Swaminathan, Dr V. L. Chopra and Dr Bhaskaran were awarded medals for their articles on sytogenetics and cytology.

Mr C. Subramaniam stated that many of the present-day problems have arisen from an exaggeration of superficial differences and supression of knowledge about the basic biological unity of all living organisms.

In a speech read out by Deputy Agriculture Minister Shah Nawaz Khan at an international symposium on the "impact of mendelism on agriculture, biology and medicine in New Delhi Mr Subramaniam said genetics had shattered the false philosophy of superior races like the one advocated by Hitler and strengthened the hands of those who were striving to introduce sanity and rationality in man's attitude towards man.

Hindustan Times
Feb. 16, 1965.

Genetics role in unifying living world stressed

New Delhi. Feb. 15 (PTI)—Mr C. Subramaniam has stated that many of the present-day problems have arisen from an exaggeration of superficial differences and suppression of knowledge concerning the basic biological unity of all living organisms.

In a speech prepared for an international symposium on the "Impact of Mendelism on Agriculture, Biology and Medicine" here, Mr Subramaniam said genetics had shattered the false philosophy of superior races like the one advocated by Hitler and strengthened the hands of those who were striving to introduce sanity and rationality in man's attitude towards man.

Mr Subramaniam's address was read by Mr Shah Nawaz Khan, Deputy Minister for Agriculture.

Mr Subramaniam said genetics had helped clarify the basis of the rich diversity in physical and intellectual make-ups and emphasized the need for creating equality of opportunities to enable everyone to give his best to the community.

It was, therefore, not surprising to find leading geneticists lending their voice to the fight against laws which discriminated and attempted to pigeon-hole human beings into tightly-demarcated groups.

Clear insight

Mr Subramaniam said genetics had provided a clear insight into the underlying unity of the living world by demonstrating that the laws of heredity were of equal validity in all organisms, whether plant or animal or man.

"This is a secret which our ancient ancestors realized and according to the famous physicist Schrodinger, the theory of non-duality—what we call Vedantic philosophy—propounded in India some 2,500 years ago, equating the personal self with the eternal self, represents the quintescences of the deepest insight into the mysteries of the universe," he said.

"When we assimilate in our minds this grandest of all thoughts, it will become easy to achieve the establishment of a society in which all people are emotionally and functionally integrated," he added.

Plant growths

He also referred to plants that grew under diverse conditions of climate and radiation levels providing enormous possibilities for studying adaptation mechanisms.

He said the Government proposed to launch upon co-ordinated all-India projects for plant breeding in all major agricultural crops and hoped that many of the perennial crops like forest and fruit trees, coconut and other palms and plantation crops would also be subjected to a vigorous programme of genetic improvement in the near future.

About 400 scientists, including 12 from foreign countries, are participating in the six-day symposium.

Nine awards

Nine scientists, including three from Japan, have been awarded gold medals by the Indian Society of Genetics and Plant Breeding for contributing "papers of high quality" to its journal, Indian Journal of Genetics.

The awards, given today by the society's president, Dr B. P. Pal, were given for three subjects—plant breeding; genetics; and cytogenetics and cytology.

Dr Pal said the decision to award the medals was taken at the society's meeting last year and it would be a regular feature.

The three Japanese recipients are Dr H. Morishima, Dr K. Hinata and Dr H Oka.

For articles on plant breeding, the award of medals went to Dr A. B. Joshi, Dr S. Ramanujam and Dr P. N. C. Pillay.

Dr M. S. Swaminathan, Dr V. L. Chopra and Dr Bhaskaran were awarded medals for their articles on cytogenetics and cytology.

"Statesman"
Feb. 16, 1965

MENDELISM IN AGRICULTURE

WORLD SYMPOSIUM BEGINS IN DELHI

A six-day international symposium on the "Impact of Mendelism on agriculture, biology and medicine" was opened in Delhi on Monday by Mr Shah Nawaz Khan, Deputy Minister for Agriculture, who deputized for Mr C. Subramaniam, reports PTI.

Mr C. Subramaniam, said in his address, which was read by Mr Shah Nawaz Khan, the many of the present-day problems had arisen from an exaggeration of superficial differences and suppression of knowledge concerning the basic biological unity of all living organisms.

Mr Subramaniam said genetics had shattered the false philosophy of superior races like the one advocated by Hitler and strengthened the hands of those who were striving to introduce sanity and rationality in man's attitude towards man.

The symposium is being attended by about 400 scientists, including 12 from foreign countries.

Mr Subramaniam also referred to plants that grew under diverse conditions of climate and radiation levels providing enormous possibilities for studying adaptation mechanisms.

He said the Government proposed to launch co-ordinated all-India projects for plant breeding in all major agricultural crops and hoped that many of the perennial crops like forest and fruit trees, coconut and other palms and plantation crops would also be subjected to a vigorous programme of genetic improvement in the near future.

Times of India
Feb. 16, 1965

GOLD MEDALS FOR 9 SCIENTISTS

Nine scientists, including three from Japan, were awarded gold medals by the Indian Society of Genetics and Plant Breeding for contributing "papers of high quality" to the Society's journal, *Indian Journal of Genetics*.

The awards, given on Monday by the Society's President, Dr. B. P. Pal, were for three subjects—plant breeding, genetics and cytogenetics and cytology.

Dr. Pal said that the medals would be awarded every year.

The three Japanese scientists who received medals were Dr. H. Morishima, Dr. K. Hinata and Dr. H Oka.

For articles on plant breeding, the medals went to Dr. A. B. Joshi, Dr. S. Ramanujam and Dr. P. N. C. Pillay.

Dr. M. S. Swaminathan, Dr. V. L. Chopra and Dr. [illegible]karan were awarded medals for articles on cytogenetics and cytology.—PTI.

Symposium on genetics ends

By a Staff Correspondent

New Delhi, Feb. 20—The six-day international symposium on the impact of Mendel's theory of heredity on agriculture, biology and medicine at the Indian Agricultural Research Institute ended today.

In a talk on rice research, Dr Robert F. Chandler of the Philippines called for problem-oriented research programmes that were not too closely associated with present practices.

Dr M. S. Swaminathan, president of the Indian Society of Genetics and Plant Breeding, said that high yielding hybrids in maize, jowar and bajra had resulted from research work conducted in India in recent years. These had been obtained by the purposeful manipulation of genetic factors to obtain new strains of plants to suit particular needs.

Indian Express
Feb. 22, 1965

India's work in plant breeding praised

NEW DELHI, Feb 21 (PTI)—The need for greater international collaboration in the exploitation of plant and animal material was emphasised by delegates from Japan, Sweden and the USA, at the international symposium on the "impact of mendelism on agriculture, biology and medicine" which concluded here yesterday.

The six-day symposium was convened by the Indian Society of Genetics and Plant Breeding to commemorate the centenary of the Mendel's laws of heredity as well as the silver jubilee celebrations of the society. Over 400 delegates from 11 countries attended the symposium.

At the concluding session, Profs A. Gustafsson and A. Muntzing of Sweden, Prof H. Kihara of Japan and Prof H. F. Robinson of USA praised the work done in India in the fields of genetics and plant breeding and in mutation and biometrical research. A plea was made for the establishment of a world Germplasm Bank for exchange of plant and animal material.

Dept of genetics

In a panel discussion on "teaching of genetics" it was recommended that all Indian universities should set up departments of genetics as early as possible since without an understanding of genetics it would not be possible to revitalise Indian biology.

Dr M. S. Swaminathan, President of the Indian Society of Genetics and Plant Breeding, pleaded for the setting up of an institute for intensive research on standardisation of an efficient, reliable and cheap oral contraceptive.

He said though the results reported at the symposium left no doubt that India would be able to feed her increasing population in the next two decades, the standard of living would not improve unless some check on population growth was introduced immediately.

Dr Swaminathan said that Indian thinking on methods of population control was totally influenced by developments in the West.

Geneticists had to take a leading role in the attempts to curb population growth since advances in genetics which have had an impact on medicine were largely responsible for the fall in death rates. The country could be launched upon the road to prosperity by exploiting the technical know-how and the varieties of hybrids evolved by Indian geneticists, he added.

The Hindustan Times, Thursday, March 11, 1965 (3)

Mexican wheat ripening in seed village

By a Staff Correspondent

New Delhi, March 10—Whispering fields of ripening Mexican wheat greeted Mr Mr C. Subramaniam, Union Minister for Food and Agriclture, as he arrived at Jounti seed village this morning.

The Mexican wheat crop is part of the quality wheat seed multiplication project sponsored by the Indian Agricultural Research Institute in the Kanjhawala development block, 20 miles from the city.

Sixty acres of land has been sown with this dwarf variety, together with two new strains, NP 880 and 1393A, developed at the IARI. The project was undertaken in October, 1964, when it was realized that all the States were short of improved seeds.

The rabi crop from this seed multiplication project is expected to yield at least 40 mds of wheat per acre, twice the average yield from local strains of wheat sown in the region.

The seeds produced this year will be used to plant the entire 1,200 acres of the village for next year's rabi crop. The following year's seed requirements of the whole of Delhi State will be met from it.

Sixteen farmers have joined hands to form the "Forty-maund Club" which is conducting the seed multiplication scheme in the village.

Seed production will be developed as a specialized skill in the village by starting a seed co-operative for grading, cleaning and marketing quality seeds.

Inaugurating a seed testing training course at the IARI this morning, Mr Subramaniam stressed the need for extending seed testing facilities on a large scale to ensure higher yields.

THE STATESMAN, 11 MARCH 1965

A FREE HAND FOR FARM SCIENTISTS

Subramaniam Calls For Better Administration

BY A STAFF REPORTER

Inauguration of the fifth training course in seed testing at the Indian Agricultural Research Institute by Mr C. Subramaniam, Union Minister for Food and Agriculture, his visit to the institute's farms at the National Physical Laboratory and the experimental farms at Jounti village, 15 miles in the Kanjhawla Development Block, and a reception by the villagers were the highlights of a three-hour programme arranged by IARI on Wednesday.

Mr Subramaniam criticized the attitude of administrators who hindered the work of agricultural scientists and technicians. Scientists felt frustrated because of administrative obstacles, which were a severe blow to progress. He suggested administrative reorganization to give a free hand to agricultural scientists and technicians to enable them to carry the fruits of their research to the masses.

He said the Government had abandoned small experimental seed farms in favour of big ones with a view to making the best use of the meagre technical advice available. He hoped that large farms would be established soon.

Mr Subramaniam said that a "Seed Bill" had been passed by the Rajya Sabha. This would soon come before the Lok Sabha. When passed the Act would give legal assurance to the farmer that seed of good and standard quality would be provided to him. The Act was needed to penalize the guilty but what was more important was a human understanding and a realization that provision of good seed to the farmer would be a great factor in increasing production.

Mr Ray Johnson, Chief of the Agricultural Division, U.S.A.I.D., described the 15 trainees as "diamonds" selected from 450 million people. Training was not an end in itself but a means to increasing production. They were required to spend 50% of their time in the fields. The supply of good quality seed to the cultivator was more important than anything else in agriculture and the trainees have an important rôle.

Dr B. P. Pal, Director of IARI, said there was need for a renaissance in agriculture of which seed testing formed an important feature.

Another official of IARI said 11 seed testing laboratories had been opened and four were expected to be opened by June (one in each State). These had been equipped by the USA. He said there was a demand for 400 such laboratories one in each district, but this could not be met because of lack of equipment.

The model farms at Pusa were green with rabi crops, four to five feet high. A good variety of maize, jowar and bajra seed produced at the farms was on display.

At Jounti, the results of the seed multiplication experiment were heartening. Two varieties of Mexican wheat seed (Sonora 63 and 64) and the indigenous varieties—NPL 880 and hybrid 1393A —which were sown on experimental basis held hopes of a good yield.

Welcoming the Union Minister, Mr Chandgi Ram, Chairman of the Kanjhawala Block Samiti, said that the villagers did not get water for irrigation in summer, when they needed it most, but their fields were flooded in the rainy season, when water was least needed. He asked the Minister to open an agricultural university in the Block.

Mr Chandgi Ram urged the Minister to use his influence with the Delhi Administration in stopping the acquisition of agricultural land.

THE INDIAN EXPRESS, THURSDAY, MARCH 11, 1965

'Quality seeds can raise food output'

By Our Staff Reporter

NEW DELHI, March 10—Mr C. Subramaniam, Union Minister for Food and Agriculture, said here today that the country was on the threshold of a breakthrough in agriculture.

Inaugurating a six-week Seed Testing Programme at the Indian Agricultural Research Institute, Mr Subramaniam pointed out that the breakthrough would not come of its own accord but only by adopting modern methods to increase agricultural production.

Stressing the importance of good quality seed as a basic ingredient in increased food production, the Food Minister called for more such training programmes. He reminded the trainers not to lose sight of quality while going in for quantity.

After the function, the Minister and newsmen drove to Jounti village in Kanjhawala Block, about 25 miles away.

Output doubled

Mauji Ram an aged farmer, looked excited as he told this reporter: "We used to think there could be nothing new in agriculture. But the use of good seed has doubled production." Kehar Singh of Tatesar village nodded his head in agreement.

Mr Chandgi Ram, Chairman of the Kanjhawala Block, requested Mr Subramaniam to ensure that the land now being tilled by farmers was not acquired by the Delhi Administration by the end of the Fourth Plan.

He also suggested that since the land was fertile, an agriculture college should be opened.

"Times of India"
March 11, 1965

Self-Sufficiency In Wheat Seed For Capital Likely

By A Staff Reporter

The Capital may achieve self-sufficiency in wheat seed from 1966. Sixty acres of agricultural land in Jounti village, 18 miles from Delhi, has been earmarked for seed production.

The project has been sponsored by the Botony Division of the Indian Agricultural Research Institute. Ten of the 16 farmers of the village selected by the Division have achieved satisfactory results.

A spokesman of the Division said that about one-third of the farmers ignored the advice of the staff and students and therefore experienced difficulties. Rati Ram, one of the farmers, however, said that scarcity of water and inherent defects in the soil resulted in poor yield on his land.

The ten successful farmers are members of a 40-maund wheat club which was established recently. The farmers aim at a minimum of 40 maunds per acre as against the average yield of about 25 maunds in the village.

About 1,200 acres of land in the village is proposed to be covered with improved varieties of wheat by the next rabi season. A seed co-operative society for grading, cleaning and marketing of seeds will soon be set up in the village.

Sunday Standard
March 14, 1965

14/3/65

Let's put food research to practical use

by S. C. Anantharaman

"BASED purely on existing knowledge and research tried out in India, it is possible to step up yields of wheat, rice, jowar, bajra and barley in this country more than four times."

So said Mr C. Subramaniam, Union Food Minister, addressing the governing body of the Indian Council of Agricultural Research (ICAR) recently.

This is a most reassuring statement indeed. But, instead of a fourfold increase, even if a ten per cent rise in our present annual foodgrain production of about 80 million tonnes could be achieved, the country would be self-sufficient in food, as our annual average grain import is only about five million tonnes. (Imports of foodgrains in 1963 totalled 4.6 million tonnes, compared with 3'6 million tonnes in 1962).

Not only this. In spite of the potentialities of our "existing knowledge," we have been unable to double our production in a ten-year period. From 52.2 million tonnes in 1950-51, our annual production had risen only to 79.7 million tonnes by 1960-61.

Research

Presuming that the "existing knowledge" was not available ten years ago, even in the last six years our production of foodgrains has not shown any appreciable improvement.

In fact, it has declined—from the 1958-59 production of 77.1 million tonnes, it now stands at 79.4 million tonnes (provisional estimates), after touching a record of 81 million tonnes both in 1960-61 and 1961-62.

If these official figures are not incorrect and if Mr Subramaniam's statement quoted above is to be believed, what does it signify? Plainly this: although we are capable of good research work we just do not have the perseverance to make the fruits of research pay.

Of course, it is foolish to imagine that we could boost our food production merely through re-

if it is meant to improve agricultural research. But is the model any good? Twenty-two years after its formation and two reviewing committees' reports later, several flaws have been found in the working of the CSIR by a third reviewing committee, the Ramaswamy Mudaliar committee.

In the circumstances, the proposal may mean only waste of time, labour and money (money, because under a reconstituted ICAR many research units now under State Governments will have to be taken over).

In the present context of the food situation in the country instead of wasting time reorganising the ICAR (which could be done in due course), a more useful step would be put to use the "existing knowledge."

A complaint often heard is that our scientists live in an ivory tower and do not take into consideration the agricultural situation in India. Although this charge comes in handy for politicians in search of a scapegoat, the allegation is not by and large true. Research work is being carried on now with the ordinary farmer's needs very much in view.

Inter-cropping

Even if there is an ivory tower mentality among our scientists, it is not entirely of their own making. People at higher levels, where precise knowledge is invariably

food, let them at least be used as fertiliser which we need in abundance. If we do not have money to produce algae on a mass scale, there is no reason why natural deposits of algae could not be exploited.

One fact about Japanese agricultural research is worth noting. In spite of her advanced technical knowledge, she has not been able to double her rice production yet.

During 1952-62 production rose from 9,923,000 tonnes to only 13,009,000 tonnes. Even this figure of 1962 is not very much higher than the rice yield in 1955 which was 12,385,000 tonnes.

But Japan has noticeably switched to other sources for food: egg production has risen from 4,675 million to 14,529 million and the milk yield from 854,000 to 2,437,000 tonnes in the same ten-year period. Japan also depends much on sea-food.

Quality seeds

But in India a switch to unconventional sources of food will be a hard and long-drawn-out process because of her people's religious beliefs. Meanwhile, with a vast coastline like ours, much "ready-made food" goes untapped. Whatever sea-food is available is costly in the many interior towns owing to poor transport facilities.

Mr Subramaniam also announced at the ICAR governing body meeting that some industrialists had shown interest in taking up production of foundation seeds and that the desirability of allowing private seed production units might be considered by the Government.

Instead of "considering the desirability of allowing private seed production units," it would have been better if the Government had

DELIBERATE

minute walk-out in the Vidhan Sabha today as a protest against the "rude behaviour" and "blunt replies" by the Home Minister, Mr Hargovind Singh.

Rising on a point of order, Mr Ram Sunder Pandey, leader of the SSP group, quoted rulings that the statements by members, who were witnesses of an incident should be given more credence and weightage than the reports of officials.

The Home Minister said that he would do so in the House but not outside. This touched off an uproar and taking exception to the Home Minister's remarks, Mr Pandey announced the decision of his group to walk out of the House.

'Dragged out'

Mr Jharkhande Rai (Com) also joined the walk-out along with members of his group saying that he protested against the "fascist Police Minister of UP," who did not give any credence to the statements of members. Other groups also joined the walk-out.

THE STATESMAN, 17 MARCH 1965

HIGH-YIELD BAJRA EVOLVED BY I.A.R.I.

The Indian Council of Agricultural Research has released three new hybrids of bajra and forage crops which give a very high yield and are resistant to crop diseases and adverse weather, reports PTI.

The release has been made to coincide with the diamond jubilee celebrations of the Indian Agricultural Research Institute beginning on March 29.

Hybrid bajra number one gives 100% more grain and 30% more fodder than the best varieties at present available in the country. It has great adaptability and gives good yields all over the country, from Ludhiana to Coimbatore.

The Pusa Giant Napier grass is a hybird grass developed at the IARI by crossing elephant grass with bajra. It has proved capable of giving over 200,000 lb of green fodder a hectare in a year and is the most productive grass so far developed anywhere in the world. Under proper irrigation and manuring conditions this grass gives one cutting, at least, every three to four weeks. It has performed well in almost all the States and is now widespread.

The last of the three, known as Pusa Giant Berseem gives 20 to 30% more fodded than varieties being cultivated at present. It is also more resistant to cold and gives high yields even during the peak winter period when there is acute fodder shortage.

A rotation of Giant Napier and Giant Berseem has been developed which if adopted on a large scale, is expected to revolutionize fodder production in the country.

3.4. 1965

Prime Minister Lal Bahadur Shastri is pleased with this sheaf of corn shown to him when he went round the fields of the Indian Agricultural Research Institute after inaugurating the Field Day on Friday. (Report on page 4).

3/4/65 the Statesman India p. 3

Sustained Efforts To Raise Production

SHASTRI'S CALL TO FARMERS

By A Staff Reporter

The Prime Minister, Mr. Lal Bahadur Shastri, appealed to farmers on Friday to make sustained and determined efforts to increase agricultural production.

In view of the food shortage in the country, it was the duty of farmers to produce more. The Government would give them all possible help.

The Prime Minister was inaugurating the "field day" celebrations at the Indian Agricultural Research Institute, New Delhi.

A large number of farmers from adjoining areas visited the experimental farms of the institute where they saw a demonstration of improved methods of agriculture.

Mr. Shastri said that India was importing foodgrains at the rate of seven lakh tonnes per month. To spend huge sums on foodgrain imports was not creditable for a country like India.

He was sure that, if proper facilities and guidance were given to farmers, they would do their best to increase production. All village level and extension workers should help farmers in this task.

SUB-PLAN SUGGESTED

He had suggested to the Planning Commission that there should be a separate "sub-plan" for agriculture within the Fourth Plan. The suggestion had been made with a view to achieving complete co-ordination among various agencies responsible for the promotion of agriculture.

India was a country of small agricultural holdings and research institutes should bear this in mind while evolving new techniques, he said.

Dr. Swaminathan, Head of the Department of Botany of IARI, took the Prime Minister round the experimental farms where high yields had been obtained by using better varieties of seeds.

Mr. Shastri evinced great interest in the high-yielding, rust-resistant varieties of wheat and hybrid varieties of maize and bajra.

A farmer shows Mr Shastri samples of the rabi crop at the Indian Agriculture Research Institute, New Delhi, on Friday when the Prime Minister inaugurated Field Day. On Mr Shastri's right is Mr Shah Nawaz Khan, Deputy Minister for Agriculture.

Shastri's Plea For Better Farm Implements

BY A STAFF REPORTER

Mr Lal Ba… …ri on Friday suggested co-ordinating age… …and village levels to increase agricultural…

The Prim… …board plough cultivator with seed sprout attachment and a properly designed bullock harness would be used by farmers during the fourth Plan. A set of this farm implement will cost a farmer Rs 250.

Farmers of Knanjhawala demonstration plots of the institute took part in the Field Day organized as part of the Diamond Jubilee celebrations of the IARI.

THE HINDU

SUNDAY, APRIL 4, 1965.

The Scientist and the Farmer

AT Pusa, near Delhi, the Indian Council of Agricultural Research Institute has been celebrating its diamond jubilee and looking back on its achievements in producing better strains of rice, wheat, sugar, maize and other seeds. Research is a slow process but if it is successful, it yields results of very high value to the nation and to the world. Speaking at the celebrations, the Food Minister has claimed that we now have the scientific know-how necessary for achieving an

3/4/65 The Times of India Patna

The Prime Minister, Mr. Lal Bahadur Shastri, examining an im proved variety of wheat at the Indian Agricultural Research Ins titute farm in New Delhi on Fri day.—TOI photograph. (Report on page 3)

नवभारत टाइम्स

नयी दिल्ली, २० मार्च १९६५

दिल्ली देहातके आंचलसे

जोन्ती ग्राम द्वारा उत्पादन क्षेत्र में क्रान्तिकारी कदम

भगवान् जितना देगा, उतना ही खेतसे मिलेगा" की बजाय खेतमें जितनी कड़ी मेहनत, उन्नत बीज, अच्छा रासायनिक खाद और सिंचाईका प्रयोग होगा, उतना ही उत्पादन अधिक होगा। इस क्रांतिकारी भावनाकी जीती-जागती तसवीर दिल्लीसे १८ मीलकी दूरीपर कंझावाला विकास खण्डके ग्राम जोन्तीमें देखी जा सकती है।

भारतीय कृषि अनुसन्धान संस्था पूसाके वनस्पति विज्ञान विभाग और कंझावाला विकास खण्ड अधिकारीके सहयोगसे यहांके किसानोंने अपने पुराने विश्वासोंको त्यागकर आधुनिक तरीकेसे खेतीमें भारी सफलता प्राप्त की है। वैज्ञानिक ढंगसे बीज डालना, खाद देना, सिंचाई आदि करनेमें नये तरीके अपनानेसे यहांके किसानोंकी वर्तमान गेहूंकी फसल बहुत ही अच्छी और अन्य ग्रामोंकी तुलनामें उत्पादनके लिहाजसे काफी आगे है।

उन्नत बीज

यहांके किसानोंके अनुसार रबीकी फसलकी सफलताका कारण अच्छी प्रकारका उन्नत बीज और रासायनिक खाद बताया जाता है। इस ग्रामके लगभग एक दर्जन किसानोंको कृषि अनुसन्धान संस्था पूसाकी ओरसे गेहूं का उन्नत प्रकारका बीज दिया गया था। इसके अलावा रासायनिक खाद और सिंचाईके साधनोंका मिलना भी लाभदायक सिद्ध हुआ।

पूसा संस्थाकी ओरसे इस ग्राममें जो तुलनात्मक ढंगसे उत्पादन बढ़ानेका कार्यक्रम शुरू किया गया है, उसका ग्रामीणोंपर बहुत ही अनुकूल प्रभाव दिखाई देता है। पूसा संस्थाके एक कृषि विशेषज्ञ श्री अमीरसिंह और विद्यार्थीगण यहांका दौरा करते रहते हैं तथा उत्पादन बढ़ानेके मार्गमें जो अड़चनें और शंकाएं पैदा होती हैं, उन्हें तत्परतासे दूर करते हैं। इसके अलावा विकास अधिकारी और उनके कार्यकर्ता भी ग्रामीणोंकी पूरी तत्परता से मदद कर रहे हैं। केन्द्रीय कृषि और खाद्यमंत्री श्री सुब्रह्मण्यम भी यहां तीन बार दौरा कर चुके हैं। जिसके कारण यहांके किसानोंकी हिम्मत बढ़ी है।

दूर-दूरके ग्रामीण

वास्तवमें जोन्ती ग्राम आसपासके सब किसानोंमें खेतीके विषयमें नयी जानकारी और चेतना एवं जागृति पैदा करनेमें आज अग्रणी बना है।

यहांपर गेहूंके पांच प्रकारके बीज उगाये गये हैं। इनमें तीन प्रकारके गेहूंकी पूसामें खोज की गयी है तथा दो प्रकारका बीज मेक्सिकोसे मंगवाकर बोया गया है।

यहांपर आकर किसान स्वयं देख सकते हैं कि अच्छे बीज, खाद, सिंचाई और मेहनतका कितना ज्यादा असर होता है। जिस खेतमें ये सारे साधन प्रयोगमें लाये गये हैं वहां तो गेहूंका पांच फुट लम्बा पौदा है और बाल पांचसे छह इंच लम्बी है तथा जहांपर ये साधन उपलब्ध नहीं हैं, वहांपर ढाई फुट लम्बा पौदा और दो इंच लम्बी बालें ही बढ़ पायी हैं।

—रा. सीसोदिया

THE SUNDAY STATESMAN, MARCH 28, 1965

I.A.R.I. PLANT BREEDING PROGRAMME

From Our Special Representative

NEW DELHI, Saturday.—The Indian Agricultural Research Institute which will celebrate its diamond jubilee next week plans to make a major contribution to the large seed improvement programme to be undertaken during the fourth Plan to step up food production

The crucial importance of advanced academic work and research in this field to be able to keep pace with the country's increasing food requirements was explained here today by Dr B. P. Pal, Director of the Institute.

In recent yea s, Dr Pal himself has played a prominent rôle in this sphere as head of a team of IARI scientists who evolved the now famous "New Pusa" variety of wheat which is resistant to "three rusts" an achievement that was hailed by agricultural scientists the world over.

Explaining what he described as the "genetic architecture of wheat", Dr Pal said plant breeding was no longer "a hit-or-miss process" but had been reduced to a planned programme Another colleague of his, Dr M. S. Swaminathan, was now conducting research in the genetic field which held bright prospects for controlled production of the right type of wheat seed.

PEST CONTROL

Next only to the breeding of new varieties was their protection from pests which again required constant research into the habits and characteristics of the endless varieties of pests that were constantly developing new resistance to old remedies Towards this end the Institute would undertake a big programme in nematology, he said.

These and many other proposed programmes would obviously involve expansion in buildings and equipment. A machine Dr Pal was anxious to acquire as quickly as possible was an artificial plant climate house called the phyto-

Dr Pal was hopeful that with the diamond jubilee the Institute would begin a new and more productive chapter in its life.

Thursday, March 7, 1963

P. 7.

Wheat Yield Can Go up to 10,000 lbs. per acre

by Dr M. S. Swaminathan

MOST people now a days are conscious of the marvels of discovery in such fields as space research, atomic energy and radio astronomy.

Few, however, are aware of the recent explosion in biological knowledge, particularly in the understanding and manipulation of genes which are the determinants of hereditary characteristics.

In a book published in 1904, the famous biologist, Jaques Loeb, had set experimental synthesis of life and the artificial transmutation of species as the twin goals of 20th Century biology. I wonder how many know that these goals have been achieved in their basic essentials and further, that Indians have contributed much to this progress.

Genetic research, leading to the elucidation of the biochemical constitution and the molecular configuration of the hereditary code script of the cell is largely responsible for this progress. It is only 65 years since the laws of genetics propounded by Gregor Mendel in 1865 were rediscovered.

As an index of the rapid progress made in the extent of sophistication and control which can be exercised in the experimental manipulation of genes, I wish in this article to cite the story of the wheat breeding work done at the Indian Agricultural Research Institute, which is celebrating its Diamond Jubilee this week.

When the wheat research work was started at the IARI in 1906, straight selection from the varieties grown by the farmers could result in a strain capable of yielding 10 to 20 per cent more than the parent strain.

Pusa Varieties

N.P. 4, the earliest of the Pusa wheats, is an example of the effectiveness of such selection. Soon afterwards, purposeful crossing work was done and varieties owing their genes to different parents were released.

Another line of breeding adopted in the earlier days was screening populations for spontaneously occurring mutations (i.e., sudden heritable changes). The variety N.P. 111 was evolved in this way. It was a mutant of the variety N.P. 4, and differed from the parent in having awns (bristles) on the flowers. Such varieties could give yields of the order 1,500-2,000 lbs per acre under efficient agriculture.

During the period 1910 to 1930, the understanding of the genetic mechanisms controlling the diversification of plant and animal species both within a species and above the level of a species, rapidly grew. As result of the concept that the maximum amount of variability in a population occurs at the centre where the species first originated, was evolved by the famous Russian Geneticist, Vavilov.

This provided the background for many plant collecting expeditions in search of new genes which combed the world during 1925-40. From the extensive germplasm assembled in this way, the desirable genes could be assembled in one variety through appropriate crosses.

Work of this kind was initiated in wheat at the IARI in 1934 by Dr B. P. Pal and the result was the famous rust resistant Pusa wheats of the N.P. 700 and N.P. 800 series. Two striking characteristics of these wheats are, firstly, that they have several genes conferring resistance to the rust and loose smut diseases and secondly, that they have a wide adaptability, a property of great importance from the point of view of simplifying seed multiplication and distribution problems.

Both these attributes are due to genes having been drawn from diverse parental material, introduced from all parts of the world. The rust resistant varieties give about 15 to 20 per cent more yield in comparison to the susceptible varieties in normal years. They are, however, the only ones worth harvesting in years characterized by severe rust epidemics.

The Indian Agricultural Research Institute, which has contributed considerably to improve Indian agriculture, is celebrating its diamond jubilee this week. In this article the head of the Institute describes how wheat yields can be increased by selection, cross-breeding and introducing hybrid vigour.

In Bihar, for example, no wheat crop could be harvested in 1954 except in fields sown with varieties like N.P. 798 having a high degree of rust resistance. Under conditions of intensive agriculture, with adequate irrigation and good manuring particularly with fertilizers, the micro-climate surrounding the plant changes in a direction favourable for the growth of both the plant and the pathogen.

It is essential that rust resistant varieties are grown, if the farmers are to get the expected returns from their investment in water and fertilizer. In the manurial trials conducted with the rust resistant Pusa wheats it has been found that the varieties which give only 10 per cent more yield than the local varieties when no fertilizer is applied, yield as much as 100 per cent more, when 30-40 lbs nitrogen per acre are supplied. With these rust resistant varieties and with adequate water and nitrogen, yields of the order of 4,000 pounds per acre can be obtained.

Japanese Strain

The next jump in increasing yield had to await the discovery and utilization of genes which can give to the plant a morphological frame capable of making it stand erect even when overloaded with grains in its heads. Such genes giving the plant a dwarf and non-lodging habit were discovered in wheat about 12 years ago in Japan.

These have now been transferred into commercial varieties in the United States and Mexico. A variety of wheat named Gaines ,popularly known as the "Shorty") is revolutionizing wheat production in the United States. Varieties like Sonora 63 and Sonora 64 developed in Mexico, under a joint programme sponsored by the Rockefeller Foundation and the Mexican Ministry of Agriculture, have helped in increasing the average yield of wheat in that country from about 800 pounds per acre in 1950 to nearly 2,000 pounds per acre in 1964.

These dwarf wheats were introduced in India by the Indian Agricultural Research Institute in 1962 and yields of 5,000 to 6,000 pounds per acre were obtained during 1964. This year the yields are expected to be higher because of the favourable season.

One may wonder if 5,000 to 6,000 pounds per acre represents the upper limit to the wheat yields attainable in our country. The answer is no. There are three important lines of progress which are already visible for increasing the yield further.

Firstly, scope exists for altering the morphology of the plant in such a way that it becomes more efficient in its conversion of solar energy into chemical energy by the well-known process of photosynthesis. This process is now a very inefficient one but one may be able to increase the efficiency by 2 to 3 times if the leaves can be made to function for a longer time and also avoid shading each other. Stiff and erect leaves which are so arranged that they do not cast their shadow upon each other would be ideal for this purpose.

Hybrid Vigour

Already such varieties have been evolved in rice and in wheat also they are under development.

The second source for improving yield would be the exploitation of hybrid vigour. It is now common knowledge that the use of hybrid vigour has resulted in great spurts in the yield of cross-pollinated plants like maize, jowar and bajra. Wheat, on the other hand,

Continued in col. 8

How to increase wheat yields

Continued from col. 5

is a self-pollinated plant and the production of hybrid seeds would normally be a very tedious and expensive process since every cross will give only one seed.

Some years ago, a gene which in a particular cytoplasmic background causes the abortion of pollen was discovered in Japan. This is now being exploited in the United States for the development of hybrid wheat. When this experiment succeeds—and there are indications that this day is not far off, a further big jump can be seen in wheat yields.

This is not all. Recent work done at the Indian Agricultural Research Institute using radiations has led to the development of branched mutants in a wheat variety. This mutant is now being improved for its other properties and one can hope that soon we may be able to increase substantially the number of grains per head of wheat by making it a branched one like that of jowar or rice.

Thus, new horizons are opening up with regard to the yields that are attainable in wheat. The target of yield in wheat which I have set for myself during the next 10 years is 10,000 lbs per acre.

The developments described here are not peculiar to wheat. All cultivated plants are the gifts of hundreds of generations of patient agriculturists who did their work in complete unawareness of the biological and chemical nature of the material they handled.

We have today the advantage of knowing that living nature is endlessly flexible, and of being able to see deep into its workings. Above all, we have the research tools by which we can remould the existing material in a manner most suited to our needs.

Hindustan Time
March 29, 1965

Genetics Society awards for nine scientists

NEW DELHI, Feb. 15 (PTI)—Nine scientists, including three from Japan, were today awarded gold medals by the Indian Society of Genetics and Plant Breeding for contributing "papers of high quality" to the society's journal, Indian Journal of Genetics.

The awards, given by the Society's President, Dr. B. P. Pal, were given for three subjects—plant breeding; genetics; and cytogenetics and cytology.

Dr. Pal said that the decision to award medals was taken at the Society's meeting last year and it would be a regular feature.

The three Japanese scientists who got medals for their articles on genetics were Dr. H. Morishima, Dr. K. Hinata and Dr. H. Oka.

For articles on plant breeding, the award of medals went to Dr. A. B. Joshi, Dr. S. Ramanujam and Dr. P. N. C. Pillay.

Dr. M. S. Swaminathan, Dr. V. L. Chopra and Dr. Bhaskaran were awarded medals for their articles on cytogenetics and cytology.

Diamond Jubilee of Pusa Institute

The FPJ News Service

NEW DELHI, March 7: The Indian Agricultural Research Institute, popularly known as the Pusa Institute, will celebrate its diamond jubilee from March 29 to April 3.

Established originally at Pusa (Bihar) in 1905, the Institute in the past 60 years endeavoured incessantly to reorient Indian farming on a progressive scientific basis. The highlights of the diamond jubilee celebrations will be a two-day symposium on "science and agriculture", a science ballet on the "origin of life" and a 'field day' which will be preceded by the annual convocation address on March 30.

Beaten track

IN the rough and tumble of the political merry-go-round in the Capital, few seem to have much time or the mood for things cultural. Perhaps it is thus that a creative ballet went unnoticed.

The criticism by the Western of Indian arts is that they are static and that we are content to follow patterns set by our forbears ages ago. To a large extent this criticism is well merited. Even the most innocuous suggestion from a critic who hints at the need for innovations brings forth angry letters from experts who would not have our musicians move from the path laid down for them by the Acharyas.

One may suppose that the same yardstick would hold good for Bharatanatyam, but Meena Swaminathan does not think so. The wife of the head of the Botany Division of the Indian Agricultural Research Institute (and daughter of the Finance Secretary, Mr Bhoothalingam), she is an accomplished Bharatanatyam dancer. She produced "The Ballet of Life" in which she sought to put the life-giving organisms as the main actors. The ballet was a mixture of the new and the old and it aimed at educating the lay people about what life is. Unfortunately it did not attract much notice in the Capital but the producers had it filmed to be shown in Europe.

The Delhi audiences will have one more opportunity to see the ballet on March 30, when it will be staged as part of the IARI diamond jubilee celebrations.

Wheat with branched head produced by irradiation at IARI.

IARI leads in wheat breeding

By a Staff Correspondent

New Delhi, March 28—Sixty years of outstanding work in plant breeding and improvement of field crops will be commemorated by the Indian Agricultural Research Institute with a week-long programme of symposia and lectures beginning from Monday.

The Institute has achieved significant understanding of the genetic architecture of wheat and earned an international reputation in wheat breeding by developing NP 809 which is resistant to three kinds of rust.

Hybrid maize, millet and Napier grass (for fodder) are among the recent products of painstaking research by scientists at the IARI. The Institute combines fundamental and applied research with teaching and extension work in the fields of surrounding villages.

New seeds are sent to State departments of agriculture who multiply them and distribute them to farmers. All-India co-ordinated trials of new varieties of seeds are bringing in valuable data regarding the agro-economic climate best suited for the new strains.

Future plans of expansion of research activities at the Institute envisage the establishment of new departments of plant genetics, nematology, plant physiology, and the establishment of a national repository of important plant germ plasm material for breeding work.

See also page 7

Twelve scientists were given Shanti Swarup Bhatnagar Memorial awards in New Delhi on Thursday. Among them were (left to right) Dr. M. G. K. Menon, Senior Professor and Deputy Director (Physics) of the Tata Institute of Fundamental Research, Bombay; Dr. T. R. Govindachari, Director of the CIBA Research Centre, Bombay; Dr. T. S. Sadasivan, Director of the University Botany Laboratory, Madras; Mr. H. N. Sethna of the Atomic Energy Establishment, Bombay; Dr. (Mrs.) Asima Chatterjee, Khaira Professor of Chemistry, Calcutta University; Dr. M. S. Swaminathan, Head of the Division of Botany, Indian Agricultural Research Institute, New Delhi; Dr. R. B. Arora, Professor of Pharmacology, All India Institute of Medical Sciences, New Delhi; Dr. Vikram A. Sarabhai, Physical Research Laboratory, Ahmedabad; Dr. S. C. Bhattacharyya, Scientist, National Chemical Laboratory, Poona, and Dr. B. K. Bachhawat, Professor of Biochemistry, Christian Medical College and Hospital, Vellore.—TOI photograph.

THE BLOCKS BETWEEN LAB AND FARM

BY A STAFF REPORTER

Dr Zakir Husain said in New Delhi on Monday that useful research and activities "of our agriculture departments have failed to make due impact on agricultural production in the country and to ameliorate the conditions of our farmers."

Opening the diamond jubilee celebrations of the Indian Institute of Agricultural Research, the Vice-President pointed out that the application of agricultural knowledge had lagged far behind its acquisition during the recent years. The country had come to realize that the path of agricultural progress was beset with many intricate problems of a technological, social and economic character. "We have also come to learn the serious inadequacy of our preparation to solve these problems, which impede the process of agricultural development," he said.

Dr Zakir Husain then analysed the reason for the not-so-happy situation in the sphere of agriculture and said that in the past agricultural research, education and extension work had not been integrated, properly co-ordinated and geared to the solution of the practical problems of the farmers. The edifice of the agricultural development programme must rest upon the three pillars of research, education and extension, he pointed out.

Regardless of the excellence of agricultural research, it would not have the desired impact on food production unless the results were put into practice by the farmers. "The research scientist, the extension worker and the farmer must form an integrated system," Dr Zakir Husain said.

Another point stressed by the Vice-President was that there should be an increase in fertilizer production. The present-day improved varieties of rice and wheat—the principal food crops—were capable of giving much more yield if fertilized "even to a moderate extent". It was sad that fertilizer consumption was still at a very low level; the fertilizer production in the country was barely half of the present-day requirements, he added.

Dr Husain called upon agricultural scientists to expand their activities so as to solve not only the problems on hand at present, but to forestall those which might arise in future and be ready to face them. "Problem-oriented research for the solution of practical problems of production should, therefore, be the order of the day and must receive priority," he said.

The Vice-President praised the achievements of the IARI in the field of agricultural research and said "today the Institute has added new dimensions to its reputation and it has rightly been acclaimed, both at home and abroad, as being one of the best centres of fundamental as well as applied research".

Mr C. Subramaniam, Union Food Minister, who also spoke on the occasion, said that agriculture "from stagnation to rapid progress".

At the time of the golden jubilee the Institute had only six divisions; it now had 12 in addition to the headquarters of the All-India Soil and Land Use Survey. A full division for research and post-graduate training of agricultural extension had also been set up at the Institute. Dr Pal expressed his gratitude for the co-operation given by international agencies like the Rockefeller Foundation, the Ford Foundation and the U.S.A.I.D.

The director said that more than 500 people had received M.Sc. and Ph.D. degrees of the Institute and about 400 students were on its rolls. "It is our hope that many of the future leaders in agriculture research, teaching and extension will develop out of them", he said.

The diamond jubilee celebrations of the Institute will last a week. The convocation of the Institute will be held on Tuesday; later, symposiums and seminars will be organized. The Prime Minister will address the students and the staff of IARI on Friday.

Hindustan Times
March 31, 1965

Chagla calls for drive against grain wastage

By a Staff Correspondent

New Delhi, March 30—Mr M. C. Chagla, Union Education Minister, today called for the promotion of a new "psychology of agriculture" that would induce a change of attitude among farmers in readily adopting new strains of grain evolved by research and the use of fertilizers in getting the best yield out of them.

Speaking at the convocation of the Indian Agricultural Research Institute here, Mr Chagla drew a parallel between the relation of food production to increasing population and waves from the sea rolling up and washing away the writing on beach sand.

It was not enough, he said, in these days of scarcity to produce between 80 to 90 million tons of food grains and allow a substantial amount of it to be wasted due to bad storage and destructive elements like birds in the fields and rats in godowns. He called for a national campaign against such preventable forms of wastage and asserted it was not good for either national self-respect or the economy to be dependent on imported food grains.

He commended the credit system of evaluating students' work as was done in the IARI, as a fairer estimate of scholastic attainments rather than the single final examination method for assessing a student's work at the Institute.

The dignity of the convocation today was marred by about a dozen commercial photographers who swarmed on to the dais, to take pictures of the students receiving their degrees, and created a scene when asked to get down from there.

Deccan Herald, Bangalore
April, 1, 1965

Link between lab. & farmer

NEW DELHI, Mar. 31. — A national agricultural research and development programme will be launched during the forthcoming kharif season to carry the results of research to the farmer, Food Minister Subramaniam announced here today.

Inaugurating the symposium on "science and agriculture" at the Indian Agricultural Research Institute, he said that an important feature would be "to stud the country with excellent demonstration plots" showing the yields that could be easily obtained in all major crops provided the available scientific know-how was put to use.

These demonstrations would be laid out in farmers' fields by staff and students of all agricultural institutions and colleges.

He said the ideas that would be generated at the symposium should be of great value in implementing the proposed programme.

The symposium has been organised as part of the week-long diamond jubilee celebrations of the IARI.

Referring to some of the important researches carried out at the institute, Mr. Subramaniam said they were not being properly applied.

Seed supply

Although improved varieties of wheat had been released in 1914 the area covered by these varieties was still small. An important reason for this situation was the absence of a proper seed multiplication and distribution machinery.

He said that unless scientists could demonstrate what they advocated, their advice would not be heeded by farmers.

Mr. Subramaniam announced that the Government had accepted the scheme for re-organisation of the IARI and had appointed Dr. B. P. Paul as the first Director-General of the re-organised set-up.—UNI.

Times of India April 1, 65

Mr M. C. Chagla, Union Education Minister, being introduced to the members of the staff of the Indian Agricultural Research Institute, New Delhi, by Dr B. P. Pal, Director of IARI, on his arrival to deliver the convocation address of the Institute on Tuesday.—Statesman.

Farm Scientists Must Go To The Fields

—CHAGLA

BY A STAFF REPORTER

Mr M. C. Chagla, Union Education Minister, on Tuesday called upon students of agriculture to induce farmers to adopt modern methods of farming.

The Minister, who was delivering the convocation address of the Indian Agricultural Research Institute in New Delhi, said the social attitude of farmers could not be changed unless efforts were made to translate research into action. It was futile to study agriculture and then seek "white-collared jobs" in cities, he said.

It was imperative to achieve self-sufficiency in food; India's dependence on other countries for food was not good for her "self-respect". For that students of agriculture must try to understand the psychology of the farmer and work with him so that he could see the light of modern technique. That was the only way to increase agricultural output. The target set in the fourth Plan, which gave priority to agriculture, to increase food production by 30% would be achieved largely because of the contribution of agricultural institutes and their students, Mr Chagla said.

He called for a national campaign to destroy pests 50% of the total agricultural produce in the country is destroyed by pests. The task for improving the quality and increasing the quantity of food production was meaningless so long as half of it was wasted in storage. Mr Chagla asked agricultural scientists to improve the existing methods of preservation. "If only we can preserve well the present agricultural produce, we will have double of its quantity without any effort," he said.

GROW MORE FOOD

A problem which rendered the "grow more food" campaign fruitless was the population explosion, the Minister pointed out. In fact, a constant increase in population was "wiping off" the results of those steps. The IARI should study the problem, he said.

Mr Chagla said that something was "radically wrong" with the present-day examination system which determined a student's ability in one single test. He praised the system followed by the IARI to determine students' ability by taking into account the term-to-term assessment of students. In this context, he suggested that the institute should introduce refresher courses to enable old students and field workers to acquaint themselves with the latest advances of agricultural science. The IARI should also examine the possibility of incorporating a course in social sciences in its curriculum for "science could not be divorced from the humanities," he added.

One hundred and sixty-six candidates received degrees in different branches of agricultural science. Out of them 32 received Ph.Ds.

The convocation was held on the second day of the Diamond Jubilee Week being celebrated by

AGRICULTURAL RESEARCH

Demonstration Plot Planned

By A Staff Reporter

Mr. C. Subramaniam, Union Minister for Food and Agriculture, announced in New Delhi on Wednesday that a "national agricultural research and development year programme" should be initiated during the kharif season this year to enable agricultural scientists to demonstrate their discoveries.

Demonstration plots would be set up all over the country to show the high yields that could be obtained in all major crops by the application of scientific knowhow.

Inaugurating a two-day symposium on science and agriculture at the Indian Agricultural Research Institute, Mr. Subramaniam said that unless scientists demonstrated the new techniques, their advice might not be accepted by farmers.

Although the country now had enough scientific knowhow for achieving an agricultural revolution, what was discovered in the laboratory was not taken to the farmer. Efficient integration of research, education and extension work was essential to make a substantial impact on the agricultural front.

THE LARGE GAP

Failure to establish a proper seed multiplication and distribution machinery for the improved varieties of wheat released by plant breeders as early as 1914, failure to exploit the advantages of crop rotation which could provide a net profit of Rs. 1,000 for a farmer on a three-acre land and to utilise organic wastes as manure were some examples which indicated the gap between acquisition of knowledge and its application.

Although the country had been dependent on agriculture for its livelihood, a parsimonious outlook towards supporting research efforts in the field of agriculture had by and large continued over the decades. As a result, agricultural research institutions had suffered from lack of high calibre scientists, equipment and facilities.

Dr. Swaminathan, Head of the Department of Botany of IARI, described how present-day advance in plant breeding was based on the genetical discoveries of Mendel. He pointed out that radio isotopes could be extremely useful in the field of plant breeding and experiments with them had been successfully conducted at the institute.

Dr. O. P. Gautam said that the quantity of water available would hardly suffice for one-third of the present area if intensive cultivation was taken up. He issued a warning against excessive use of water which had led to waterlogging and salinity in the Punjab and U.P.

Dr. H. R. Arakeri said that drought-resistant varieties of foodgrains should be developed if dry farming was to be introduced in the country on a substantial scale.

Dr. S. E. Roy said that the primitive implements used by Indian farmers must be changed. He particularly mentioned the "khurpi," the sickle and the 'desi plough."

ICAR TO BE REORGANISED

By A Staff Reporter

The Union Cabinet has approved a scheme for the reorganisation of the Indian Council of Agricultural Research.

This was announced by Mr. C. Subramaniam, Food Minister, while speaking at a symposium on science and agriculture in New Delhi on Wednesday.

The Minister said that Dr. B. P. Pal, Director of the Indian Agricultural Research Institute, had been appointed Director-General of the reorganised set-up.

निडर और निष्पक्ष ग्रामीण पत्र

India's Leading Rural Weekly in Hindi

सेवाग्राम

गांव वालों का अपना पत्र

वर्ष १२ : अंक १२ ● दिल्ली ● सोमवार, २९ मार्च १९६५

अनुसंधान संस्थाओं की शानदार सफलता...पर

खेतों में 'ढाक के वही तीन पात'

आए दिन कृषि अनुसंधान संस्थानों से खबरें निकलती रहती हैं कि अमुक संस्था में अमुक जिंस की अमुक किस्म विकसित हुई जो मौजूदा उपज से तिगुनी-चौगुनी पैदावार देगी। पढ़ने वाले के दिल और दिमाग में खुशी की लहर दौड़ जाती है और वह सोचने लगता है कि वह दिन दूर नहीं जब हमारा देश नई किस्मों को उपजाकर अनाज उत्पादन में आत्म-निर्भर बन जाएगा, पर "ढाक के वही तीन पात।" सालों गुजर जाने पर भी नई किस्में किसानों तक नहीं पहुंच पातीं। यदि पहुंचती हैं तो उनमें इतनी मिलावट रहती है कि उनसे कोई खास फायदा नहीं होता और किसान का अनुसंधान संस्थानों से विश्वास उठ जाता है।

—ज्ञानेंद्र प्रसाद जैन—
संपादक, 'सेवाग्राम'

हर नेता और अधिकारी कहता है कि विज्ञान का इस्तेमाल खेती के लिए जरूरी है। खेती के पुराने तरीकों को बदलना होगा, नए बीजों, यंत्रों और खादों को इस्तेमाल करना होगा। पर इनकी जानकारी किसानों तक कैसे पहुंचे? अनुसंधान संस्थान फसलों के नए बीज तैयार कर राज्यों के कृषि विभागों को दे देती हैं जो ब्लाकों के जरिये ग्राम बीज सहायकों को दिए जाते हैं। ग्राम बीज सहायक उन्हें अपने खेतों में उगाते हैं और उनसे हुई फसल को या तो सीधे किसानों को बेच देते हैं या विभाग उनसे खरीद लेता है। इस तरह संस्थान से आए बीजों का फैलाव होता है। कागज पर यह योजना ठीक लगती है, पर अमली तौर पर इस तरह का बहुत सा बीज उगाया न जाकर खाने के काम आता है। बीज सहायकों से बीज सरकारी विभाग नहीं लेते। किसान इसलिए नहीं लेते क्योंकि उन्हें मंहगा पड़ता है। उस सूरत में फार्म का बढ़िया बीज आढ़तियों के हाथों बेच दिया जाता है।

बढ़िया बीज सड़ा

सूरतगढ़ के सरकारी फार्म पर भी हमने गेहूं का बीज बरसात में सड़ते देखा, क्योंकि सहकारी संघ ने बार-बार तकाजा करने पर भी उसे समय

(शेष पृष्ठ १६ पर)

संकर मक्का गंगा १०१ किस्म जो भारतीय कृषि अनुसंधान संस्थान ने विकसित की है और दक्षिण भारत में बोई जाती है। यह फी एकड़ ६० मन उपज देती है और फी पौधा दो भुट्टे।

नई दिल्ली की पूसा कृषि अनुसंधानशाला को जो देश की प्रमुख कृषि अनुसंधान संस्था है इस महीने ६० साल पूरे हो जाएंगे। इस अवसर पर एक सप्ताह का समारोह मनाया जाएगा जिसमें राष्ट्रपति, प्रधान मंत्री, खाद्य व कृषि मंत्री व उच्च अधिकारी भाग लेंगे। एक दिन दिल्ली के आसपास के गांवों और देश के अलग-अलग भागों से चुने किसान प्रतिनिधि आएंगे और संस्था की कारगुजारियों को देखेंगे। क्या पूसा संस्थान में तैयार की गई गेहूं, मक्का व अन्य फसलों की किस्मों से किसान लाभ उठा रहे हैं? समारोह के अवसर यह सवाल शायद कड़ुवा लगे, पर महत्वपूर्ण है।

पूसा संस्थान की नई किस्में

पूसा संस्थान ने हीरक जयंती के मौके पर बाजरे व चारा की तीन किस्में निकाली हैं जो इस तरह हैं—

संकर बाजरा नं. १

मौजूदा बढ़िया से बढ़िया किस्म के मुकाबिले अनाज १०० फीसदी और चारा ३० फीसदी अधिक देती है। यह देश के किसी भाग में भी उगाई जा सकती है।

पूसा जाइंट नेपियर घास

यह 'ऐलीफेंट' घास व बाजरे की संकर किस्म है और १ एकड़ में १,००० मन हरा चारा दे सकती है और हर राज्य में उगाई जा सकती है।

पूसा जाइंट बरसीम

२० से ३० फीसदी अधिक चारा देती है और सख्त से सख्त सर्दी में भी पैदा होती है।

एक साल में मक्का की तीन फसलें!

विकास क्षेत्र अजीतमल (इटावा, (उ. प्र.) की १०० एकड़ भूमि में एक साल में मक्का की तीन फसलें ली गईं। पहली मई के आखीर सप्ताह में बोई और अगस्त के आखीर में काट ली। दूसरी फसल सितंबर के शुरू में बोई और १५ दिसंबर के आसपास काट ली। तीसरी फसल फरवरी के आखीर में बोई और मई के शुरू में काटी। कुछ किसानों ने मक्का के साथ लोबिया नं. २ और उड़द नं. ९ भी बोया।

हर फसल में २½ मन अमोनियम सल्फेट और २½ मन सुपरफास्फेट फी एकड़ डाला।

'सेवाग्राम चित्रावली'

पाठकों को जानकर खुशी होगी कि हमने इस साल ६४ पृष्ठों की एक चित्रावली प्रकाशित की है जो 'सेवाग्राम' के ग्राहकों को मुफ्त भेजी जाएगी। जो लोग ३१ मई तक 'सेवाग्राम' के ग्राहक बन जाएंगे उन्हें भी यह चित्रावली मुफ्त दी जाएगी।

ESTABLISHED 1838

The Times of India

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NO. 92, VOL. CXXVII. NEW DELHI: SATURDAY, APRIL 3, 1965

The Prime Minister, Mr. Lal Bahadur Shastri, examining an im proved variety of wheat at the Indian Agricultural Research Ins titute farm in New Delhi on Fri day.—TOI photograph. (Report on page 3)

See Report overleaf

Times of India 3.4.65

Sustained Efforts To Raise Production

SHASTRI'S CALL TO FARMERS

By A Staff Reporter

The Prime Minister, Mr. Lal Bahadur Shastri, appealed to farmers on Friday to make sustained and determined efforts to increase agricultural production.

In view of the food shortage in the country, it was the duty of farmers to produce more. The Government would give them all possible help.

The Prime Minister was inaugurating the "field day" celebrations at the Indian Agricultural Research Institute, New Delhi.

A large number of farmers from adjoining areas visited the experimental farms of the institute where they saw a demonstration of improved methods of agriculture.

Mr. Shastri said that India was importing foodgrains at the rate of seven lakh tonnes per month. To spend huge sums on foodgrain imports was not creditable for a country like India.

He was sure that, if proper facilities and guidance were given to farmers, they would do their best to increase production. All village level and extension workers should help farmers in this task.

SUB-PLAN SUGGESTED

He had suggested to the Planning Commission that there should be a separate "sub-plan" for agriculture within the Fourth Plan. The suggestion had been made with a view to achieving complete co-ordination among various agencies responsible for the promotion of agriculture.

India was a country of small agricultural holdings and research institutes should bear this in mind while evolving new techniques, he said.

Dr. Swaminathan, Head of the Department of Botany of IARI, took the Prime Minister round the experimental farms where high yields had been obtained by using better varieties of seeds.

Mr. Shastri evinced great interest in the high-yielding, rust-resistant varieties of wheat and hybrid varieties of maize and bajra.

Hindustan Times 2.4.65

Co-operation in agriculture

Aid by consortium recommended

By a Staff Correspondent

New Delhi, April 1—Technical assistance by a consortium of small non-loan-giving nations providing managerial talent as trainers and motivators in farm programmes was recommended at the Symposium on International Co-operation for Agricultural Improvement in India today.

Speaking at the symposium, organized as part of the diamond jubilee celebrations at the Indian Agricultural Research Institute, Dr Morris Kilbridge of the U.S. AID advocated the "do it, show and help" attitude for these experts, who would be expected to work in small communities without creating social barriers in order to be effective in their mission.

Aid strategy

Outlining a "strategy for assistance to small town agro-industries," he maintained that they required little capital equipment and that the operating costs would be less than in industrial cities. The products would find a ready local market and promote the trend towards the urbanization of small towns.

Dr M. S. Randhawa, Director-General of the Ministry of Food and Agriculture, said there were agro-industrial corporations in four States. The centre at Coimbatore was considered a model.

Mr R. G. Johnson, in his talk on international co-operation for training and development, observed that the limiting factor was the lack of skilled manpower with the willingness to put their skills to work under farm conditons. He suggested the stepping up of in-service training systems for young farm experts rather than sending them abroad to acquire farm training.

Mr R. W. Cummings commended the maize improvement programme in India and said it had become the springboard for international co-operation in agricultural research in Southeast Asia.

PM's call for increased farm output

NEW DELHI, April 2: Prime Minister Lal Bahadur Shastri today appealed to farmers to make sustained and determined efforts to increase agricultural production.

He said India was importing grains at the rate of about seven lakh tonnes per month and spending crores of rupees on these imports. It was not a matter of credit for a country like India.

The Prime Minister was inaugurating the "Field Day" at the Indian Agricultural Research Institute which is celebrating its diamond jubilee.

A large number of farmers from adjoining areas today visited the Institute where they were given a demonstration of improved methods of agriculture.

Addressing a gathering of farmers, Shri Shastri said that in the prevailing conditions in the country every farmer should do his best in overcoming the food shortage.

He assured the farmers that the Government would give them all possible help for increasing production. He wanted that all village level and extension workers should help farmers.

Praising the work of the Research Institute, Shri Shastri said it should keep in mind that in most parts of the country the average land holding of a farmer was about half to one acre. The farmer should, therefore, be provided with such improved implements as would serve the needs of his farm.

The Prime Minister was taken round various departments of the Institute to see the research work done there. He showed keen interest in the farms under the botany division where breeding of new and improved varieties of import crop plants is being carried out. With these new varieties the Institute hopes the country would achieve greater production in future.

Hindustan Times 3.4.65

Shastri asks farmers to use improved ploughs

By a Staff Correspondent

New Delhi, April 2—Prime Minister Lal Bahadur Shastri today urged farmers to adopt improved ploughshares and new implements in a determined effort to end food scarcity.

Addressing a gathering of farmers in a straw-strewn field of freshly harvested Mexican wheat at the Indian Agricultural Research Institute, Mr Shastri asked the farmers to realize that 700,000 tons of wheat was imported every month to make up the imbalance between production and actual requirements.

This, he added, was not something to be proud of and called for a co-ordinated effort in extension work to step up production.

The Prime Minister was conducted round the experimental fields and shown the new agricultural equipment being developed at the institute.

Outdated khurpi

According to experts, 70 per cent of the total energy of farm operations is absorbed by the outdated khurpi, sickle and plough now in use. The plough yoke needs to be modified too.

During the fourth Plan, attempts will be made to extend the use of the mould board plough, cultivator with seed-spout attachment and a properly designed bullock harness. A new set of improved farm implements will cost the farmer about Rs 250.

THE SUNDAY STATESMAN, APRIL 4, 1965

FARM REVOLUTION ESSENTIAL, SAYS KOTHARI

By A Staff Reporter

The Diamond Jubilee Week of the Indian Agricultural Research Institute ended on Saturday with an appeal by Dr D. S. Kothari, Chairman of the University Grants Commission, to scientists to elevate agriculture "from a primitive craft to modern industry".

Presiding over the Post-Graduate School Day at the Institute, Dr Kothari said that IARI had a unique position of knowing intimately "the stark reality" about the country's agriculture. The Institute could, therefore, succeed in bringing about a revolution in the sphere of agriculture. The revolution could not come just by acquiring knowledge. What was needed was a spirit of dedication among agricultural scientists and their willingness to "expect less from society and do more for it", he said.

Dr Kothari said that increasing salinity was rendering arable land useless in many parts of the country. The problem was acute in West Pakistan where an expert committee had expressed the view that it could be solved in the time of the present generation provided necessary emphasis was given to agricultural education and the scientists had determination to fight it. The same thing was true of India as well. Hence the need for scientific investment for the development of agriculture, he said.

Dr R W. Cummings, Field Director, Rockefeller Foundaation, and Dr B. P. Pal, Director of IARI, who also spoke on the occasion, called upon the students of the Institute to accept the challenge to assume leadership in the sphere of agriculture.

Earlier, Dr Kothari distributed prizes to winners of a sports competition organized by the Post-Graduate School Students' Union.

The Hindustan Times, Friday, April 23, 1965

Gas from cow-dung

IARI prestige project goes up in smoke

By a Staff Correspondent

New Delhi, April 22—Two of the Indian Agricultural Research Institute's prestige projects in Delhi villages have proved damp squibs.

The projects—production of cow-dung gas and provision of special types of air-tight storage bags—have failed to catch the imagination of villagers. Apparently, desk-bound scientists at the Pusa Institute had not correctly assessed the villagers' needs and their limitations before launching the projects nearly eight years ago.

With a view to stop wastage of cow-dung, the institute designed a "gas-generating pit," which, besides producing gas for cooking and lighting purposes, supplied superior quality of manure which could be used as fertilizer. The pit, fitted with pipes and other ancillaries, cost Rs 450.

Each pit could produce 100 cubic feet of gas daily, enough to meet the requirement of a five-member family. Five pits were launched in as many villages on an experimental basis in 1957. It was hoped that other villagers would be encouraged to set up such pits at their own expense.

But experience has proved otherwise. Instead of utilizing the projects, the villagers have preferred to wait for electricity to reach their homes.

An average villager uses a charcoal stove. He cannot afford to use even a kerosene stove (costing about Rs 8) and even the most prosperous among them cannot think of changing over to a gas cooker costing Rs 80 or Rs 100.

The best way

They told the institute men that the best way to use cow-dung was to use it as fuel. The villagers have also found that chemical fertilizers supplied by the community development blocks were better than the "fermented cow-dung" obtained from the pit.

The institute admits that the project has failed because sufficient gas can be produced through fermentation of cow-dung, only during summer months. In winter or on days when the temperature is low, the operation is uneconomic.

Similarly, only half a dozen peasant families have so far bought the polythene-coated, moisture-resistant bags in the past four years. Each bag, costing Rs 40, can store grain weighing up to 30 maunds for seven to eight years.

It has been found that the average farmer does not store grain for more than three or four months.

The difficulty with bags is that once they are unsealed, their damp-resistance capacity is affected. The institute has now designed bags with a capacity of 20 maunds, which will be sold to the farmers at a cheap rate from next year.

"The Hindu"
29-5-65.

Multiplication of High-yield Wheat Seeds

(FROM OUR CORRESPONDENT)

OOTACAMUND, May 27.

An event of considerable national importance from the agricultural point of view took place to-day, the first death anniversary of the late Prime Minister Nehru, when certain varieties of wheat-seed with very high yield potentialities —achieved through the use of atomic radiations by Dr. M. S. Swaminathan, Head of the Botany Division, Indian Agricultural Research Institute, New Delhi and his colleagues—were sown for large-scale multiplication at the Wheat-breeding Sub-station of the IARI at Wellington, in Nilgiris.

Giving this information to me, Dr. Swaminathan, who visited the substation specially for this purpose, said that among many other valuable endowments, Pandit Jawaharlal Nehru had given India a clear atomic policy, when he said: "Whatever will happen, India will never use atomic energy for evil purposes." Conversely, he added, Mr. Nehru had emphasised that India should become one of the leading nations in the world in the exploitation of atomic energy for peaceful purposes. He said that anyone who visited the Wellington Wheat-breeding sub-station to-day, would see that, thanks to Mr. Nehru's atomic policy, man had become almost "Brahma" so far as the crop plants were concerned.

Through the use of atomic radiations, Dr. Swaminathan and his colleagues had created thousands of new plant types in wheat, rice, barley, cotton and other economic plants at the Indian Agricultural Research Institute in New Delhi.

MUTATION OF COLOUR

It may be mentioned that this work was recognised in the form of a Bhatnagar Memorial Award to Dr. Swaminathan early this year. The staff of Wellington Sub-station led by Mr. P. N. N. Nambisan, Officer-In-Charge, sowed to-day seeds of what might be termed "the most precious atomic baby of 1965" as far as India was concerned said Dr. Swaminathan. This eminent botanist and his colleagues had shown through extensive experiments that some dwarf wheat varieties, developed in Mexico, had very high yield potentialities. One of these varieties, termed "Sonore 64" yielded over six tons per hectacre during 1964-65 in several acre plots. Grain of this variety, Dr. Swaminathan said, was red like the imported PL 480 wheat. Since grain of red colour was not liked by the Indian farmers and consumers, seeds of this variety were exposed to atomic radiations and mutants with an amber colour were produced. Seeds of these mutants, isolated at New Delhi in April 1965, were brought and sown in the Wheat-breeding Sub-station at Wellington to-day for large-scale multiplication. Since wheat could not be grown in North India during the summer months, this sub-station would help to accelerate the pace of wheat research.

Dr. Swaminathan said that the seeds harvested at this sub-station would be sown at Delhi and many other places in North India during October and November 1965 and would definitely revolutionise wheat production in India.

Besides the amber colour mutants, many other wheat and barley mutants were sown to-day by the staff of the Wheat Breeding Sub-station Wellington

Times of India
May 21, 1965

Location Of National Biological Laboratory

SCIENTISTS DIFFER

Indian scientists are split on the question of location of the National Biological Research Laboratory at Palampur in Kangra Valley.

While the Director-General of the Council of Scientific and Industrial Research and three other scientists, Dr. B. P. Pal, Dr. M. S. Randhawa and Dr. M. S. Swaminathan, have favoured Palampur, Dr. H. J. Bhabha and Prof. P. Maheshwari, Chairman of the Biological Research Laboratory, have voiced their opposition to it.

They are against Palampur on account of its remoteness from a university, transport problems and difficulty of stocking tropical plants and animals there.

Seven members of Parliament from the Punjab have thrown in their weight behind the selection of Palampur. In their joint letter to the Prime Minister and the Union Education Minister they have said that Palampur was selected after a good deal of consideration and in consultation with eminent scientists. Any change at this stage, in their view, would cause resentment in the Punjab.

The letter has been signed by Mr. Hem Raj, Mr. Sadhu Ram, Mr. Iqbal Singh, Mr. Gajraj Singh, Mr. D. C. Sharma and Mr. Chunilal

According to C.S.I.R. sources, the tentative scheme for the National Biological Laboratory was prepared by Maj.-Gen. S. S. Sokhey and circulated to all members of the Biological Research Committee. It was discussed at a conference attended by 39 scientists at Hyderabad in November 1963

The C.S.I.R. sources claim that Prof. Maheshwari had considered the draft plan "quite satisfactory" except for a few changes which he had suggested. Before the plan was adopted it was "very widely" circulated among eminent biologists in the country and abroad.

The governing body of C.S.I.R. approved the scheme as well as the site.

Prof. Maheshwari has questioned the decision to locate the laboratory at Palampur. In his letter to Mr. M. C. Chagla he has said that in spite of the assurance that the question of location of the laboratory was open for reconsideration, the Director-General of C.S.I.R. had informed the Biological Research Committee that Kangra Valley had been finally chosen and that he was going ahead with the project.

NOT REPRESENTATIVE

In Prof. Maheshwari's view, the expert committee, on whose recommendation Kangra Valley was selected, could hardly be considered representative of biology as a whole. It consisted of three botanists from Delhi and all of them belonged to the Indian Council of Agricultural Research and the Indian Agricultural Research Institute.

Prof. Maheshwari has said: "You would certainly not like that a new laboratory costing Rs. 314 lakhs should be maimed from the very beginning because of a wrong choice of its surroundings. It would be a colossal mistake to act in a hurry without properly weighing all aspects of the question."

Dr. Bhabha in his letter to Mr. Chagla has also expressed the view that it was not "wise" to set up a National Biological Laboratory which is not closely associated with a university

Kangra Valley would not be suitable for the laboratory as its climate was unrepresentative of the rest of India. "We would be making the greatest contribution to the advance of biology in the world by locating such a laboratory in a climate more typical of this continent as the laboratories of advanced countries are unlikely to cover such climatic conditions."—UNI.

Hindustan Times
May 5, 1965

87 mds Of Wheat Per Acre

"The Times of India" News Service

LUDHIANA, May 4: A major breakthrough in wheat production has been achieved as a result of the experiments conducted at Punjab Agriculture University here.

A strain of one of the Mexican dwarf wheat varieties has given an yield of about 87 maunds per acre.

The average all-India yield is about nine maunds an acre and the per acre yield of wheat in the Punjab and Ludhiana district is about 13 and about 23 maunds an acre respectively.

Dr. D. S. Athwal, Head of the Department of Plant Breeding in the university, told reporters that the development of the new strain did not involve any increase in expenditure.

He disclosed that about 50 progressive farmers would be selected from all parts of the Punjab to observe the planting of the new variety in demonstration plots.

New Variety Of Wheat

LUDHIANA, May 4: The Agricultural University has developed a new variety of wheat capable of yielding more than 80 maunds per acre.

PV-18, harvested in a demonstration plot of about 40 sq. yards at the university farm last month, gave an estimated yield of 87 maunds.

The new variety is highly resistant to the three groups of rusts common in the Punjab.

PV-18 attains a maximum height of three feet against five feet in case of C306.—UNI.

The Times of India

Monday, May 3, 1965

A Thought for Today

Our characters are the result of our conduct.

—Aristotle

PRIORITIES IN AGRICULTURE

Every time the subject of food comes up in the Lok Sabha the complaint is made that agriculture has not been given sufficient priority in the Plan. The complaint heard once again during the debate on the budget demands of the Food Ministry last week has no relationship to the facts. The truth is that 20 per cent. of the total allocation in the Plan is reserved for agriculture, community development and irrigation and that no substantial increase could have been made in this without slowing down the development of organised industry and mining. Perhaps better results might have been obtained if the Plan had put greater emphasis on minor irrigation projects and on the development of the fertiliser industry. But it is one thing to find fault with the pattern of investment in agriculture and quite another to argue that the overall allocation for agriculture has been inadequate. That the results have not been commensurate with the investment only emphasises the need for a thorough reappraisal of the pattern of investment to ensure the maximum increase in per acre yields in the fourth Plan. The first need, as Mr. Subramaniam told the House in his reply to the debate, is to meet fully the increasing demand for fertilisers. Already plans are under way to develop the fertiliser industry at a faster rate. But larger supplies of fertilisers will not help if the farmer has no clear idea as to what type and how much of it will ensure the maximum yields for the crop he wants to sow. There should be no delay in completing sample soil surveys in every district to ascertain the kind of fertiliser and the quantity needed to achieve the best results for different soils and crops.

The farmer is conservative by nature and seldom takes to a new practice unless he sees with his own eyes that it is to his advantage. The best way to educate him in new farming practices, as suggested by one member, is to set up an experimental centre in each development block to demonstrate how large increases in per acre yields can be obtained by proper use of fertilisers and pesticides. These centres can also help in popularising the results of research. There is little justice in the complaint made by one member that the I.C.A.R. has not done much for agricultural research. What has been lacking is not research but its practical application in the field. The farmer can hardly be expected to take advantage of the results of research unless better tools and improved seeds are easily available to him. Indian agriculture suffers from inefficient management. It is a pity therefore that the proposal for a country-wide study of farm management practices should have been abandoned. Its findings would have been of immense benefit to all agencies engaged in rural development work. It is time indeed that the Government undertook a study not only of farm management practices but also of the progress in the implementation of various land reform laws. The startling disclosure by one of the speakers during the debate that 16 lakh farmers have been engaged in litigation as a result of these laws speaks for itself. How does the Government expect illiterate farmers to take full advantage of laws whose implications cannot very often

Hindu - June 5th

DISTRICT NEWSLETTER

NEW WHEAT STRAINS

RESEARCH WORK AT WELLINGTON

(FROM OUR CORRESPONDENT)

OOTACAMUND (Tamil Nad).

Not many in the South are aware of the work being done at the Wheat Breeding Sub-station of the Indian Agricultural Research Institute at Wellington in the Nilgiris in evolving various strains of rust-resistant wheat.

As a result of systematic work for the past ten years, three new varieties of Khapli wheat, two varieties of bread wheat and three varieties of barley have been released for cultivation in the Nilgiris and other areas in the South. When these varieties are grown all over the Nilgiris and Palani Hills, rust infection in wheat will be considerably reduced.

In recognition of the national importance of some of these improved strains the Madras Government has included the wheat variety, called the Khapli, in the list of crops to be cultivated by villagers on a subsidy basis under the "Gramasahayak scheme". This will greatly help in popularising cultivation of improved strains of wheat in the State.

EXPERIMENTAL GROWTH

Apart from its usefulness as a research centre for the breeding of rust-resistant wheat, the Wellington sub-station has also become a centre where experimental wheat material can be grown during the summer months. Thus, seeds harvested at Delhi and other places in the North are sent to Wellington in May and sown here immediately. Seeds from these plants will be harvested in September-October and sent back to different stations in the north to be grown there in October-November. In this way research work on this crop is being speeded up and a new strain produced within half the time taken before the establishment of the Wellington sub-station.

Within five or six years of making a "cross", a new variety can be released for cultivation. Such acceleration in the tempo of breeding work is essential since it has been found that most of the earlier wheat varieties do not respond even to the application of more than 30 lbs. of nitrogen per acre.

STEPS TO INCREASE YIELD

If the average yield of wheat has to be raised from the present level of 800 lbs. per acre, it is considered essential that varieties which can utilise profitably larger levels of soil nutrition are made available as quickly as possible. By breeding dwarf varieties which do not lodge even when heavy doses of fertilizers are applied, wheat production can be revolutionised.

The Indian Agricultural Research Institute has already taken up this work, using some dwarf wheat varieties from Mexico as parents.

This station has recently acquired some additional area of land from the military authorities. A modern glass house for experiments has also been constructed. Much credit must go to Dr. M. S. Swaminathan, Head of the Division of Botany, Indian Agricultural Research Institute, New Delhi, and Dr. Srinivasan, who was in charge of the sub-station for more than five years.

बहुमुखी प्रतिभा के धनी अमं
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व्यक्ति के पास इतने गुणों क
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दरबारों तक पहुंचा दिया

Times of India 9.5.65.

An earhead of wheat before and after the use of atomic radiation.—TOI photograph.

INDUCED MUTATIONS IN CROP PLANS

"Times of India" 9/5/65.

Exhibition Inaugurated

By A Staff Reporter

A few decades ago an eminent scientist declared that "artificial mutation of species" should be the goal of the 20th century science. An exhibition on "induced mutations in crop plants," inaugurated at the Botany Division of the Pusa Institute on Saturday, was proof that the goal was within reach well before the end of the century.

The exhibition the first of its kind organised in India, shows how crops can be increased and strains improved by the application of atomic energy. More than 1000 mutations of wheat and barley were on view.

From the imported Mexican wheat, red in colour, a new amber-coloured dwarf Sonara (named after a city in Mexico) wheat has been evolved. The tall, purely Mexican variety was easily damaged by heavy fertilisation and fast winds, so the shorter variety, was produced.

The red of the original wheat did not appeal to India and an acceptable amber-coloured wheat was discovered. An Indian farmer who sowed the new wheat seeds claims to have harvested 7,000 lb per acre.

Jowar-like wheat produced by physical mutation or gama-rays was also exhibited. A single stem of wheat grew 13 to 14 branches through radiation. This new wheat source can increase the yield per acre to 10,000 lb.

Twenty varieties of barley produced from the N. P. Barley. 104 can increase the output by 25 per cent. The new wheat and barley seeds are being multiplied for release shortly.

Pictures and charts, in another section of the exhibition, showed the progress in crop research. X-ray-induced variation in flowers was also depicted. From single-petalled cosmos and chrysanthemum, multi-petalled, giant flowers can be produced.

The exhibition was inaugurated by Prof. P. Maheshwari, Head of the Botany Department, Delhi University.

Hindustan Times, Saturday, August 14, 1965

Czechs honour our scientist

London, Aug. 13 (PTI)—Dr M. S. Swaminathan, of the Indian Agricultural Research Institute in New Delhi, has been awarded the Mendel Memorial Medal by the Czechoslovak Academy of Sciences "in recognition of his outstanding contributions to genetics," according to a communication received from Mr Swaminathan here yesterday.

"Patriot" Aug. 13, 1965

Czech award for Indian expert

LONDON, Aug. 12 (PTI)—Dr M. S. Swaminathan, an expert from the Indian Agricultural Research Institute New Delhi, has been awarded the Mendel memorial medal by the Czechoslovak Academy of Sciences in recognition of his outstanding contributions to the progress of genetics.

CZECH MEDAL FOR INDIAN

LONDON, August 13: Dr. M. S. Swaminathan, of the Indian Agricultural Research Institute, New Delhi, has been awarded the Mendel Memorial Medal by the Czechoslovak Academy of Sciences "in recognition of his outstanding contributions to progress of genetics," according to a communication received here.—PTI.

INCREASE IN CROP YIELD

Expert's Suggestion

CAMBRIDGE, August 3: Dr. M. S. Swaminathan told a meeting at Cambridge University yesterday that scientific ingredients necessary for trebling the present average yields of rice, wheat, maize and other cereals were available in India.

In rice and wheat the dwarf varieties, which were capable of utilising solar and chemical energy very efficiently, had yielded more than six tons per hectare. Use of atomic radiation had helped correct defects of crop varieties introduced from other countries.

To step up yields there was need for supply of all necessary inputs particularly seeds and fertilisers.—PTI.

'Statesman' 6.8.65

SPECIAL CADRE OF FARM RESEARCHERS

FROM OUR CORRESPONDENT

LUDHIANA, Aug 5.—Mr C. Subramaniam, the Union Food and Agriculture Minister, disclosed here today that the question of creating an all-India agricultural research service, as suggested by a scientists' panel attached to his Ministry, was being considered by the Government.

Inaugurating the fourth all-India wheat research workers' conference on wheat at Punjab Agricultural University here, the Minister said that various other problems, including better service conditions for scientists, absence of administrative hindrances and handicaps, and opportunities for travel and free exchange of ideas—all of which were important to the development of research—were also being examined by the Government.

The Minister said it was most important to safeguard academic freedom and scientific initiative of the individual research worker in the interest of efficient research.

Unless we created a research climate and temper, Indian scientific talent would go to other countries, where the right climate prevailed.

Mr Subramaniam disclosed that a scientist in the Class I grade at the Indian Agricultural Research Institute refused the director's post in a large institute with nearly 60% more pay because he wanted to continue his scientific work.

This confirmed his belief that the drain on talent India was currently experiencing was not caused solely by lack of high pay scales.

He, however, said that if only the right conditions could be created India would be a paradise for agricultural scientists.

While stressing the need to increase food production, Mr Subramaniam asked research workers to take interest in the propagation of population control methods.

Referring to improved wheat varieties, he disclosed that 20 tons of Sonora-64 seed was being imported from Mexico.

Mr Subramaniam complimented the Panjab Agricultural University for integrating research, teaching, training and extension in agriculture and called upon other universities to emulate the example of Punjab.

Mr Subramaniam also said that intensive agricultural programme (package programme), which has been launched in seven districts of the country about five years ago would be continued in the fourth Plan with the assistance of the Ford Foundation.

The conference was presided over by Dr B. P. Paul, Director-General of the Indian Council of Agricultural Research.

Dr P. N. Thapar, Vice-Chancellor of the University, in his address said that the evolution of the dwarf wheat strain from Mexican wheat at Ludhiana, which gave an yield of 87 mds per acre, would help to solve the problem of evolving dwarf varieties of wheat which could resist waterlogging.

THE INDIAN EXPRESS, MONDAY, AUGUST 16, 1965

Dr M. S. Swaminathan of the Indian Ag ricultural Research Institute, New Delhi, who has been awarded the Men del Memorial Medal by the Czechoslovak Academy of Sciences in recognition to his outstanding contributions to the study of genetics, talks to Dr Charles A. Panton of Jamaica during a break between sessions of the Mendel Memo rial Symposium in Prague.

MENDLOVO UČENÍ ŽIJE NA CELÉM SVĚTĚ

Pohled na hlediště při slavnostním zahajovacím ceremoniálu

Brněnské symposion genetiků celého světa, uspořádané ve dnech 4.—8. srpna Československou akademií věd pod záštitou vlády Československé socialistické republiky a několika vědeckých světových organizací na počest stého výročí publikování Mendlova učení o dědičnosti, skončilo. Jeho druhá část začne zítra v Praze. Symposion bylo vskutku jedno z největších, které se kdy u nás pořádalo. Probíhalo v důstojném prostředí — v novém brněnském divadle opery a baletu. Zúčastnilo se ho přes tisíc vědců z 39 zemí včetně naší republiky. I když úřední řeč symposia byla angličtina, v níž byly předneseny všechny projevy a diskusní příspěvky, mluvili vědci společným jazykem: jde především o pokrok ve vědě, o pokrok, který může přinést lidstvu lepší život. Žádné politické aspekty a náboženské předsudky nesmí nikdy vědě bránit v tom, aby se mohla svobodně rozvíjet. To bylo krédo, které již na začátku symposia vyslovil v několika svých projevech a rozhovorech náš nejstarší akademik, dvaadevadesátiletý Bohumil Němec, jeden z nejlepších našich genetiků. Řada vědců byla včera vyznamenána stříbrnými pamětními Mendlovými medailemi, někteří se stali doktory honoris causa Vysoké školy zemědělské v Brně. Brno samo včetně svých vědeckých pracovišť a vysokých škol jako město, v němž Jan Řehoř Mendel žil, pracoval a umřel, má dnes Mendlův památník a nově instalované genetické oddělení v Moravském muzeu. Všem těm, kteří se o památku Jana Řehoře Mendla, jehož jméno dnes s velkou úctou vyslovuje celý vědecký svět na západě i na východě, na severu i jihu naší zeměkoule, všem těm, kteří se zasloužili o důstojný průběh symposia a Mendlových oslav, patří uznání a dík. Mendlovo učení žije na celém světě.

CO ODPOVĚDĚLI...

V průběhu symposia jsme položili některým světovým genetikům čtyři otázky a požádali jsme dotazované, aby nám odpověděli.

Otázky zněly:

1. **Kterého vašeho díla si nejvíc ceníte a jaký má význam?**
2. **Co pokládáte za nejvýznamnější světový objev v genetice v posledních dvaceti letech?**
3. **Jak jste byl spokojen s organizací brněnského symposia?**
4. **Jakými cestami by se podle vás měla ubírat věda — obor, v němž pracujete — do budoucnosti?**

A tady jsou odpovědi:

Profesor N. P. DUBININ, Moskva, SSSR:

1. Mezi pracemi, které se mi podařilo zdárně realizovat, chtěl bych napřed uvést starší práce z let 1928—1940. Připomínám vytvoření centrové teorie genu; tehdy se mi poprvé podařilo sestavit teorii dělitelnosti genu a nárys jeho vnitřní struktury. V současnosti se tato teorie skvěle rozvinula v dnešní molekulární genetice. Dále bych chtěl poukázat na důkaz o efektu postavení genů — mé pokusy dokázaly, že myšlenka vyslovená již dříve, je opravdu správná. Podařilo se mi ukázat na pokusech s drozofileu, že účin genu závisí na jiných genech, ležících v chromozónu vedle něho. Jestliže má centrová teorie genu dnes takový ohlas v podobě dnešní molekulární teorie struktury genu, pak další vývoj teorie efektu situace genu v celém rozsahu je věcí budoucnosti. Nepochybuji, že teorie má před sebou velké perspektivy. Například v tak důležitém procesu jako je zhoubné bujení tkáně, mají zřejmě velký význam změny v organizaci chromozónu, jež jsou nezbytně spjaty s jevy efektu situace genů.

Třetí proud v zaměření mých starších prací představuje genetika a evoluce populací; zde se mi podařilo objevit řadu nových skutečností a zformulovat řadu teoretických zásad, jež sepjaly genetiku s darvinismem.

V poslední době se zabývám působením radiace a chemických mutací; to umožňuje vytvářet nové metody řízení dědičnosti. Výsledky těchto prací jsou shrnuty v mých knihách »Problémy radiace a genetiky« a »Molekulární genetika«. V roce 1966 budou v SSSR vydány dvě moje nové knihy věnované otázkám evoluce a selekce: »Evoluce populací a radiace« a »Genetika populací a selekce«. Z prací posledního údobí je třeba uvést, že jsem řídil práce, které vedly ke vzniku kosmické genetiky v SSSR.

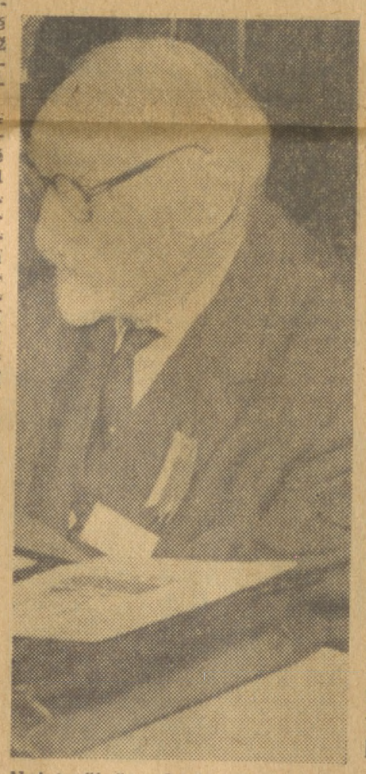
2. V posledních dvaceti letech byl největší událostí v genetice objev, že skutečným nositelem dědičnosti jsou nukleinové kyseliny a stanovení genetických principů v syntéze molekul bílku. Dále lze poukázat na významné výsledky prací věnovaných zkoumání povahy působení radiace a chemických mutací a konečně na vznik kosmické genetiky.

3. Organizace Mendlova symposia byla velmi dobrá. Bylo velmi příjemné, že se práce symposia zúčastnil nestor československé vědy, akademik Bohumil Němec. Je důležité, že Mendlova památka byla uctěna jak připomenutím jubilea, tak také současně symposiem o mutacích, na němž byly hodnoceny práce z této nejvýznamnější oblasti současné biologie.

4. Sám pracuji na řešení otázek radiace a chemické mutace, genetické teorie evoluce a kosmické genetiky. Všechny tyto oblasti jsou významné pro vědu i praxi. Budoucnost selekce závisí na nových moderních způsobech stanovení dědičnosti. Vzniká otázka stanovit evoluci organismů v přírodě. V medicíně se vynořují úkoly ochrany dědičnosti člověka před škodlivými vlivy, zejména před radiací. Je třeba léčit vrozená onemocnění na molekulární úrovni.

Brzy dojde k setkání kosmonautů s mimozemským životem. Jaký je? Samy lety kosmonautů k dalekým planetám a světům budou muset být zajištěny také genetikou, protože uvnitř lodi se bude muset vytvořit uzavřený cyklus organismů, které zajistí kosmonautům možnost dlouhodobého pobytu ve vesmíru.

V celku je genetika jednou z nejangažovanějších věd dneška. Stojí dnes v jedné řadě s fyzikou, matematikou a chemií. Brzy však její význam pro zajištění života člověka ještě vzroste. Na úspěších genetiky v mnoha ohledech závisí blahobyt lidstva, zdraví člověka, jeho fyzická dokonalost, dlouhý život a mládí.



Nejstarší čs. akademik dvaadevadesátiletý Bohumil Němec.

Profesor dr. M. S. SWAMINANTHAN, universita New Delhi, Indie:

Důležité obory mé práce jsou:

1. Vytváření velkého počtu mutací, zajímavé jak v teorii, tak i v praxi v oboru Triticum, do kterého patří šlechtěná pšenice a důkazy, že nepřímé působení záření může být důležité při využití potravy sterilizované radiací.

Rovněž pěstování různých druhů pšenice, dosažené indukční mutací a druh auto — tetraploidního hrachu (Trifolium alexandrium) jsou důležité pro indické zemědělství.

2. Uvolnění molekulární skladby Mendlova »faktoru« a způsob, jakým gen vytváří proteizmy.

3. Symposion bylo velmi dobře organizováno a dělalo dojem skvělého okna do světa v oblasti genetiky ve všech větvích a aplikacích.

4. Měli bychom získat zvýšenou kontrolu nad experimentální manipulací genů tak, abychom mohli genetiky užít jako nástroje k růstu produktivity skliznì i domácího zvířectva. Jedině tak můžeme využít Mendlových objevů, abychom falsifikovali malthusiánskou filosofii o vztahu výroby potravin a růstu populace.

■

Profesor dr. Arne MÜNTZING, Institut genetiky v Lundu, Švédsko:

1. Můj zájem se soustřeďuje na různé výzkumné náměty, jako například:

a) indukční polyploidy u obilovin (žitopšenice — Triticale) a tetraploidní žito. O tuto práci mám v prvé řadě zájem, je také důležitá pro vytváření nových druhů v pěstování rostlin;

b) cytologické studie o původní čistotě u žita a jiných rostlinných druhů. Taková čistota se vyvíjí z normálních, bezvadných jedinců po různých stránkách a má obvykle zhoubný vliv na plodnost a sílu.

2. Podivuhodné výsledky týkající se genů a genetický kód objevený v posledních letech hlavně u mikroorganismů.

3. Symposion se mně líbilo velmi mnoho.

4 Co nejvíce integrace v genetice a biochemii.

■

Profesor dr. C. H. WADDINGTON, president Mezinárodní unie biologických věd, universita v Edinburghu, Skotsko:

1. Ve své práci v genetice si nejvíce cením objevu procesu »genetické asimilace«. Je to pochod, při němž selekce jedinců rodů, kteří za určitých zesílených podmínek vyvinou určitou modifikaci, vede po mnoha generacích k objevení jedinců, kteří mají tuto modifikaci, i když vnější popudy nejsou přítomny a kteří se vyvíjejí za dokonale normálních podmínek.

Důležitost této práce spočívá v tom, že:

a) ukazuje, jak zdání dědičnosti získaných vlastností může být způsobeno přijetím mendelovských procesů, takže se nemusíme domnívat, že je nějaké skutečně přímé dědění získaných vlastností;

b) objasňuje proces, který by mohl být velmi cenný v chovatelství domácích zvířat, i při pěstování rostlin po stránce opatřování výživy za obtížných podmínek;

c) proces závisí na teoretickém pochopení procesů embryonálního vývoje, který jsem po mnoho let studoval.

2. Největší objev genetiky za posledních dvacet let je objev struktury genetického materiálu (DNA) učiněný Watsonem a Crickem.

3. Organizace brněnského symposia byla mimořádně dobrá, pohotová a rázu přátelského. Když jsem měl nehodu — zlomil jsem si zub — pracovníci symposia mne ihned odvezli na kliniku, kde mi rychle a odborně poskytli potřebné ošetření. Velmi jsem vděčen za péči a pozornost při této první pomoci.

4. Vědní obor, v němž nejvíce pracuji, je kontrola vývojových procesů působením genetických faktorů. Nejdůležitější zaměření tohoto vědního oboru pro nejbližší budoucnost je studium molekulárního mechanismu, kterým geny působí, tj. formace sdělovatele RNA, jeho působení při kontrole proteinové syntézy atd.

Malé rozhovory se konaly v přestávkách mezi jednáním. Na snímku dr. Marianne Krohová z holandské botanické laboratoře university v Nijmegenu a Dagmar Pleskotová s Ludmilou Bedrnikovou z pražského Ústavu experimentální botaniky na balkónu nového brněnského divadla.

Stranu připravil: BOŘIVOJ VALNÍČEK za jazykové spolupráce dr. MARIE FAIXOVÉ a dr. V. BURIANA.

Fotografie: KAREL KULATÝ, MIROSLAV MACHA a ČTK — EMIL BICAN.

LZE ŘÍDIT GENETICKOU „VÝBAVU“ ČLOVĚKA?

Profesor John Weir z Kansaské university z města Lawrence v Kansasu v USA předvídá vědě o dědičnosti mimořádné úkoly nikoliv proto, že je sám genetik, ale vzhledem k palčivým problémům, které před lidstvem stojí.

»Způsob, jak se genetika bude rozvíjet, lze předpovědět jen těžko,« řekl profesor Weir našemu zpravodaji v jednom z mnoha kuloárních rozhovorů na symposiu běžných. »Zřetelnější jsou již úkoly, které před touto vědou stojí. Domnívám se, že jedním z hlavních je objasnění role genetiky při diferenciaci — vývoji a formování — organismů.«

»Lékařská věda snad bude moci jednou v budoucnu řídit s využitím poznatků o dědičnosti genetickou „výbavu“ člověka. Je to však stejně vzdálený cíl, jako cesta na Mars.«

Aktuálnost tohoto problému ukazují čísla o počtu lidských jedinců duševně obtížených tak, že nejsou schopni normální školské výchovy. V současné populaci jich jsou asi tři procenta. O tom, že duševní vlastnosti — talent, nadání, ale i negativní vlastnosti — jsou dědičné, v současné době není pochyb. Podle názoru profesora Weira bude moci lékařská věda v budoucnu být nápomocna nejen při volbě partnerů, ale bude moci i zasahovat do nositelů dědičnosti, desoxyribonukleových kyselin. Cíl stejně vzdálený a náročný, jako kosmický program tohoto století.

»S využitím znalostí z genetiky může už nyní udržet medicína osoby s dědičnou chorobou, například cukrovkou v takovém stavu, že choroba už není handicapem. Dříve, kdy lidstvo neumělo takovéto nemoci léčit, mnoho jedinců umíralo velmi časně a tím se omezoval přirozeným způsobem výskyt takovýchto onemocnění v příštích generacích. Léčbě — předcházení — dědičných vad zůstává lékařská věda zatím dlužna. Využití biochemických poznatků, zásah do sestavy desoxyribonukleových kyselin, je problémem a úkolem příštích generací.«

Profesor John Weir je optimista. Vzpomněl, že od Mendlových objevů získala tato věda mnoho dalších mimořádných poznatků, z nichž některé lze k Mendlovým co do významu přirovnat — objev biochemické podstaty dědičnosti a jiné. Věří v další praktický přínos této vědy.

Tak vypadá Mendlova zahrádka dnes po úpravách v bývalém augustiniánském klášteře na Starém Brně.

»Objevy, objekty genetických výzkumů, nemusejí být vždy z počátku vyloženě praktické,« zdůraznil, »ale jejich praktický smysl se s největší pravděpodobností dostaví.«

Jeden ze způsobů, jak urychlit výzkumy a jejich praktické využití je podle názoru profesora z Kansasu mezinárodní spolupráce. Sám využil symposia k tomu, aby navázal osobní kontakty s vědci zabývajícími se stejným oborem, má živý zájem o práci československých odborníků, potěšilo jej pozvání do československého Ústavu experimentální biologie a genetiky. Živě se zajímal o historii Mendlových pokusů a o místa, kde žil a pracoval tento velký brněnský rodák. Ocenil úpravu památníku, i zachovalost architektonické krásy kláštera. A výhled do zeleně brněnských parků a zahrad.

Proletáři všech zemí, spojte se!

ROVNOST

ORGÁN JIHOMORAVSKÉHO KRAJSKÉHO VÝBORU KSČ

PNS 30 ● 50 HAL. ● NEDĚLE 8. SRPNA 1965 ● ČÍS. 189 ● ROČ. 80

Prohlášení čs. vlády

Včera vydala vláda Československé socialistické republiky prohlášení, v němž rozhodně odsuzuje agresi USA ve Vietnamu, která je hrubým porušením ženevských dohod o Indočíně z roku 1954, mezinárodního práva Charty OSN. Plně se staví za stanovisko vlády VDR ze dne 6. srpna 1965 a znovu vyjadřuje svou plnou podporu návrhům VDR ze dne 8. srpna 1965. Podrobné prohlášení přináší dnešní Rudé právo.

Brněnské symposion končí

MEDAILE A DOKTORÁTY

Skončilo vědecké symposion o genetice ● Čestné doktoráty pěti vědcům ● 31 pamětních medailí Jana Řehoře Mendla.

BRNO (Voj) — Čestné tituly »doktor zemědělsko-lesnických věd« a »doktor veterinárních věd« udělila včera Vysoká škola zemědělská v Brně při příležitosti Mendlova mezinárodního symposia pěti předním zahraničním vědcům z oboru genetiky.

Na slavnostním shromáždění v aule Vysoké školy zemědělské udělil hostům — účastníkům symposia — tituly rektor školy, prof. dr. inž. Miroslav Vyskot, DrSc., člen-korespondent ČSAV.

Čestný doktorát zemědělsko-lesnických věd obdrželi akademik Nikolaj Vasiljevič Cicin z SSSR, prof. dr. Artur Horn, člen Maďarské akademie věd; prof. dr. Frederic Bruce Hutt, profesor Cornellovy university v Ithace v USA, prof. Arne Müntzing, ředitel Institutu genetiky v Lundu ve Švédsku a čestný doktorát veterinárních věd prof. dr. Edvard Sörensen, profesor Královské vysoké školy veterinární a zemědělské v Kodani.

ČSAV udělila dnes 31 vědcům, kteří se zasloužili o vědecký program Mezinárodního symposia o genetice v Brně pamětní medaile. Mezi vyznamenanými je 26 zahraničních genetiků.

OBĚD NA HRADĚ...

Pět »novopečených« doktorů honoris causa, kteří tyto největší akademické pocty obdrželi včera dopoledne v aule Vysoké školy zemědělské, se sešlo na brněnském hradě k slavnostnímu obědu. Ale to, co při obědě vypravovali, bylo tak »neslavnostní« a tak přátelské, že jsme se snažili jejich slova alespoň ve zkráceném znění zachytit pro naše čtenáře.

Akademik Cicin řekl: »Konečně nastala doba, kdy vědci celého světa si podávají ruce, aby svými vědeckými pracemi přispěli k obživě celého lidstva, aby už nikdo na světě neumíral hladem. Ten náš boj ještě není u konce a nikdy nebude. To nás zavazuje, abychom v naší práci nepolevili.«

Profesor Hutt z USA: »V blízkosti university, kde pracuji, je malá vesnička jménem MORAVIA. Kdykoliv ji budu projíždět, vždycky mně její jméno připomene Moravu a Brno, všechno hezké, co jsem u vás prožil.«

Profesor Müntzing, Švédsko: »Byly doby, kdy Švédové přicházeli na vaše území, podmaňovat si je a podle toho byli „odměněni". Jsem nesmírně rád, že mám jako Švéd u vás jiné úkoly. Vaše uznání za moji čtyřicetiletou vědeckou činnost mě naplňuje pocitem štěstí a hrdosti. Budu doma všem vyprávět o tom, co jste ve vědě udělali a co jste udělali pro záchranu Mendlovy památky a jeho učení.«

Profesor Sörensen, Dánsko: »Dvacet let už spolupracuji s českými a slovenskými vědci. Mám ve vašich řadách četné přátele. A to mě těší.«

Rektor Vysoké školy zemědělské v Brně, prof. dr. inž. Vyskot, dr. Sc., ukončil oběd slovy: »Přeji vám všem, abyste mohli i nadále pracovat na svých pracích, abychom se tu opět alespoň za pět let sešli, aby se genetika nadále rozvíjela, abychom získali pro lidstvo další poznatky a pomohli všem lidem na zemi k lepšímu životu.« (ša)—

BRNĚNSKÉ ZAJÍMAVOSTI

● **Ani pracovníci n. p. Lacrum** nezůstali pozadu za ostatními brněnskými závody. Na pomoc oblastem jižního Slovenska, postiženými záplavami přispěli částkou 42.255 Kčs.

● **Lidová hvězdárna a planetárium na Kraví hoře** v Brně připravila na dnešní nedělní odpoledne a večer tyto pořady: v 15 hodin v planetáriu pohádka pro děti »O Pastýři a Pánně«, v 17 a v 19 hodin pro dospělé »Naše Mléčná dráha«. Hvězdárna je otevřena od 20 do 22 hodin. Bude se pozorovat Měsíc, Mars, souhvězdí, mlhoviny a hvězdokupy.

na poslední chvíli

Včera dopoledne vědecká komise, ve které byli mimo jiné profesoři Tobias z Kapského Města, Correnty z Palerma, Jenoves z Mexika a z našich antropologů a prehistoriků prof. Poulík, Děkan, Valšík a ředitel Moravského muzea dr. Jelínek, prohlédla horní čelist nalezenou v jeskyni Kůlna pracovníky Moravského muzea. Vědci zjistili na základě stratigrafické situace archeologických a antropologických znaků, že jde o čelist neandrtálce z doby více než před čtyřiceti tisíci lety. Je to pátý objev neandrtálce na našem území vůbec a prvý, který byl učiněn při systematickém výzkumu.

Hindustan Times
Sept. 2, 1965

What's on in Delhi

Indian Institute of Islamic Studies: Prof. G. L. Tikku, of California University, to speak on Phenomenon of Saints, Panchkuin Road, 6 p.m.

Institution of Electrical Engineers: Dr K. L. Rao to speak on Perspective Planning for Power, National Institute of Sciences of India Hall, Mathura Road, 6 p.m.

Indian Society of Genetics and Plant Breeding: Lecture by Dr M. S. Swaminathan on Genetis—Its Past, Present and Future, IARI auditorium, 4 p.m.

India International Centre: Seminar on Social Policy for India, Mr R. Jagannadha Rao to address, 40 Lodi Estate, 9-30 a.m.

Teachers' Day: Celebrations, Government Higher Secondary School, Jangpura, 6 p.m.; Prahladpur, 10 a.m.

New Delhi Hari Sabha: Discourse, sabha premises, Kali Bari, andir Marg, 8 p.m.

Times of India
Sept. 3, 1965

Stepping Up Milk, Egg Production

NEED FOR GENETIC RESEARCH

By A Staff Reporter

A dynamic programme of genetic research can help increase substantially the production of milk, eggs, wool, honey, silk and lac in the country, according to Dr. M. S. Swaminathan, Head of the Botany Division, Indian Agricultural Research Institute.

Dr. Swaminathan was felicitated by the Indian Society of Genetics and Plant Breeding on Thursday for winning the Mendel Memorial Medal of Czechoslovakia. He went to Prague recently to receive the medal. He also attended a symposium on genetics there.

Speaking at Thursday's function, Dr. Swaminathan said that genetics was basic to progress in the fields of agriculture, medicine and biology.

He hoped that in the next few years the exact molecular organisation of genes would be discovered. This would help scientists rectify some of the hereditary defects in human beings.

PROPER STUDY

Dr. Swaminathan pleaded for a proper study of genetics in the country. During the past five years a silent revolution had taken place in India in the application of genetic principles to crop improvement. Through a combination of the right type of crop variety and agronomic practices it had been possible to obtain greater yields in major crops like rice, wheat, maiz, jowar and bajra.

The application of atomic energy in plant breeding had helped accelerate the pace of progress in the development of new varieties. A recent example of the use of this technique was the elimination of the red colour from seeds of Mexican dwarf wheats.

The modern plant breeder had many potent tools with the help of which he could produce in a short time the variety suitable for specific agricultural conditions. In dynamic agriculture new problems would constantly crop up and it was essential that the breeder anticipated some of them.

"If we make it possible for research findings to be adopted by farmers on a large scale, agricultural production in the country will increase rapidly," Dr. Swaminathan said.

The Mail Sept. 22, 1965.

A world of plenty and prosperity awaits our agricultural community, thanks to successful application of genetic principles to crop improvement

FARM EVOLUTION BY PLANT BREEDING

By

Dr M. S. SWAMINATHAN

DURING the last five years a silent revolution has taken place in India on the application of genetic principles to crop improvement.

Through a combination of the right type of crop variety or hybrid and the agronomic practices that are necessary for bringing out the best in the variety, it has been possible to obtain yields in the major crop plants like rice, wheat, maize, jowar and bajra of an order which did not seem possible some years ago.

A few years ago, a spontaneous mutation, i.e. a sudden heritable change, conferring a dwarf stature and stiff and erect leaves was discovered in the rice variety, Chou-Wu-Gin in Taiwan. By crossing Chou-Wu-Gin with the tall strain, Tsai-Yuan Chung which had other desirable features this gene was transferred to the hybrid Taichung-Native I. This dwarf variety has given in some parts of India yields of the order of 5-7 tons per hectare. The dwarfness enables the plant to stand erect even when it is grown in very rich and heavily fertilized soils, while the stiff leaves prevent shading of the lower leaves by the upper ones and thereby enable all the leaves to utilise solar energy effectively for the prodction of carbohydrates.

In wheat, genes conferring a dwarf habit were discovered in the Norin variety in Japan about ten years ago. These genes were immediately transferred by gene ticists in North America and Mexico to commercial wheat varieties. Realising the importance of such dwarf varieties for pushing up wheat production, the Indian Agricultural Research Institute introduced from Mexico in 1963 a large collection of dwarf wheats with the help of the Rockefeller Foundation and the Mexican Ministry of Agriculture. Trials carried out during the last two years have shown that some of these wheats like Lerma Rojo, Sonora 64 and V-18 are capable of yielding over 6 tons per hectare in adequately fertilized and irrigated lands. While prior to 1963 yields of the order of 50 Mds per acre were considered to be difficult of achievement, it is not uncommon to see reports now of yields of 70-80 Mds per acre.

Hybrid maize, hybrid bajra and hybrid jowar have now become available for cultivation in different parts of the country as a result of the work done under All-India Coordinated Projects sponsored by the Indian Council of Agricultural Research in collaboration with the Rockefeller Foundation. State Departments of Agriculture and Agricultaral Universities. These hybrids have raised yields in a very dramatic manner. Some of these hybrids have given high yields not only in India but also in other countries, thereby showing that a broad-based genetic background leads to a wide adaptability. Thus, some maize strains developed in India have given the highest yields in trials conducted in Thailand and Indonesia. The jowar hybrid, C.S.H.2, has been proved to be the best yielder in Brazil. When these hybrids are grown with suitable fertilizer applications, yields of the order of 5-8 tons per hectare can be easily obtained.

By a process of chromosome engineering leading to the doubling in the normal chromosome number, a new variety of Berseem, called the Pusa Giant Berseem, was developed at the Indian Agricultural Research Institute. This variety gives high fodder yields very early in its growth and is also resistant to frost. Pusa Giant Berseem has also done well beyond the frontiers of India and there is much interest in its cultivation in countries like the Netherlands.

The application of atomic energy in plant breeding has helped to accelerate the pace of progress in the development of new varieties. A recent example of the use of this technique is the elimination of the red colour from the seeds of the Mexican dwarf wheats. By irradiation of wheats like Sonora 64 and Lerma Reje mutations conferring an amber grain colour were induced. Thus, within two years of the introduction of these varieties into India, it has been possible to rectify some of their defects and make them widely acceptable both to the farmer and the consumer.

In order to provide a window into this world of plenty and prosperity that awaits our farming community, a National Programme of Demonstrations of high yields have been initiated during kharif 1965. Reports from Madras say that in crops like jowar and bajra yields never visualised before have been obtained in these demonstrations which were conducted in farmers' fields on a minimum area of one hectare. If only a good population of plants can be maintained and reasonable amounts of fertilizer and water applied, the new varieties and hybrids will give enormous yields.

molecules, like sugar, by their sponge-like character. More than half the volume of horse haemoglobin crystals is occupied by liquid of crystallization. Each molecule is surrounded by six nearest neighbours with whom it makes tenuous contacts involving no more than a few atoms; the remaining space between the molecules is filled with water or salt solution. Consequently, there is little difference between the forces acting on a molecule in solution and in the crystal: in both phases most of the surface of each molecule is in contact with water.

The sponginess of the crystals allows small molecules like oxygen to diffuse through the spaces between the large protein molecules. Consequently, if a suspension of oxygen-free haemoglobin crystals is placed in contact with air, they turn into oxygenated haemoglobin throughout. The reaction is accompanied by a change from the purple colour of venous blood to the scarlet of arterial blood and can be followed under a microscope. X-ray analysis shows that the four subunits composing the haemoglobin molecules rearrange themselves in the crystal, just as they do in solution. This proves that the constraints placed on each molecule by its neighbours in the crystal are weaker than the forces set up within each molecule as a consequence of its combination with oxygen, and makes it unlikely that the structure of haemoglobin is affected by crystallization.

All chemical reactions in living cells are catalysed by enzymes and all enzymes are proteins. Many of them can be crystallized. In one or two instances it has been possible to prove that they are as active catalytically in the crystal as they are in solution. We may be confident, therefore, that crystallization does not alter the structure of enzyme molecules. This is fortunate because X-ray analysis of crystalline proteins, though difficult and laborious, is the only method of determining the three-dimensional structure of enzymes and of discovering the changes which their structure may undergo in the performance of their catalytic function. By combining X-ray analysis with chemical studies we can learn to understand complex biological functions in terms of the relatively simple laws governing the interactions between single atoms.

* * *

Acknowledgments for Figure 2 are due to the Academiè Press, for Figure 3 and 4 to *The Scientific American*, and for Figure 6 to *Nature*.

AGRICULTURE AND THE ARTIFICIAL TRANSMUTATION OF THE GENE

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Gregor Mendel, whose laws of heredity propounded in 1865 gave birth to the science of genetics during the present century, could carry out his studies in garden peas only because of the existence of the same gene in alternative forms of expression (known as alleles). The Dutch scientist, Hugo de Vries, showed that new alleles of a gene arise by mutations or permanent hereditary changes, and that mutations combined with the process of recombination of genes could lead to an unlimited degree of elaboration of hereditary characteristics. As a broad generalization, evolution can be pictured as a process of "muddling through" of microbes into men as a result of recombination and selection operating upon blind (i.e., unpredictable) mutations. Simple organisms such as bacteria and viruses, with a new generation every 10 or 20 minutes and with enormous populations consisting of billions of

Fig. 1.—Induction of awning in the wheat variety N.P. 799 which is awnless: *left*, ear head of N.P. 799; *right*, ear head of N.P. 836, an awned mutant of N.P. 799.

individuals could well adjust to the vagaries of the environment by mutation alone. Due to the low frequency of spontaneous mutation, evolutionary progress in more complex organisms would result in a blind alley if it were entirely dependent on the occurrence by chance of mutations of the right type. The higher organisms have hence relied heavily on the exchange of genetic information with each other, a process popularly known as sex! No wonder then that Hugo de Vries wished very much that man could find a way of artificially altering the gene, thereby gaining control over the most powerful of the evolutionary mechanisms.

The dream of de Vries was realized in 1927 when H. J. Muller in the United States showed that the sluggish natural mutation rate can be artificially accelerated by exposing living organisms to X-rays. In 1940, C. Auerbach and J. M. Robson of Edinburgh discovered that chemicals like mustard gas can also be used as mutagenic agents (this information was classified as secret during the Second World War and published only at the end of the war). These discoveries raised new hopes in the hearts of the practical breeders who had until

Fig. 2.—Induced flower variation in cotton (*Gossypium hirsutum*): *left*, normal condition where anther column surrounds the style; *right*, mutant where the anther column is separate from the style and stigma.

then been compelled to remain content with the mere making of recombinations of the material already at hand, providentially supplemented, on rare and isolated occasions by an unexpected mutational windfall. A few examples of the role of spontaneous mutations in transforming a wild into a cultivated plant would be appropriate to give an idea of their impact on agriculture.

The possession of efficient mechanisms for self-propagation and self-protection is an essential requisite for the survival of a species in nature. Most of the wild relatives of cultivated cereals like wheat and rice have hence very tough glumes covering the grains and also a very brittle attachment of the individual flowers to the inflorescence. As a result, it is difficult to thresh the seeds and collect them together. A mutation conferring easy threshing and a tough rachis was hence picked up when it occurred, by the early agriculturists. Similarly, in cotton the wild relatives do not possess the lint hairs essential for making cloth and a mutation which led to the origin of lint hairs had obviously been isolated and preserved. In tobacco, all the wild relatives of the cultivated species have an enzyme which converts nicotine into nornicotine. If such a conversion takes place there will be no nicotine in the mature leaves. A mutation which suppresses the action of this convertor enzyme has therefore been picked up by man and stabilized in our present-day varieties. The sweet lupin completely devoid of poisonous alkaloids developed in Germany 30 years ago represents a recent example of a spontaneous mutation capable of changing the agricultural history of the plant. In vegetatively propagated plants like fruit trees, ornamental shrubs, potatoes and pineapples, the isolation of spontaneously occurring mutations has been a very important method of breeding.

Viewed in the above context, the enthusiasm of breeders for the artificial induction of mutations is understandable. Nearly forty years of work in this field, however, has not fulfilled the early hopes, and the practical exploitation of the new variability created by treatments with mutagens—physical or chemical—has suffered from two major handicaps. First, most of the induced mutants being lethal or sub-lethal are useless from a practical standpoint. Secondly, nearly all of them are the same as are found in nature. Painstaking research in Sweden, Germany, the United States, Britain, India and other countries has, however, revealed that mutation breeding, when employed as a tool for solving a well-defined problem, may prove to be very effective. Also, coincident with the growth of basic knowledge on the enhancement of mutation rate and the widening of the mutation spectrum, the effectiveness and utility of the mutation breeding technique have increased. This is already clear from the striking successes achieved in increasing many times the yield of the antibiotic principle in the organisms giving rise to penicillin, streptomycin, &c. In these organisms, the generation time is short, the screening procedures are very efficient and enormous populations can be conveniently handled. As a result, even a rare beneficial mutation can be picked up easily. The multicellular structure of higher organisms introduces many complications in the recovery of the mutations induced by different treatments, but recent work has shown that given a good understanding of the morphological, developmental and genetic architecture of a plant, much progress can be made in the practical exploitation of this technique. I shall cite in this article a few examples from the work of my colleagues and myself at the Indian Agricultural Research Institute in bread, wheat, and cotton, to illustrate this. For convenience, I shall group them in four categories.

Specific Desirable Changes

Introduction of Awns into Wheat.—The wheat plant in the wild state has well developed bristles or awns on the flowers, as a protection mechanism. The European farmer has, however, selected naturally occurring mutations suppressing awn development, to facilitate easy threshing. In India, on the other hand, farmers prefer awned wheats as they are less prone to be damaged by birds. Many of the wheat varieties bred in India in recent years have the gene for awnlessness from European or North American varieties which have been used in crosses as donors of genes for rust resistance. By subjecting these improved awnless varieties to treatments with X-rays and gamma rays, mutants with well developed awns could be easily developed. The great merit of this procedure is that one desirable change can be brought about without in any way upsetting the adaptive and productive characteristics of the parent variety. Studies in N.P. 836, an awned mutant of the earlier variety N.P. 799, have shown that the introduction of awns in an awnless variety helps to increase yield by about 10 per cent particularly in dry areas (Figure 1). Awns contain chlorophyll and they hence add to the photosynthetic surface. Consequently, the grain weight tends to be higher in the mutant, as compared to the parent strain and this difference has a striking effect on yields in dry areas, where the number of effective tillers per plant is only one or two.

Changing Red into White Grain.—A mutation for grain colour produced this year by a combination of ultra-violet and gamma ray treatments in the dwarf wheat varieties, Sonora 63 and Sonora 64, developed in Mexico is another example of an induced specific desirable change. These dwarf varieties have the genes for short height, first isolated in the Norin wheats of Japan about 10 years ago. The transfer of the dwarfing

Fig. 3.—Ears of some induced mutants in *Triticum aestivum* resembling other species: left to right, *Aestivum*-type (control); Compactoid-type; *Sphaerococcum*-type; *Turgidum*-type; Speltoid-type; Vavilovoid-type.

genes (three distinct ones have been so far identified) to commercial wheat varieties has ushered in a new era in wheat yields. The variety Gaines bred in North America by incorporating the Norin dwarfing gene holds the world record for wheat production, having yielded nearly 10,000lb. per acre in a 25-acre plot. The wheat varieties developed in Mexico under a cooperative programme of the Rockefeller Foundation and the Mexican Ministry of Agriculture have helped to treble the average yield of wheat in that country within a decade. Mexican dwarf wheats like Sonora 63 and Sonora 64 were hence introduced into India in 1963. During the past two seasons in fields fertilized with over 100lb. of nitrogen these wheats have given yields of the order of 5,000 to 6,000lb. per acre. With the previous varieties yields higher than 4,000lb. per acre were seldom possible owing to the occurrence of severe lodging under conditions of high soil fertility and frequent irrigation. Though the morphological frame of the Mexican dwarf wheats proved ideal for intensive agriculture, they had red grains and hence gave dark *chapathis* (unleavened bread, which is the form in which wheat is mostly consumed in India). The farmer and the consumer prefer amber coloured wheat grains and hence these dwarf wheats were subjected to treatments with radiations and chemical mutagens. In the progenies of plants treated with ultraviolet and gamma rays, mutants with amber grains, which had all the other characteristics of the parent strains, were isolated this year and these can be appropriately regarded as the most precious atomic babies of 1965, so far as India is concerned.

Making Cotton Resistant to Jassids.—One of the major needs of India is more extensive cultivation of cotton varieties with a long staple length. Many long staple varieties stature and good grain quality but poor tillering ability, has been improved from an average number of six tillers per plant in the parent to over eight in the mutant.

Transmutation of Species

All the allied species of bread wheat, *Triticum aestivum*, have been synthesized from a single variety in New Delhi. The sub-species created artificially include what are known botanically as *Compactum, sphaerococcum, spelta, macha* and *vavilovi* (Figure 3). A similar transmutation of species has also been accomplished in the emmer wheat series, to which the macaroni wheat, *T. durum*, belongs.

The origin of new species or sub-species through single gene mutations suggests that although the evolutionary scale is usually traversed only by minute steps, occasionally jumps of larger quanta can take place. While most of these mutants are largely of theoretical interest, a mutant in the bread variety N.P. 797 obtained in treatments with radioactive sulphur (S^{35}) having the ability of adventitious branching recorded in nature only in the "Egyptian Miracle wheat" (*T. turgidum* var. *mirabile*) is of great practical interest. When it was first isolated this mutant had much sterility and also a weak expression of the branching character. By selection during the past five years, plants with well branched ears and good fertility have been developed (Figure 4). These plants produce nearly twice as many grains per ear as the parent variety. Fortunately they have also an associated dwarfing habit and may enable us to raise Sorghum-like wheat varieties.

Changes Not Found in Nature

Examples of the artificial creation of genes not found in a world collection of varieties exist in plants like barley and snapdragon, but they are very few. This is to be expected

The traditional methods of interpreting observations using paper, pencil and the pen recorded output of the radio telescope will always have an important place in radio astronomy—especially when there is no way

Polarization and Faraday Rotation.—Another exciting discovery at Parkes was that

AGRICULTURAL RESEARCH & DEVELOPMENT

An Indian Express feature

Indian Express. September 27, 1965

5-year revolution in farming methods

by

Dr M. S. SWAMINATHAN

DURING the last five years a silent revolution has taken place in India on the application of genetic principles to crop improvement. Through a combination of the right type of crop variety or hybrid and the agronomic practices that are necessary for bringing out the best in the variety, it has been possible to obtain yields in the major crop plants like rice, wheat, maize, jowar and bajra of an order which did not seem possible some years ago.

Dwarfing genes

A few years ago, a spontaneous mutation, i.e., a sudden heritable change, conferring a dwarf stature and stiff and erect leaves was discovered in the rice variety, Chou-Wu-Gin in Taiwan. By crossing Chou-Wu-Gin with the tall strain, Tsai-Yuan-Chung, which had other desirable features this gene was transferred to the hybrid Tai-chung-Native I. This dwarf variety has given in some parts of India yields of the order of 5-7 tons per hectare. The dwarfness enables the plant to stand erect even when it is grown in very rich and heavily fertilized soils, while the stiff leaves prevent shading of the lower leaves by the upper ones and thereby enables all the leaves to utilise solar energy effectively for the production of carbohydrates.

In wheat genes conferring a dwarf habit were discovered in the Norin variety in Japan about 10 years ago. These genes were immediately transferred by geneticists in North America and Mexico to commercial wheat varieties. Realising the importance of such dwart varieties for purshing up wheat production, the Indian Agricultural Research Institute introduced from Mexico in 1963 a large collection of dwart wheats with the help of the Rockefeller Foundation and the Mexican Ministry of Agriculture. Trials carried out during the last two years have shown that some of these wheats like Lerma Rojo, Sonora 64 and V-18 are capable of yielding over 6 tons per hectare in adequately fertilized and irrigated lands. While prior to 1963 yields of the order of 50 maunds per acre were considered to be difficult of achievement, it is not uncommon to see reports now of yields of 70-80 mds. per acre.

Hybrid vigour

Hybrid maize, hybrid bajra and hybrid jowar have now become available for cultivation in different parts of the country as a result of the work done under All-India Coordinated Projects sponsored by the Indian Council of Agricultural Research in collaboration with the Rockefeller Foundation, State Departments of Agriculture and Agricultural Universities. These hybrids have raised yileds in a very dramatic manner. Some of these hybrids have given high yields not only in India but also in other countries thereby showing that a broad-based genetic background leads to a wide adaptability. Thus, some maize strains developed in India have given the highest yields in trials conducted in Thailand and Indonesia. The jowar hybrid, CSH 2, has proved to be the best yielder in Brazil. When these hybrids are grown with suitable fertilizer applications, yields of the order of 5-8 tons per hectare can be easily obtained.

New tools

By a process of chromosome engineering leading to the doubling in the normal chromosome number, a new variety of Berseem called the Pusa Giant Berseem, was developed at the Indian Agricultural Researcch Institute. This variety gives high fodder yields very early in its growth and is also resistant to frost. Pusa Giant Berseem has also done well beyond the frontiers of India and there is much interest in its cultivation in countries like the Netherlands.

The application of atomic energy in plant breeding has helped to accelerate the pace of progress in the development of new varieties. A recent example of the use of this technique is the elimination of the red colour from the seeds of the Mexican dwarf wheats. By irradiation of wheats like Sonoro 64 and Lerma Rojo, mutations conferring an amber grains colour were induced. Thus, within two years of the introduction of these varieties into India, it has been possible to rectify some of their defects and make them widely acceptable both to the farmer and the consumer.

In order to provide a window into this world of plenty and prosperity that awaits our farming

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Message...

MINISTER FOR FOOD & AGRICULTURE, GOVT. OF INDIA, New Delhi,

THE inadequacy of our agricultural production has thrown a grave challenge to the nation, engaged in the task of its economic growth, and in the increasing responsibilities of its defence. It is a challenge to our will to live in prosperity and freedom. For, agriculture supplies are the sinews of our development and strength.

Our men of science are called upon to provide the ideas and leadership for bringing into the field methods and techniques which will effect a breakthrough in our agriculture and sustain its dynamic growth. Our institutes and individual scientists are doing very useful work, and we are steadily building up the now-how for progressive adoption of scientific methods in agriculture. We have had 'unique' achievements, in terms of crop yields. The 'unique' should become the normal, and n order to help this countrywide revolution we need a more purposeful and efficient integration of research, education and extension.

Agriculture in this country should be regarded as a management problem and not merely a way of life, and I am sure the productivity approach is going to help us in maximising output. Such an approach will also provide incentive for the growth of agro-industries.

I attach importance to the dissemination of information on the results and findings of research on a nationwide scale. Apart from benefiting the farmers, such information will help in building up valuable scientific knowledge in the country, and in fostering a progressive outlook on agriculture which is so vitally needed.

The Indian Council of Agricultural Research has a long record of dedicated service, and I hope that with the reorganisation of the Council, which is being done, it will become an yet more efficient instrument of agricultural research, education and information.

Sd/- C. SUBRAMANIAM.

Please see next page also

Revolution in farming

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community, a National Programme of Demonstrations of high yields has been initiated during kharif 1965. Reports from Madras say that in crops like jowar and bajra yields never visualised before have been obtained in these demonstrations which were conducted in farmers' fields on a minimum area of one hectare. If only a good population of plants can be maintained and reasonable amounts of fertilizer and water applied, the new varieties and hybrids will give enormous yields. The slogan most suited to India today is "Reduce the growth of human population and increase the density of plant population in the field."

Swadesmitran
September 23, 1965. Madras

தாவர இன விருத்தி மூலம் விவசாயப் புரட்சி

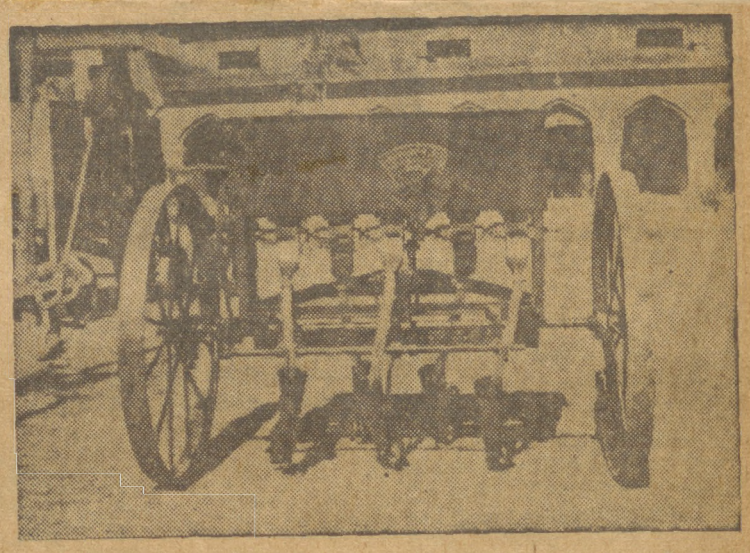
கடந்த ஐந்தாண்டுகளாக இந்தியாவில் பயிர் அபிவிருத்திக்குத் தாவர இனப் பெருக்க முறைகளைப் பயன்படுத்தும் சந்தடியற்ற புரட்சியொன்று நடந்து கொண்டிருக்கிறது. இரு பிறவி வித்துக்கள் அல்லது இடத்திற்குப் பொருத்தமான வித்தினங்களைத் தெரிந்தெடுத்து நவீன விவசாய முறைகளில் பயிரிட்டு அரிசி, கோதுமைசோளம், மக்காச்சோளம், கம்பு முதலான முக்கியப் பயிர்களில் பெரிய அளவு மகசூல் உண்டாக்கப் பட்டு வருகிறது.

சில ஆண்டுகளுக்கு முன்பு தைவானில் சூ-வூ-ஜின் என்ற கட்டை ரக நெல் வித்தொன்று கண்டு பிடிக்கப்பட்டது. இப்பயிர் உயரம் கட்டையாயும் அதன் இலைகள் நேராகவும் விரைப்பாகவும் இருந்தன. இந்த கட்டை ரக வித்தை நீண்ட ரக நெற் பயிர் வித்தோடு கலப்புச் செய்து தைச்சுங் நாடன்-1 என்ற ஒரு இரு பிறவி ரகம் உண்டாக்கப் பட்டது. குட்டையாக வளரக் கூடிய இந்த ரகத்தை இந்தியாவில் சில இடங்கல் பரிசோதித்துப் பார்த்ததில் ஹெக்டாருக்கு 5 முதல் 7 டன் மகசூல் கிடைத்திருக்கிறது. இப்பயிர் குட்டையாயிருப்பதால் வளமான மண்ணில் அதிகமான உரங்களைப் போட்டுப் பயிரிட்டாலும் கூடச் செழித்து வளரும் பயிரானது வளைந்து போகாமல் நிமிர்ந்து நிற்கும். இதனுடைய இலைகளும்விரைப்பாக நிற்பதால் ஒன்றுக்கொன்று நிழலை உண்டாக்கி அடிப் பக்கத்திலுள்ள இலைகளின் வளர்ச்சியைத் தடுத்து விடுவதில்லை. அதனல் பயிரின் எல்லா இலைகளிலும் சூரிய வெளிச்சம் நன்றுகப் படிந்து கார்போஹைட்ரேட்ஸ் சிறப்பாக உற்பத்தியாகிறது.

இரு பிறவி வித்துக்கள்:—

இந்திய விவசாய ஆராய்ச்சிக் கழகமானது ராக்பெல்லர் அற ஸ்தாபன உதவியோடு ராஜ்ய விவசாயத் துறைகளையும் விவசாயப் பல்கலைக் கழகங்களையும் இணையாகச் சேர்த்துக்கொண்டு நாடு முழுவதிலும் சில ஒருங்கிணைப்புத் திட்டங்களை நடத்தி மக்காச்சோளம், கம்பு, சோளம் முதலான தானியங்களில் இருபிறவி வித்துக்களைத் தேவைக்குப் போதுமான அளவு நாட்டில் கிடைக்கும்படி செய்துள்ளது. இந்த இரு பிறவி வித்துக்கள் அபரிமிதமான மகசூலைத் தருவனவாயுள்ளன. இவற்றுள் சில ரகங்கள் இந்த நாட்டில் மட்டிலுமல்லாமல் வெளி நாட்டிலும் சில இடங்களில் விதைத்துப் பார்த்ததில் கணிசமான மகசூல் அளித்திருக்கின்றன. இதிலிருந்து பரந்த அடிப்படையில் இந்த வித்துக்களை உபயோகிக்கும் அளவுக்கு இவற்றில் நிலைமைகளைச் சமாளித்து வளரும் தன்மை யேற்படுகின்றன என்று தெரிந்து கொள்ள முடிகிறது. இந்தியாவில் உற்பத்தி செய்யப் பெற்ற சில மக்காச் சோள ரகங்களை தாய்லாந்திலும் இந்தோனேஷியாவிலும் பயிரிட்டுப் பரிசோதித்ததில் அவைகள் அதிகபட்சம் மகசூல் அளித்திருக்கின்றன. சி. எஸ். எச். 2 சோள இரு பிறவி வித்துக்கள் பிரேசிலில் சிறப்பான மகசூலை அளித்திருக்கிறது. நல்ல வகையில் ரசாயன உரங்களைத் தெரிந்து போட்டுப் பயிரிட்டால் இரு பிறவி வித்துக்கள் ஹெக்டார் ஒன்றுக்கு 5 முதல் 8 டன் மகசூலை மிகச் சுலபமாகத் தந்துவிடும்.

டாக்டர் எம் எஸ். ஸ்வாமிநாதன்



தேவையான அளவுக்கு மட்டும் சீராக நிலத்தில் விதைக்கும் விதைக்கக்கூடிய யந்திரம்

புதிய தினவனப் புல்.—

குரோமோசம் நம்பரை இரட்டிப்பாக்கும் ஒருவித புது நுணுக்க முறையால் புதுடில்லி இந்திய விவசாய ஆராய்ச்சி நிலையத்தினர் பூசா ஜெயன்ட் பெர்சீம் என்ற தீவனப்புல் ரகமொன்றைச் சிருஷ்டித்தார்கள். இந்த ரக தீவனப்புல் அதிகமான மகசூலை மிக விரைவில் தருவதோடு உறை பனியையும் சமாளித்து வளர்கிறது. இந்தப் புல்லை வெளிநாடுகள் பலவற்றில் பரிசோதித்துப் பார்த்ததில் எல்லா இடங்களிலும் நல்ல பலன் தருவதாகத் தெரிய வந்திருக்கிறது. அதனல், நெதர்லாந்து முதலான பல வெளிநாட்டினர் இதனைத் தம் நாடுகளில் பயிரிடுவதில் அக்கரை காட்டி வருகின்றனர்.

அணு சக்தியை உபயோகப் படுத்தியும் தாவர அபிவிருத்தி வேலையின் வேகத்தை அதிகரிக்க முடிந்திருக்கிறது. சமீபத்தில் மெக்சிகன் ரகக் கட்டைக் கோதுமையின் செந்நிறத்தை அகற்ற இது பயன்படுத்தப்பட்டது. சொனோரா-64, லெர்மா ரோஜா முதலான ரகங்களில் அம்பர் நிறத்தை யூட்டும் முறை வெற்றிகரமாக்கப்பட்டிருக்கிறது. இந்த ரகம் இந்தியாவில் அறிமுகப் படுத்தப்பெற்ற இரண்டாண்டுகளுக்குள் அதிலுள்ள குறைகள் பல நீக்கப்பட்டு விவசாயியும் பொதுமக்களும் விரும்பக் கூடிய ஒரு ரகமாக ஆக்கப் பட்டு விட்டது.

1965-ம் ஆண்டு 'காரீப்' பருவத்தில் தேசம் முழுவதிலும் அதிக மகசூலுக்கு நேரடி நிரூபணத் திட்டமொன்று தொடங்கப் பெற்றது. சென்னை மாநிலத்தில் விவசாயிகளின் நிலத்தில் நடத்திய நிரூபணங்களில் சோளம் கம்பு ஆகிய பயிர்களில் இதுவரை கண்டு கேட்டிராத அளவு மகசூல் கிடைத்திருப்பதாகத் தகவல் வந்திருக்கிறது. இரு பிறவி வித்துக்களை அளவாக விதைத்துத் தரமாக உரமிட்டுப் போதிய நீர் பாய்ச்சிப் பயிர் செய்தால் அபரிமிதமாக விளைச்சல் கிடக்குமென்பது உறுதி ஆகையினல் நாம் இன்று "மக்கள் தொகையைக் குறைத்து வயல் உற்பத்தியைப் பெருக்குவோம்" என்று முழங்கி இரு பிறவி வித்துக்களையும் இதர நவீன விவசாய முறைகளையும் கையாண்டு நாட்டை வளப்படுத்திக் காக்கக் கடமைப்பட்டிருக்கிறோம்.

Times of India
Oct. 1, 1965

National Tonnage Club Of Farmers

By A Staff Reporter

The Union Food Minister, Mr. C. Subramaniam, will inaugurate the first convention of the National Tonnage Club of Farmers on Saturday.

The convention will be held at the Division of Botany, Indian Agricultural Research Institute.

A field day to enable farmers to see new hybrids of jowar, bajra, maize and grass will be organised on the occasion. A seminar on how to produce three tons of wheat, jowar, bajra and maize per acre will also be held.

The National Tonnage Club of Farmers was formed in June. Membership is open to farmers willing to produce a minimum of two tons of rice, wheat, maize, jowar or bajra per acre.

Times of India
Oct. 2, 1965

Experiments In Growing Of Foodgrains

By A Staff Reporter

Experiments at the Botany Division of the Indian Agricultural Research Institute show that it is possible to produce a minimum of 10 tons of foodgrains per hectare by growing two crops in a year in areas where irrigation facilities are available.

New hybrids and varieties of jower, bajra and maize were grown on a demonstration plot at the Institute during the last rabi season. The yield wheat was six tons per hectare. The maize yield is expected to be six or seven tons, jowar five or six tons and bajra four tons per hectare.

Many of these varieties or hybrids have been developed in the past four years under projects sponsored by the Indian Council of Agricultural Research and executed in collaboration with Rockefeller Foundation. High-yielding varieties of wheat and rice are also now available.

The dwarf Mexican wheat varieties introduced in India in 1963 have been tested all over the country during the past two seasons. Two of them, Lerma Rojo and Sonora 64, have been found to be promising enough to warrant their large-scale cultivation under heavy manuring.

The Union Food and Agriculture Ministry has arranged for import of 250 tons of seeds of these two varieties. The seeds are expected in India early next week. These will be distributed to Government seed farms and to progressive farmers.

Times of India
Oct. 3, 1965

Minister's Appeal To Farmers For Higher Output

By A Staff Reporter

The Union Minister for Food and Agriculture, Mr. C. Subramaniam, asked farmers on Saturday to take a pledge to work for higher agricultural production.

Inaugurating a farmers' convention organised by the National Tonnage Club at the Indian Agricultural Research Institute, Mr. Subramaniam said that the country must achieve self-sufficiency in food and reduce its dependence on foreign imports.

He assured the farmers that the Government would give them every possible facility including supply of fertilisers, insecticides, quality seeds and improved agricultural implements.

Agriculture had been given top priority in the Fourth Plan keeping in view the need for self-sufficiency in food.

Mr. Subramaniam hoped that the National Tonnage Club would popularise the results of research conducted at the Indian Agricultural Research Institute.

Dr. V. K. R. V. Rao, member of the Planning Commission, said that there would be a special plan for agriculture during the Fourth Plan. A sum of Rs. 2,500 crores would be invested in agriculture in the next five years.

Hindustan Times
Oct. 3, 1965.

Modern farming methods needed

New Delhi, Oct. 1 (UNI)—India needs only 25 million acres of land to produce 100 million tonnes of grain against 200 million acres now under grain cultivation if the results of modern Indian scientific research can be applied extensively.

This is the view of Dr M. S. Swaminathan, head of the Department of Botany at the Indian Agricultural Research Institute, New Delhi.

He told newsmen yesterday that it was for the Government to exploit the various high-yielding varieties of grain developed at the institute.

Referring to the criticism that the hybrid or other high-yielding varieties of grains were not available to farmers, he said that multiplication of quality seed produced by scientists was a matter for the Government.

Dr Swaminathan said that if necessary facilities were provided by the Government improved seeds could be supplied to all farmers in India by 1967-68. At 45 maunds per acre 300,000 acres of land would be required to produce hybrid wheat seed for this purpose.

YOUTH and TODAY

PRACTICAL TRAINING FOR AGRICULTURAL GRADUATES NEEDED

"WHENEVER there is a food crisis, somebody invariably asks: 'Why don't the agricultural graduates go and work in the villages and help in increasing food production? Why do they seek white-collar jobs in cities? There must be something wrong either with agricultural education or with the students.' This time your Farming Correspondent has asked these questions. Well, we are rather tired of having these questions thrown at us. And we want to answer them," write three young agricultural graduates working in the Indian Agricultural Research Institute, Delhi.

P.C. KESAVAN writes: "You are right. There is something lacking in agricultural education as at present given in our colleges. It lacks practical farm training. Agriculture is no less complex technically than medicine or engineering. Medical and engineering graduates get a thorough grounding in hospital and workshop practices. House surgeonship is compulsory for medical graduates. This practice does not exist in agricultural education.

The practical knowledge that is referred to here does not merely mean the practical classes in laboratories and experimental farms which the students attend. These classes have their value but they do not give adequate experience of actual field problems.

A pioneer agricultural college at Coimbatore and a few others once tried introducing compulsory farm and dairy training for six months at the end of the final year exams. Unfortunately sister institutions did not follow suit. The Coimbatore students found themselves six months behind in the race for jobs. So the experiment was given up. Some colleges and institutions offer facilities for training but it is not a compulsory part of the curriculum.

Farm training should not only be compulsory but comprehensive, dealing with soil management culture operations, prophylectic measures, seed multiplication, animal husbandry and dairy and poultry keeping. State farms could be tried as training grounds for agricultural graduates. Women students could be given special training in home science and nutrition. It would be of immense help if trainees could be given some stipends during this period of training. Without this most essential training an agricultural graduate is left with the feeling that he had been taught about agriculture and not agriculture itself".

VENKAT RAO GADWAL adds: "There are three fields of work open to agricultural graduates—extension, teaching and research. He can become a farmer but only if he has some land for himself. No agricultural graduate deliberately seeks a white-collar job. It would be truer to say that whatever job he accepts in these three fields, white-collar administrative duties are thrust upon him. A good deal of paper work is demanded of him.

There is need for a lot of research to be done in our country about agricultural and food production problems. We need pure research which will add to theoretical knowledge. We also need short-term problem-oriented research. Both kinds need agricultural graduates. The supply is far short of the demand as yet.

The big gap is between the research institute and the farmer. The extension worker, also an agricultural graduate, is the liaison between these two. His work has many difficulties. The conservatism and ignorance of the farmer which we talk about all the time is the least of his problems. His job is done through practical demonstrations and pilot projects. To work a successful demonstration plot he must have all the materials he wants like seeds, fertilizer, water, to mention the three most important. He must be able to get them when he wants them. This he is often not able to. To fail in a demonstration is ten times worse than not trying the experiment at all.

Unless there is co-ordination between research institutes and research administration is efficient, the extension worker cannot work at peak power. An example of such co-ordination is the release of the hybrids in maize and sorghum and bajra. Such co-ordination schemes have to come for all major crops.

In this connexion people may be interested to know about the development of a "seed village" in Kanjawala block, Delhi, where 60 acres have been brought under high-yielding wheat varieties in the rabi 1964-65. The produce of this area will not only saturate the 1,200 acres in the village itself but also meet the needs of Delhi State. This was done by the Division of Botany, Indian Agricultural Research Institute, Delhi. Let us now see how efficiently the Delhi Administration will take it up".

M. MURALIKRISHNA winds up for the defence: "The problem of food preservation is one of the important fields of agricultural work which agricultural graduates have to tackle. At present the agricultural education in our country at the undergraduate level does not include extensive instruction on this aspect of storage and preservation of horticultural and agricultural produce. Our country needs a great many food technologists. Today many of our processing factories are without qualified technologists. Agricultural graduates are going into this field of work.

The production of cereal grains and pulses alone amount to about 75 million tons in India. Most foodgrains have to be in storage for short or long periods. Losses in storage may be caused by insect infestation, rodent attack or fungus growth. Conservative estimates put the figures of annual loss in foodgrains from all these causes at 5 to 7 million tons a year.

This being the position with regard to low moisture foods as cereals, the plight of high moisture foods as fruit and vegetables can well be imagined. Preservation or cold storage of perishables is very necessary to save the valuable protective foods from deterioration. This problem is more important especially where the growing and consuming centres are far away from each other.

The field of nutrition is another where the agricultural graduate is in demand. Women would find this specially suitable to their temperament.

Our failure on the food front is due to many causes. Agricultural planning is done by economists, agricultural policy is set by politicians and ideologists and implemented by administrators who use the same methodology for agriculture as they do for steel, information and broadcasting or education. Having started on these lines there is no point in asking from time to time: 'Where are our agricultural graduates? What are they doing?' We are right here where we are needed doing our part of the job."

TEXTILE WORKERS OBSERVE FAST

COIMBATORE, Oct 24.—As many as 1,500 textile workers belonging to Hind Mazdoor Sabha, All-India Trade Union Congress and the Dravida Munnetra Kazhagam observed a 10-hour fast here yesterday in protest against the attitude of textile mill managements on bonus issue, reports PTI.

At a meeting later, the workers were asked to be prepared to go on a general strike on the issue.

Mr P. S Chinnadurai, president of the District Textile Workers Union (H.M.S.), told the meeting that the three trade unions would meet within two days to decide as to when they should serve the strike-notice.

The workers in 41 textile units in the district are demanding increased bonus on the basis of last year's profits.

Of all the bouquets Prime Minister Shastri received on his 61st birthday, none was more significant than this bouquet of ears of corn, offered by Union Food Minister C. Subramaniam, in token of the nation's determination to become self-sufficient in food.

The Tribune,
October, 8, 1965.

Dr. H. J. Bhaba addressing the Council of Scientific and Industrial Research on "Defence production and self-sufficiency", in New Delhi on Wednesday. (Report on page 8)

The Hindustan Times
October, 9, 1965.

Better emoluments for farm scientists planned

By our Special Correspondent

New Delhi, Oct. 8—The Union Government is considering a proposal to constitute an Indian agricultural research service to foster a national programme of agricultural research.

The maladies afflicting agricultural research are an acute shortage of technically competent scientists, low scales as well as innumerable grades of pay as compared to administrative and some technical services and rigid financial rules which prevent easy transfer of research scientists from one position to another.

Frequent shift in personnel caused by a constant quest for slight improvement in salary renders specialization difficult. Also, most of the available talent is being deployed for planning and not for ensuring performance, as the pay scales are higher on the administrative side.

The proopsal for constituting the service has been approved by the governing body of the Indian Council of Agricultural Research and has been recommended to the Government for acceptance.

The proposed service will not be patterned after the IAS but will be modelled on the Agricultural Research Service in the UK. Its aim will be to provide job opportunities and to make conditions of recruitment flexible so that competent scientists can be fitted into attractive pay scales. The advancement of scientists will be based solely on their ability to do outstanding work and provide effective leadership. Posts will be created which are commensurate with the scientific attainments of the candidate. Whenever a scientist is considered fit for promotion, his pay scale will be raised even though he may be holding the same post, when appropriate posts at higher levels are not available.

Four categories

It will also be seen that facilities exist for scientists to move from one place of work to another without loss or interruption of service benefits. Under the reorganized ICAR, there will be scientists belonging to the Givernment and non-Government cadres and easy movement of personnel from one cadre to another should be possible.

It is proposed to employ four categories of research scientists—those working in institutes regarded as subordinate offices of the Food and Agriculture Ministry: those in the offices attached to the commodity committees; those employed directly in the ICAR—sponsored or administered projects and those in all-India coordinated projects where funds are provided by the ICAR but the staff is administratively integrated with the respective State departments.

Initially, this service will not be extended to the State departments of agriculture, although efforts will be made to persuade the State Governments to prescribe similar qualifications and scales of pay for their scientists. Before financing the research schemes in the States, the ICAR will make sure that provision has been made for competent scientists and that the scales of pay are such as to attract suitable scientists.

Fewer grades

According to the scheme, to avoid frequent shifts from one scale to another, it is necessary to provide fewer grades. The five grades proposed are: Rs 400 to Rs 750; Rs 750 to Rs 1,000; Rs 1,000 to Rs 1,600; Rs 1,600 to Rs 2,000 and Rs 2,000 to Rs 2,750. Recruitment may be made at any of these levels, depending upon the calibre of the scientist. There will be a few special posts carrying salaries of Rs 2,750 to Rs 3,000 and Rs 3,500 for scientists who have made outstanding contributions to either increasing crop production or advancement of human knowledge.

All scientists employed in different types of institutions can be considered for the service, but the exact grade in which each officer should be fitted will have to be considered by a selection committee constituted by the ICAR. It would thus be possible to weed out unproductive individuals from research institutions as well as to encourage those who have done good work. Subsequent recruitment will be through advertisements.

The Food and Agriculture Ministry is now considering the financial implications of the scheme.

"HINDUSTAN TIMES"
Monday Oct 18, 1965

Agriculture University helps in food drive

From our Correspondent

Ludhiana, Oct. 17—Punjab Agriculture University has launched a crash programme in response to Prime Minister Shastri's appeal to raise food production.

The university has presented two seeds bags of 2½ kilos each, one containing PV-18 and the other best variety C-306 or C-275, to 30 of the State's progressive farmers.

This is probably the first time the university has made a direct approach to farmers.

During this season the university had a yield of 87 maunds of wheat per acre by using the Mexican variety named PV-18. This achievement has already been greatly appreciated by the Centre.

Dr Dilbagh Singh Athwal, professor of plant breeding, who had invited 30 farmers from Punjab to receive seeds, was responsible for the discovery of this new dwarf wheat.

He told the farmers that on the basis of results of these tests on cultivators' fields the university would decide to release new dwarf wheat PV-18 for large-scale cultivation in Punjab. He said the university planned to produce about 1,500 maunds of nucleous seeds of this variety during the coming rabi season.

Jullundur: In response to Mr Shastri's appeal, the farmers are evincing keen interest in the grow more food campaign. Preparations are being made for rabi sowing. Of the 7,000 tons of fertilizers allotted to Jullundur district, 4,000 tons will arrive here on Nov. 2, according to Mr Kulwant Singh, Deputy Commissioner.

Farmers will also be given other facilities for intensive cultivation. With the reclamation of 20,000 acres of banjar land, the Bajwara block will produce 30,000 maunds of additional wheat in May. More land will now be brought under wheat.

THE ILLUSTRATED WEEKLY OF INDIA

October 24, 1965

"GROW MORE FOOD". Prime Minister Lal Bahadur Shastri, on his 61st birthday, is offered a bouquet of "bhuttas" by Union Food Minister C. Subramaniam. Looking on is Mrs. Shastri.

The Hindustan Times, Monday, November 29, 1965 (3)

Viswanathan for proper use of farm research

By a Staff Correspondent

New Delhi, Nov. 28—Chief Commissioner Viswanathan today expressed the hope that by proper utilization of the results of scientific research already available, India's food problem would be solved before long.

He was inaugurating the Jawahar-Jounti Seed Co-operative.

Congratulating the farmers of Jounti village on their excellent achievements during the last season when some of them could obtain yields of the order of 48 maunds per acre while others harvested only between 20 to 35 maunds, he said the pioneering enthusiasm of Jounti village should inspire farmers everywhere.

Dr M. S. Swaminathan, head of the division of Botany, Indian Agricultural Research Institute, explained the name Jawahar-Jounti Seed Co-operative as a homage to Jawaharlal Nehru who once said: "Everything can wait but agriculture cannot."

The farmers of Jounti will produce seeds of hybrid bajra for which there is a great demand during the months of February-May in sugarcane fields after harvesting sugarcane.

It is expected the co-operative will be able to meet the entire needs of the Delhi Union Territory for wheat seeds from 1966.

Three tractors and a number of bullock ploughs are being used in New Delhi to grow food grains and vegetables in bungalows occupied by Ministers and officers of the Government.

So far, 25.13 acres of land have been put under cereals and vegetables—14.47 acres under vegetables and 10.66 acres under cereals.

The officers themselves are bearing the expenses on growing vegetables and food grains.

Compounds of some office buildings have also been acuired for cultivation. These include the office of the vigilance Commission, Punjab High Court, Upper Air Observatory and Exhibition Grounds.

A small plot of half an acre has been acquired in Rajghat for potato cultivation.

NSC BULLETIN

Vol. 1. No. 7 November, 1965

THEY THAT SOW IN TEARS : SHALL REAP IN JOY
HE THAT NOW GOETH ON HIS WAY WEEPING,
AND BEARTH FORTH GOOD SEED
SHALL DOUBTLESS COME AGAIN WITH JOY
AND BRING HIS SHEAVES WITH HIM

Book of Common Prayer
Psalm CXXVI.

THE SECOND OCTOBER

The 2nd October every year is celebrated as a symbol of Indian freedom—freedom from want and hunger—which the Father of the Nation, Mahatma Gandhi, aspired for the Indian people. Besides the importance of this auspicious occasion as the birthday of the Mahatma, this day marks the beginning of new ideas, renewal of our pledge to work with sincerity and determination for the development of country's economy.

Second October, this year, was celebrated with new zeal when Shri C. Subramaniam, Union Minister for Food & Agriculture presented to the Prime Minister (on the latter's birthday synchronizing with that of the Mahatma), a bouquet, not of flowers nor of any routine type of offering commonly presented on birthdays, but of cobs of hybrid maize and *bajra* alongwith a sincere pledge of hard work by all those concerned with the agricultural development in the country. On behalf of the agriculturists of the country. Shri C. Subramaniam assured the Prime Minister that **Indian farms were pledged to back Indian arms.**

(See also pages 3 & 4)

PRESERVATION OF QUALITY IN SEEDS

(D. S. Rana)

(Highly technical process is required in order to produce improved seeds. The concept that a healthy grain can serve to be a good seed is not wholly true. and acceptable as science has now proved that for producing healthy seed, scientific means have to be adopted.. Much progress has been made in this direction in advanced countries like U. S. A. .The Rockefeller Foundation has rendered active support to implement the idea of producing improved seeds with scientific methods. For this purpose the Rockefeller Foundation has been sponsoring scientists from India to study and do research in leading universities and research stations in U. S. A.

In this write-up, Shri D. S. Rana, one of the officers of the Corporation who underwent study and research in improved seed production in U. S. A. under a Rockefeller Foundation scholarship gives the scientific bases adopted for preserving high quality in seeds.

This write-up is a useful supplement to the comprehensive article published in NSC Bulletin (Vols 2 to 5) under title, Processing and Preserving High Quality Seed.—Editor).

During my stay of little over one year in Lincoln, Nebraska and some other places in U. S. A., under a Rockefeller Foundation Scholarship, I worked, most of the time with the Foundation Seed Division of the University of Nebraska, on production, processing, seed inventory and marketing of foundation seed of hybrid corn, hybrid sorghum, soybeans, wheat and oats. Since the University of Nebraska produces only foundation seed of different crops, I also visited some other private and public organisations to study production, processing and marketing of certified as well as foundation seeds.

The procedure of drying, processing and marketing followed by the above mentioned and other companies is basically the same.

SEED DRYING

The drying of seed is very important as low moisture percentage in seed improves the storability and saves the seed from heat, insects and diseases. After drying, the seed may be held in storage until it is cleaned or sent directly into the cleaning line.

Seed corn is dried by forcing heated air through the ear corn. The ear corn is placed in drying bins which have false floors. Most of the processing plants have upper and lower ducts in the middle, and drying bins on both sides, so that the air can be reversed. The temperature of the heated air is maintained at 110° F or a little below, and the seed is dried to 12% moisture. Seeds of some small grains and vegetables are dried even to 10% or below.

SEED PROCESSING

The first phase of precessing is precleaning. This involves scalping off large trash and removing of awns and other foreign material by using scalpers. The next step is the basic cleaning. Here the material larger or smaller than the good seeds are removed and the good seed is generally sized and cleaned. The air screen machine is the basic machine most often found in this type of operation. Sometimes seed can be brought up to the required purity in this operation, more often additional separating and up-grading is carried out.

Rocket graders or the Simon Carter Precision graders are used for width and thickness sizing; disc and indent cylinder separators for length sizing of seed; gravity separators for removing the immature seeds, weed seeds, or foreign material, such as particles of soil which are of the same size as the crop seed but whose specific gravity is different from that of the crop seed.

(To be concluded)

CORRIGENDUM

In the article entitled, Coordinated Sorghum Hybrid No. 2, by Drs. N. Gangaprasada Rao and Leland R. House, published in Vol. I, No. 6, September, 1965 issue of NSC Bulletin, the table giving comparative yields of local and hybrid sorghums may please be corrected as under:—

Second column of the table may be read: 'Fodder yield as % of local' instead of 'grain yield as % of local'.

NEWS & VIEWS

FIELD DAY

A field day was organized on this historical day, 2nd October, 1965, at the fields of the Indian Agriculture Research Institute in the Pusa Institute under the auspices of the National Tonnage Club of Farmers and the All India Crop Improvement and Certified Seed Producers' Association. The function was inaugurated by Shri C. Subramaniam, Union Minister for Food & Agriculture, and was attended by Dr. V. K. R. V. Rao, Member, Planning Commission, Shri B. Sivaraman, Secretary, Department of Agriculture in the Union Ministry of Food & Agriculture, Dr. M. S. Randhawa, Chairman, NSC, Dr. B. P. Pal, Director General, I. C. A. R., officials of NSC, I.A.R.I., a number of progressive farmers and others.

Speaking on the occasion, Shri Subramaniam exhorted the **research workers in the agriculture field to work hard and coordinate their research work with the needs of the farmers**. He admitted that there were certain shortcomings still to be overcome, but he felt that a zealous and spirited approach by all those concerned with agriculture—from administrator, research worker to the farmer —the shortcomings could be quickly overcome. The Minister significantly **paid tributes to the jawans who had shown admirable spirit of valour and fought for the defence of the country with the available resources. He said that the same very spirit should prevail with the farmers and they should work with enthusiasm and detemination to increase agricultural output to the maximum, by exploiting all available resources.** Shri Subramaniam also emphasized the need for boosting up export of agricultural produces in order to earn more foreign exchange which was one of the biggest needs of the hour. He said that, to begin with, export potential of berseem and jute could be exploited.

(Continued on page 4)

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TRAINING PROGRAMME

For the last two years, the National Seeds Corporation has been sponsoring training programme for its staff as well as for representatives of the seed producers. The training is imparted in seed production, processing etc., with the objective that those who grow seed crop and those who operate seed processing plants should be thoroughly conversant with the right practices of seed production and operation principles.

With the expansion in seed production, need for additional trained personnel is growing. The Corporation is, therefore, establishing a longer and more thorough training programme this year with the active advice and assistance of the Rockefeller Foundation, USAID and the Ford Foundation. The coming training programme is scheduled to begin on 13th December, 1965, for a period of about two months. It would be possible to include a limited number of representatives of seed producers at this session. The second training programme would be scheduled for early February, 1966. The training in both the programmes would relate to seed processing, seed production, machinery adjustment and maintenance, seed laboratory techniques, seed certification etc.

Those of the seed producers and growers who are producing seed under the certification system of the N. S. C., and who wish to take part in this training programme may immediately write to the National Seeds Corporation, giving participant's name and the post he is holding|he would hold in the seed organisation sponsoring the candidate.

(Continued from page 3)

Dr. V. K. R. V. Rao spoke of the great need of agricultural development in the country during the Fourth Plan Period in order to achieve self-sufficiency in food. He said that very high importance had been given to agriculture in the Fourth Plan and the targets fixed should not be mere paper targets; these would have to be achieved by sincere and strenuous efforts.

AGRICULTURAL EXHIBITION

The field day was organized in accordance with the spirit of the auspicious day of 2nd October by putting up an exhibition depicting the activities of various organisations engaged in the research and development of agriculture in India. The visitors evinced keen interest in the role of NSC (as briefly depicted in the exhibition) and appreciated the leadership given by it in the development of a healthy seed industry in the country. Shri C. Subramaniam accompanied by Dr. V. K. R. V. Rao, inspected the NSC stall. Dr. V. K. R. V. Rao greatly admired the quality of seeds handled by NSC.

The visit of the invitees was later arranged to the fields where crops of hybrid maize, sorghum and *bajra* were standing. The farmers visiting the fields were thrilled at the sight of the miraculous performance of the hybrids. They left the fields with a feeling of satisfaction and hope that hybrid seeds could show a sure way to prosperity.

A view of NSC exhibits : Shri C. Subramaniam and Dr. Rao admiring the healthy seed of Pusa Sawani Bhindi.

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MORNING

The Deccan Chronicle

Founder: K. S. RAJAGOPAL

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SECUNDERABAD, WEDNESDAY, DECEMBER 22, 1965

Dr. C. V. Raman delivering the presidential address of the 31st annual meeting of the Indian Academy of sciences; Mr. Pattom Thanu Pillai and Dr. D. S. Reddi, are to his left.

—Photo: Chronicle

Big Boost To Jowar Production Thro' Genetic Engineering

(By Our Staff Reporter)

HYDERABAD, Dec. 21.

The nine million tons of jowar currently being produced in the country on 43 million acres could easily be produced on nine million acres, at the maximum, with the hybrid variety evolved in our research institutions, said Dr. M. S. Swaminathan, Head of the Botony division of the Indian Agricultural Research Institute, New Delhi here today.

Delivering a public address on "Plant Genetics and Food Production," in connection with the three-day meetings of the Indian Academy of Sciences, the distinguished botnoist said that plant genetics had ushered in a new hopeful era in Indian agriculture by opening up new vistas in crop yields.

Through a process of genetic and chromosome engineering, very high yielding varieties of maize, jowar and bajra (cumbu) had been developed during the past four years, he said.

These varieties and hybrids, Dr. Swaminathan said, if grown with adequate quantities of fertiliser and water could yield four to six tons of grain per hectare. Since a minimum of two crops could be grown in our irrigated lands, the yield potential of our lands could be as high as ten to twelve tons per hectare.

In fact, at the Botony Division of the Indian Agricultural Research Institute, 5.8 tons of maize were harvested in October this year in the same hectare of land in which 6.3 tons of wheat had been harvested earlier in April. Such favourable situation for high production did not exist in the temperate areas of the globe, he said.

With the hybrid jowar, he said, even a poor farmer could obtain one ton yield per acre and with this an altogether new land use patterns could be envisaged. The varieties of hybrids recently produced by our geneticists were all maturity-oriented and could be grown in any season, provided there was water and the temperature was not too unsuitable.

New Era

Dr. Swaminathan pointed out that we in India were only at the beginning of the scientific age with reference to agriculture. The new genetic tools had conferred upon man the powers of "brahma" as far as the creation of new varieties was concerned. The branched wheats evolved at the Indian Agricultural Research Institute through the use of atomic radiations would open a new dimension in wheat yields. The production of amber coloured grains from Mexican varieties with red grain within two seasons was an example of the rapid progress possible.

Genetic manipulation of quality had just begun and already wheat varieties with over 14% protein content had been selected. The discovery made at the Nutritional Research Laboratories, Hyderabad, that excess of the amino acid leucine in the jowar grain was responsible for the occurrence of pellagra in populations mainly subsisting on jowar, had paved the way for breeding jowar varieties low in leucine content, Dr. Swaminathan added.

"The rapid increase in the demand of fertilisers during the last years is due to the striking response shown by the new varieties and hybrids to fertilisers application. During the spread of intensive agricultural practices, new problems such as new diseases and pests will crop up and it is essential that genetic research in the country is developed to the extent necessary for anticipating some of these problems and solving them quickly," he said.

Plant Paradise

Earlier, Dr. Swaminathan stated that India was a paradise for plant growth as was clear from the occurrence of over 20,000 plant species in the country, a number far surprising than found in countries of a much larger land area such as the USSR and USA.

The laws of heredity discovered by Gregor Mendel in 1865 had made it possible for us to synthesise plant varieties which could utilise more efficiently solar energy as well as chemical energy applied in the form of organic and inorganic manures. Genes or the factors determining hereditary characteristics were located on rod-like bodies called chromosomes, whose number was constant in every species. While the history of the earth was written in its layers, the history of all living organisms was inscribed in their chromosomes, he said.

Changes In Atmosphere

Mr. C. Ramaswami, Director General of Observatories, in an interesting lecture dealt with the "dramatic" changes taking place in the upper atmospheres in middle and high altitudes towards the end of winter and biennial changes high up over the equatorial regions. He explained how the probing of the atmosphere by rockets led to these spectacular discoveries. Thumba, the new rocket launching station near Trivandrum, was India's contribution to this fascinating branch of rocket meteorology.

Regarding the satellite meteorology,

(Contd. on page 8)

Indian Academy Of Sciences

(Contd. from page 1)

Mr. Ramaswami said that the credit for opening up this new branch should go to the American scientists. The meteorological satellites were still in the research and development stage but even during this period, they had proved to be of great operational value. They had provided a very useful new tool in the hands of weather forecasters all the world over. They had also provided an enormous amount of new type of observational material which should help us to unravel the mystery of the cyclones of the Bay of Bengal and the Arabian Sea, Mr. Ramaswami added.

Phytotoxicity

Prof. T. S. Sadasivan, Director of the U.G.C. Centre for Advanced Studies in mycology and plant pathology, Madras, in a lecture on "Phytotoxicity," said that although phytotoxicity was recognised as a fundamental problem over a half a century ago, its importance was gaining ground ever since the discovery of powerful chemotherapeutan and antibiotics. "We are now entering into an age of systematic fungicides and therefore to keep pace with these newer developments a more critical study of life processes in plants seems essential." The very vastness of the problem of phytotoxicity underlined the need to understand the physiology of a plant system under the stress of chemical and antibiotics, he said.

Times of India
December 29, 1965.

Mr. C. Subramaniam, Union Food Minister, addressed the fifth convocation of the Indian Agricultural Research Institute, New Delhi, on Tuesday. He is being greeted by departmental heads of the institute. —TOI. photograph.—(Report on page 3)

NEW SCIENTIST 16 DECEMBER 1965

A charming set of tributes to the late J. B. S. Haldane is published in a "Haldane Number" of *Science Reporter*, the excellent magazine of the Indian Council of Scientific and Industrial Research. It was, of course, in India that Haldane spent his last years, and apart from tributes from Britain, the USA, the USSR and France, there are accounts by Indian scientists of their associations with the great man. M. S. Swaminathan, for example, tells of Haldane's stimulation of experiments on cooperation and competition among varieties of rice and also on improvement of coconuts. Appropriately, too, the last word is Haldane's, with a reprinting of his poignant but very funny verses on his experiences with rectal carcinoma.

शाखाओं में बंटी हुई बालवाली गेहूं की नयी किस्म

अब गेहूं भी रंग बदलेगा

● रमेशदत्त शर्मा

'देश पर अभी भी खतरा है। इस संकटकाल में जवान ने खून देकर, प्राणों की बाजी लगाकर देश की रक्षा की है। क्या हमारे किसान भाई किसी से पीछे रह सकते हैं ? वे भी आगे आयें और अपना श्रम और पसीना दें।' प्रधानमन्त्री श्री लालबहादुर शास्त्रीने खाद्यान्न-मोर्चेको सैनिक मोर्चेके समान ही महत्वपूर्ण कहा है। और यह मोर्चा इसलिए और महत्वपूर्ण हो गया है' क्योंकि इसके निमित्त हमपर राजनीतिक दबाव डालनेकी कोशिश की जाने लगी है। आज हमें आत्मनिर्भर होना है और अधिक अन्न उपजानेके अभियानको सफल बनाना है। इसी सन्दर्भमें प्रस्तुत है 'गेहूं' पर यह महत्वपूर्ण लेख।

'गेहूं रुपयेका सोलह सेर बिक रहा है। यदि यही हालत रही तो लोग भूखों मर जायेंगे।' (सन १८६५ में एक दैनिक पत्रमें मंहगाईके बारेमें छपी खबर)

● "छी!" चन्दोने नाक चढ़ाई, "लाला वो भी कोई गेहूं है। लाल-लाल भूंजा हुआ-सा लगता है, मानो किसीने उसका सारा सत निचोड़ लिया हो। रोटी ऐसी चिकड़ी बनती है, जैसे चमड़ेकी हो। एक बार मैं ले आयी थी, तो हमारे उन्होंने उसकी रोटी छूकर न दी। लाला, हमें तुम कुछ महंगा ही दे दो, हम तो दो क्या पौने-दो सेरका भी देसी गेहूं ले लेंगे।"

"अरी हवा खा," लाला दो टकेके मजदूरकी औरत देखकर तिनक पड़ा "तू पौने दो लिये फिरती है। देसी गेहूं बाजारमें है ही नहीं। जब आयेगा तो भी समझ ले, चौदह-बारह छटांकका बिकेगा।"

उस दिन चन्दोका पति बुधई भी, जो गिरहकटी छोड़कर रिक्शा चलाने लगा था 'मोटे शरबती दानेके देसी गेहूं' को ललचायी आंखोंसे देखकर खाली हाथ लौट आया।... फिर पाण्डेगंजके अनाजके गोदामसे देसी गेहूंकी बोरी चुराकर ला रहा था, पकड़ा गया... और चन्दो हवालाती दागीकी लुगाई बन गयी (**देखिए, श्रीमती चन्द्रकिरण सोनरेक्साकी कहानी 'देसी गेहूं', 'धर्मयुग', २३ मई, १९६५**)।

● दूसरे विश्वयुद्धसे पहले हमारा देश अनाज बाहर भेजता था। विश्वयुद्धके बाद वह उन देशोंमें अग्रगण्य है, जो अपना पेट भरनेके लिए दूसरे देशोंका मुंह जोहते हैं। मोहनजोदड़ो, हड़प्पा और नाबदाटोली-महेश्वरकी खुदाईमें मिले गेहूंके दाने बताते हैं कि गेहूं बड़े पुराने जमानेसे (लगभग पांच हजार वर्षसे) भारतका प्रमुख धान्य रहा है। वैज्ञानिक मानते हैं कि अफगानिस्तान, अबीसीनिया और भारतसे ही गेहूं सारी दुनियामें फैला। (आश्चर्य है कि वेदोंमें गेहूं (गोधूम) का जिक्र नहीं है)। आज इस शस्य श्यामला भूमिकी हालत यह है कि बुधई जैसे कितने ही इसके बेटे अमरीकासे आये भुंजे-से चेहरेवाले लाल-लाल गेहूंको गलेसे नीचे उतार नहीं पाते और शरबती गेहूं खेतोंकी गोदसे निकलकर सीधा गोदाम ही पहुंचता है।

● ....कड़कती धूप। पसीनेसे लथपथ एक सांवला नौजवान गेहूंके गोरे खेतमें खड़ा है। एक-एक बाल लेता है और हथेलीपर रगड़कर दाने निकालता है। फिर ध्यानसे दानोंको देखकर पास ही रखे बोरेमें या बाल्टीमें डालता जाता है। रगड़ते-रगड़ते हथेली लाल हो गयी है, तीखे सीकुरोंने कई-बार उसकी हथेलीमें धंस कर उसे परेशान कर दिया है।

आजसे नहीं, पिछले एक महीनेसे चौबीस वर्षीय जार्ज वर्गीजका नित्य नियम बन गया है कि पौ फटते ही खेतपर पहुंच जाना, फिर जहां कल छोड़ा था, वहांसे एक-एक पौधे की बाल लेकर उसको हथेलीपर रगड़कर दानोंका रंग देखना। बारह-एकके बीच होस्टल आकर खाना खा लेना और फिर खेतपर।

मैंने कहा, "हमारे यहां तो जब किसान खेतपर काम करता है, तो उसकी पत्नी वहीं उसे खाना या 'कलेऊ' पहुंचा देती है। तुम्हारे लिए ऐसा इन्तजाम नहीं हो सकता था ?"

जार्ज कुछ नहीं बोला, शरमाकर, रह गया।

पूरे एक महीनेमें उसने गेहूंके १,२०,००० पौधोंकी बालें रगड़ डालीं। यह पूराका पूरा खेत लाल गेहूंका था

(बायें) भारतीय कृषि अनुसन्धान परिषद, नयी दिल्ली का 'गामा-गार्डन' जहां पौधों को (आम तौर पर बीज) रेडियो विकिरण की खुराक देकर उनकी नस्ल सुधारी जाती है। (दायें) गेहूं की आदमकद नाजुक किस्म को मजबूत काटी की बौनी किस्म में बदलने वाले डॉ. एम. एस. स्वामीनाथन

इन पौधोंको भारतीय कृषि-अनुसन्धान शालाके गामा-गार्डन में गामा-किरणोंको खूराक दी गयी थी। इस विकिरणका असर यह हुआ कि १,२०,००० पौधोंमें जार्जको कुल ३० पौधे ऐसे मिले हैं, जिनके दानोंका रंग देसी शर्बती गेहूंसे टक्कर लेता है। अब इनको बोया जायेगा और फिर जो फसल होगी, उसके दानोंका रंग देखा जायेगा। जार्जको पूरा भरोसा है कि लाल गेहूंके इन मुट्ठी भर रंग बदले दानोंसे, फसल-दर-फसल उगाते जानेके बाद एक दिन उन सभी चन्दो और बुधइयोंकी शिकायत दूर की जा सकेगी, जो लाल रंगसे घृणा करते हैं। और शायद खाद्य-समस्या भी, क्योंकि गेहूंकी यह किस्म एक एकड़में ८० मनकी पैदावार देती है, प्रचलित किस्मोंसे दुगुनी।

गेहूंने रंग बदला तो क्यों ? वास्तवमें आजका विज्ञान फसलोंके रंग-ढंग बदलनेमें बड़ा माहिर हो गया है। पहलेसे अधिक पैदावार वाली, मोटे दानेवाली, दानोंकी अधिक कतारोंवाली, अधिक प्रोटीन और अधिक विटामिनवाली और पहाड़ोंसे लेकर रेगिस्तानों तक हर तरहकी जमीनोंमें उगनेवाली फसलोंकी नयी-नयी किस्में अब वनस्पति-विज्ञानियोंके इशारोंपर पनपती जा रही हैं। क्योंकि वे प्रकृतिके उस रहस्यको समझ गये हैं, जिसने इतनी विविध वनस्पतियों और भांति-भांतिके जन्तुओंको जन्म दिया है। गेहूंको ही लें तो कभी ये एक मामूली घास जैसा था, जिसे भूमध्य-सागरीय प्रदेशकी घटिया मिट्टीमें आज भी कुछ आदिवासी जातियां उगाती हैं। और आज सारी दुनियामें गेहूंकी अठारह जातियां हैं। भारतमें गेहूंकी पांच जातियां मिलती हैं जिनके वैज्ञानिक नाम हैं : **ट्रिटिकम एस्टीवम, ट्रि. (ट्रिटिकम) डुरम, ट्रि. डाइकॉकम, ट्रि. स्फीरोकॉकम,** और **ट्रि. टर्जिडम**। इनमेंसे **ट्रि. स्फीरोकॉकम** और **ट्रि टर्जिडम** की खेती अब कोई नहीं करता। **ट्रि. डाइकॉकम** महाराष्ट्र, मैसूर, आन्ध्रप्रदेश, और मद्रासके कुछ इलाकोंमें उगाया जाता है। **ट्रि. एस्टीवम** और **ट्रि. डुरम** ये दो जातियां प्रमुख रूपसे उगायी जाती हैं। पंजाब उत्तरप्रदेश, बिहार, मध्यप्रदेश, और राजस्थान मुख्य गेहूं-उगावक प्रदेश हैं और यहां **ट्रिटिकम एस्टीवमका** चलन है। गेहूंकी खेतीके कुल क्षेत्रफलकी दृष्टिसे उत्तरप्रदेश और प्रति एकड़ पैदावारके लिहाजसे पंजाब सबसे आगे है। सारे भारतमें तीन करोड़ तीस लाख एकड़में गेहूं होता है और कुल पैदावार है एक करोड़ टन (खानेवाले ४५ करोड़!)।

हिरोशिमा और नागासाकीमें जिस परमाणु-शक्तिने ताण्डव-नृत्य किया था, वही आज अन्य फसलोंके साथ-साथ गेहूंके सुधारमें भी लगी है। फसल-सुधारके लिए 'एक्स-

● शेष पृष्ठ ४७ पर ⟶

गेहूं की सीकुर विहीन किस्म (दायें) से रेडियो विकिरण द्वारा पैदा की गयी सीकुर युक्त किस्म

→ पृष्ठ २६ का शेष

अब गेहूं भी रंग बदलेगा

किरणोंका उपयोग करनेकी बात पहली बार सन् १९२७में अमरीकाके प्रो. मुलरने घोषित की थी। उन्होंने बताया कि 'एक्स-किरणों' से पौधोंके गुणोंके वाहक—गुणसूत्र बदले जा सकते हैं। इस परिवर्तनको विज्ञान उत्परिवर्तन (म्यूटेशन) कहता है। इन उत्परिवर्तित किस्मोंसे जो अच्छी हों, उन्हें छांट-छांटकर बढ़िया-बढ़िया किस्में निकाली जा सकती हैं।

भारतमें डॉ. स्वामिनाथन्‌ने इस ओर ध्यान दिया और आज वे अपने विषयके अन्यतम विशेषज्ञ हैं। उन्होंने भारतीय कृषि अनुसन्धानशालाके वनस्पति-विभागमें पहली बार एक 'गामा-गार्डन' स्थापित किया, जहां पौधोंको 'गामा-किरणों' द्वारा उपचारित किया जाता है। डॉ. स्वामिनाथन्‌ने 'एक्स-किरण', 'गामा-किरण', 'फास्ट' और 'थर्मलन्यूट्रॉन' तथा 'बोटा-कणों' के अलावा उत्परिवर्तन पैदा करनेवाले अनेक रसायनोंका इस हद तक प्रयोग किया है कि वे भली-भांति जानते हैं कि किस पौधेपर कौनसे विकिरणका उपयोग वांछनीय होगा।

गेहूंके साथ सरल स्वभाव स्वामिनाथन्‌ने बड़ी खिलवाड़ की है। किसी भी एक जातिके पौधोंपर विकिरण डालकर, उनसे बाकी ज्यादातर जातियोंको पैदा कर लिया है। यह कुछ ऐसी ही बात है जैसे कोई बिल्लीसे शेर, चीता, वगैरह सभी सजातीय जानवर पैदा कर दे।

गेहूंमें गुणसूत्रोंकी मूल संख्या ७ है; आज जो जातियां उपलब्ध हैं, उनमें ७ गुणसूत्र वाली तो वही हैं, जो सिर्फ भू-मध्यसागरमें उगायी जाती हैं (द्वि. मोनोकॉकम), बाकी जातियोंमें १४, २१, २८ और ४२ गुणसूत्रोंवाली हैं, यानी मूलसे दुगुनी, तिगुनी, चौगुनी और छहगुनी संख्यावाली। एक रूसी वनस्पति-विज्ञानी जेबरकने एक चौगुने गुणसूत्र वाली— चतुर्गुणित जातिको षट्गुणित जातिसे मिलवाकर अष्टगुणित और दशगुणित जातियां पैदा कीं और सातका पहाड़ा पूरा किया। अब डॉ. स्वामिनाथन् और उनके युवा सहयोगी डॉ. रावने द्वि. एस्टिवम नामक षट्गुणित जातिके दानोंपर बोनेसे पहले 'एक्स' और 'गामा-किरणें', और 'फास्ट-न्यूट्रॉन' डालकर (इथाइल मीथेन सल्फोनेट नामक रसायन द्वारा भी) इस एक ही जातिसे नौ जातियां और पैदा कर दीं।

● डॉ. स्वामिनाथन्‌ने ही कुछ समय पहले विकिरण द्वारा गेहूंकी एक किस्म पैदा की है, जिसकी बालें शाखाओंमें बंटी होती हैं। यानी जितने दाने पहले तीन बालोंपर पैदा होते थे, उतने अब एक ही बालसे निकल आयेंगे। गेहूंकी एन. पी. (न्यू पूसा) ७९९ किस्मकी बालें सीकुर विहीन होती थीं, अब उसपर डॉ. स्वामिनाथन्‌ने ही 'गामा-किरणों' के द्वारा उत्परिवर्तन पैदा करके एक सीकुरयुक्त किस्म पैदा कर दी है—एन. पी. ८३६।

और लाल गेहूंको शरबती रंग देनेमें लगे जॉर्ज वर्गीसने मुझे लिखा है— "मैं जो भी कुछ कर रहा हूं, उसका श्रेय मेरे मार्गदर्शक डॉ. स्वामिनाथन्‌को है। उन्होंने ही मुझे इस कार्यमें प्रवृत्त किया, दिशा बतायी और हम गेहूंका रंग बदल सकें तो इसमें मेरी थोड़ी बहुत सहायता रहेगी, परन्तु मूलतः तो यह डॉ. स्वामिनाथन्‌की ही उपलब्धि होगी।" जॉर्ज वर्गिस डॉ. स्वामिनाथन्‌के निर्देशनमें पिछले दो वर्षसे मैक्सिको (अमरीका) के बौने गेहूओंमें उत्परिवर्तन-सम्बन्धी अध्ययन कर रहे हैं, डॉक्टरेटके लिए।

जॉर्ज वर्गीस जैसे कितने ही युवकोंको स्वामिनाथन् ने फसल सुधारके अमित सम्भावनाभरे मार्गपर बढ़ाया है।

पिछले दिनों वैज्ञानिक एवं औद्योगिक अनुसन्धान परिषद् की ओरसे जब उनको १९६१ का शान्तिस्वरूप भटनागर पुरस्कार (दस हजार रुपया) भेंट किया गया, तो १४० से अधिक शोध-प्रबन्धोंके लेखक (और कुल चालीस वर्षीय) स्वामिनाथन्‌ने कहा था कि गृह्य सूत्रोंसे लेकर चरक और सुश्रुत् तकने माता-पिता द्वारा सन्तानके गुण प्रभावित होने का वर्णन किया है.... लेकिन जिस विज्ञानमें इन सबका विस्तृत अध्ययन किया जाता है, उस आनुवंशिकी (जेनेटिक्स) को हमारे यहां बी. एस-सी के विद्यार्थियों (क्योंकि कुल एक प्रश्न आता है) विकल्पमें छोड़ देते हैं।...एक भी विश्व-विद्यालयमें जेनेटिक्सके प्रोफेसरका पद नहीं है और विकिरण द्वारा उत्परिवर्तन पैदा करके फसलोंके सुधारके तो कुछ प्रयत्न किये भी गये हैं, परन्तु पशुओंके नस्ल-सुधार कार्यक्रम में इस विधिका उपयोग नहींके बराबर ही किया गया है।

तीस-पैंतीस साल पहले मोर्गन और मुलर जैसे कुछ लोगों ने मक्खी मारते-मारते मारते जीव-विज्ञानकी इस नयी शाखा—आनुवंशिकी नींव रख दी थी। उस मक्खी— 'ड्रोसोफिला मेलानोगेस्टर' को आज 'आनुवंशिकी रानी' कहा जाता है, जिसपर बेहद प्रयोग किये गये हैं। कोई नहीं बता सकता कि कुल कितनी मक्खियां मारी जा चुकी होंगी। इन्हीं मक्खियों की बदौलत हमारी जानकारी इतनी बढ़ी है कि आज हम जानते हैं कि आदमीके कुल ४६ गुणसूत्रोंमेंसे प्रत्येक गुणसूत्र पर ४०,०००,०००,००० से अधिक न्यूक्लिओटाइडोंके जोड़े होते हैं, जो उसके समस्त गुणोंका निर्धारण करते हैं। क्या पता गेहूंके लाल रंगकी तरह, कल आदमीमेंसे भी अमानवीय घृणाके शिकार काले रंगको पैदा करनेवाले 'न्यूक्लिओटाइड' यानी जीनको निकाल फेंका जाये और वर्णभेद सदा-सदाके लिए समाप्त हो जाये।

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पृष्ठ: ४७ / धर्मयुग / १९ दिसम्बर, १९६५

THE INDIAN EXPRESS, WEDNESDAY, DECEMBER 29, 1965

Subramaniam for new ideas in agriculture

NEW DELHI, Dec 28 (PTI)— Mr C. Subramaniam, Union Food and Agriculture Minister, emphasised the need today to discard cropping patterns based solely on tradition and to examine the new possibilities opened up by research.

He said that higher standard of living could not be achieved except through an agricultural revolution and for that it was essential to adopt scientific methods of crop management.

"We have to radically alter the whole set of agricultural practices which were evolved to suit the conditions of an entirely different production range as well as the quantitative food needs. There is nothing derogatory to the prestige of our ancestors or of our present-day farmers if we emphasise the need to discard out-dated ideas and outmoded tools in agriculture."

Mr Subramaniam was delivering the convocation address at the Indian Agricultural Research Institute here.

Research application

Mr Subramaniam said that extension workers should keep in touch with what was going on in the research laboratories and convey to the farmers the latest findings which were fit for application. The time-lag between discovery and application must be reduced. Research findings with great applied significance were being rendered useless as no arrangements were made for their application.

Farmers needed impressive demonstrations in the fields and supply of the necessary inputs in time, as well as availability of an adequate quantum of credit facilities and assurance of a remunerative price he said.

Birth control

The Food Minister said a lasting solution to the food problem could be obtained only if the rate of population growth was checked. Scientists should evolve new and acceptable ways of achieving a more rapid recline rate in the population growth. This was a field of vital importance for research and it was not enough to put all faith in "borrowed methodology."

The Indian Council of Agricultural Research, the Council of Scientific and Industrial Research and the Indian Council of Medical Research, he said, should embark on joint activity to strike "fresh paths" in the field of birth control.

, 6 JANUARY 1966

BAL SAHNI EDAL FOR MINATHAN

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THE STATESMAN, 7 JANUARY 1966

More Food By Genetic Manipulation

THE INDIAN EXPRESS, THURSDAY, JANUARY 6, 1966 5

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Malayala Manorama - Weekly
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ഭട്നഗർ സ്മാരക സമ്മാനം നേടിയ ശാസ്ത്രജ്ഞന്മാർ

കോയമ്പത്തൂർ ആർ. നരേന്ദ്രനാഥ്

നമ്മുടെ ശാസ്ത്രജ്ഞന്മാർക്ക് ഭാരതത്തിൽ ലഭിക്കാവുന്ന ഏറ്റവും ഉന്നതമായ ബഹുമതിയാണല്ലോ ടോ നഗർ സ്മാരക സമ്മാനം. സുപ്രധാനങ്ങളായ ഈ നേട്ടങ്ങൾ സമാർജ്ജിച്ച ശാസ്ത്രത്തിന് മഹത്തായ സേവനം അനുഷ്ഠിക്കുന്നവർക്കാണ് ഈ സമ്മാനം കൊടുക്കുക, ആധുനിക ശാസ്ത്രത്തിന് ഭാരതത്തിൽ വർദ്ധിച്ചു വരുന്ന പ്രാധാന്യമാണ് ഇതിൽ നമുക്ക് കാണാവുന്നത്. കഴിഞ്ഞ വർഷം കേന്ദ്ര വിദ്യാഭ്യാസ മന്ത്രി ശ്രീ എം. സി. ചഗ്ളയാണ് 1960, 1961, 1962 എന്നീ കൊല്ലങ്ങളിലുള്ള സമ്മാനങ്ങൾ ശാസ്ത്രജ്ഞന്മാർക്ക് സമ്മാനിച്ചത്. കേന്ദ്രവിദ്യാഭ്യാസ മന്ത്രിയുടെ വാക്കുകളിൽ "ഇതാണ് നമ്മുടെ എളിയ നോബൽ സമ്മാനം., സാമൂഹ്യ ജീവിതത്തിൽ ശാസ്ത്രജ്ഞന്മാർക്ക് ന്യായമായി ലഭിക്കേണ്ട അംഗീകാരത്തിന് ഈ സമ്മാനംകൊണ്ട് ഔദ്യോഗികമായ മുദ്രകൂടി ലഭിക്കുന്നു. ഭാരതീയ ശാസ്ത്രജ്ഞന്മാരെ അവരുടെ കർത്തവ്യാനുഷ്ഠാനങ്ങൾക്കു പ്രോൽസാഹിപ്പിക്കുവാനും അവർക്ക് കൂടുതൽ നേട്ടങ്ങൾക്കുവേണ്ടി പ്രചോദനം നൽകാനും ഇത് ഇടവരുത്തുമെന്ന് ന്യായമായി പ്രതീക്ഷിക്കാം.

ആധുനിക ശാസ്ത്രത്തിൽ വിഭിന്നങ്ങളായ ശാഖകളിൽ പ്രവർത്തിക്കുന്ന നാലു ശാസ്ത്രജ്ഞന്മാർക്ക് ആണ്ടുതോറും സമ്മാനങ്ങൾ നൽകുന്നതിന് 1963-ൽ തിരുമാനിക്കുകയുണ്ടായിട്ടുണ്ട് ഒരു ശാസ്ത്രജ്ഞന് ഈ സമ്മാനത്തിനർഹനായിത്തീരുവാൻ നാൽപ്പത്തഞ്ചു വയസ്സിൽ കൂടുതലാകുവാൻ പാടില്ലെന്നും വ്യവസ്ഥയുണ്ട് സമ്മാനത്തുക പതിനായിരം ഉറുപ്പികയായിരിക്കും. യുവതലമുറയെ ലക്ഷ്യംവച്ചു കൊണ്ടാണിങ്ങനെ ചെയ്തിട്ടുള്ളതെന്ന സ്പഷ്ടമാണ്.

1960-ലെ സമ്മാനങ്ങൾ ബോംബെയിലുള്ള ടാറാ മൗലിക ഗവേഷണാലയത്തിലെ ഡപ്യൂട്ടി ഡയറക്ടർ ശ്രീ എം. ജി. കെ. മേനോനും, ബോംബെയിൽ തന്നെയുള്ള ഒരു സ്വകാര്യ ഔഷധ ഗവേഷണാലയത്തിലെ ഡയറക്ടറായ ഡാ. ടി. ആർ. ഗോവിന്ദാചാരിക്കും, മദിരാശി സർവ്വകലാശാലയിലെ സസ്യശാസ്ത്ര ഗവേഷണവിഭാഗത്തിന്റെ ഡയറക്ടർ ഡോ. ടി. എസ്. സദാശിവനും, ബോംബെയിലെ അണുപോർജ്ജസ്ഥാപനത്തിലെ എൻജനിയറിംഗ് വകുപ്പിലുള്ള ശ്രീ എച്ച്. എൻ. സേതുനസ്സും ആണ് ലഭിച്ചത്. പ്രപഞ്ചരശ്മിയെ സംബന്ധിച്ച പഠനങ്ങളിൽ, പ്രത്യേകിച്ച് മൗലികകണങ്ങളെക്കുറിച്ചുള്ള ഗവേഷണങ്ങളിൽ, ഉണ്ടായനേട്ടങ്ങൾക്കാണ് ശ്രീ. എം. ജി. കെ. മേനോനു സമ്മാനം കിട്ടിയത്. പ്രപഞ്ചരശ്മിയെപ്പറ്റിയുള്ള പഠനങ്ങളും പ്രധാനപ്പെട്ട എല്ലാ രാജ്യങ്ങളിലും പ്രാധാന്യം നൽകിവരുന്നുണ്ടെന്നു വസ്തുതാ സൂരണീയമത്രേ. ഇക്കാര്യത്തിൽ ഭാരതീയരായ പല ശാസ്ത്രജ്ഞന്മാരും ലോകവിഖ്യാതി സമാർജ്ജിച്ചിട്ടുണ്ട്. സസ്യരസതന്ത്രപരങ്ങളായ വിഷയങ്ങളിൽ പല നൂതനങ്ങളായ വിവരങ്ങളും ശേഖരിക്കുന്നതിനു ഡോ. സദാശിവനു സാധിച്ചിരിക്കുന്നു. സസ്യസമൃദ്ധമായ ഭാരതത്തിൽ ഈ ശാഖയിലുണ്ടാകുന്ന പുരോഗതി പല തരത്തിൽ പ്രയോജകീഭവിക്കുമെന്നതിൽ സംശയമില്ല. ട്രോംബേയിലെ പ്ലൂട്ടോണിയം സ്ഥാപനത്തിന്റെ സംവിധാനത്തിനു ഗണനീയങ്ങളായ സേവനങ്ങൾ ഡോ. സേതുനായിൽ നിന്നു ലഭിച്ചിട്ടുള്ളതുംഗീകരിച്ചാണ് അദ്ദേഹത്തിനു സമ്മാനം നൽകപ്പെട്ടത്. ഭാരതീയ ശാസ്ത്രജ്ഞന്മാരും സാങ്കേതിക വിദഗ്ദ്ധന്മാരും തനിച്ചാണ് ഈ സ്ഥാപനത്തിന്റെ നിർമ്മാണം മുഖ്യമായി നിർവ്വഹിച്ചിട്ടുള്ളത്. ഭാരതം അണുപോർജ്ജത്തിന്റെ പ്രയോഗക്കാര്യത്തിൽ മഹത്തായ സ്ഥാനം കരസ്ഥമാക്കിയിട്ടുള്ളതു നമുക്ക് അഭിമാനത്തിനു വക നൽകുന്നുണ്ട്.

1961-ലെ സമ്മാനങ്ങൾ ഡോ. ജി. എൻ. രാമചന്ദ്രൻ, ഡോ. മിസ്സിസ് അസിമാചാരർജിഹൈരാ, ഡോ. എം. എസ് സ്വാമിനാഥൻ, ഡോ ആർ.ബി.

ഡോ. സ്വാമിനാഥൻ കേന്ദ്രമന്ത്രി ശ്രീ ചഗ്ളയിൽ നിന്ന് അവാർഡ് സ്വീകരിക്കുന്നു

THE CANBERRA TIMES, SATURDAY, JANUARY 29, 1966

Times of India 12.2.66

India wants help to raise production

India would look to Australia perhaps more than to any other country for help to develop its agriculture, Dr M. S. Swaminathan said yesterday.

Dr Swaminathan, Head of the Division of Botany at the Indian Agricultural Research Institute, New Delhi, and Mr K. P. A. Menon, Secretary-designate of the Indian Council of Agricultural Research, are visiting Canberra to study the organisation of scientific work in Australia, particularly that of the CSIRO.

"The Indian Council of Agricultural Research is being reorganised to spearhead the agricultural 'revolution' in India effectively," Dr Swaminathan said.

"One of the most important things in science is to ask the right questions. This is particularly important in India, where resources — finance and scientific manpower — are scarce.

Science has answers

"I think Australian scientists have managed to ask the right questions and find the right answers in a reasonable period of time."

Dr Swaminathan said India needed as much help as possible in building up its agricultural 'input' industry — the production of fertilisers and agricultural machinery — without which agriculture in his country could not be dealt with scientifically.

India would look for more help from Australia rather than from Europe or the United States, largely because conditions for crop growth were very similar in India and Australia.

Referring to drought and famine in India, Dr Swaminathan emphasised that the drought was the worst for 60 years.

"Our task is to make our agriculture so intensive that even the smallest holdings can produce a reasonable income," he said.

Better Seeds

Though a very high percentage of land under rice and wheat is officially claimed to have been covered by improved seeds the yields have been disappointing. This cannot be ascribed solely to inadequate irrigation and essential inputs but is due to a very considerable extent to the poor quality of seeds. The reluctance by co-operatives to distribute seeds produced at State farms of which there are about 4,000, and the heavy losses incurred by privately run registered seed farms are a further reflection on their quality. Nearly all the existing farms vary in size from 25 to 50 acres, and are, therefore, subject to inter-crossing with poor strains. Multiplication of doubtful strains by small farmers with little capital for inputs and technology leads to further deterioration. All this underscores the importance of stricter isolation of seed farms. This is best achieved by setting up large units, each of several hundred or a thousand acres. Besides, the proposal to bring 32.5 million acres under high-yielding varieties to increase the present production potential of 90-92 million tonnes (under normal weather conditions) to 125 million tonnes by 1970-71 calls for a vast programme for better seeds.

The National Seeds Corporation has set up impressive schemes for this purpose but they are not enough. According to official estimates, about 10 to 12 seed farms ranging between 5,000 to 15,000 acres will be needed to meet Fourth Plan requirements. Seed farming is a specialised business and requires scientific research, superior technology and management, involving investments on a large scale. Hence Mr. C. Subramaniam's proposal to persuade joint stock companies to participate in it. The success of such companies in producing high-yielding seeds in the plantation sector is encouraging. But opening the door to private enterprise alone is not the entire answer. Certain incentives too should be provided: suitable lands, an assured supply of water, fertilisers and pesticides; and a price policy providing for reasonable returns on investments. All this, of course, implies a pragmatic rather than doctrinaire approach to the problem of seed multiplication.

Times of India 12/2/66

THE HINDU, SATURDAY, MARCH 12, 1966.

OUR SCIENTISTS-1

An Outstanding Genetist

[This is the first in a series on young and outstanding scientists of India who have made notable contributions in their respective fields.]

At 40, Dr. Monkombu Sambasivan Swaminathan—who recently received the Birbal Sahni Medal of the Indian Botanical Society—already ranks among the topmost genetists of India with international recognition.

Dr. Swaminathan, who now heads the botany division of the Indian Agricultural Research Institute in New Delhi, has been engaged for over a decade in research in plant genetics. Many are the contributions which have won for him honours from national and international scientific bodies. But modest as he is, he wants to attribute the credit to his students and fellow workers in the Institute. The highest national honour received

by him so far is the Shanti Swarup Bhatnagar Memorial Award of 1961.

International recognition came to him in August 1965 when at a world meet of genetists at Brno, the Czechoslovak Academy of Sciences honoured him with the Mendel Memorial Award—which has not been conferred before on any Indian or even an Asian genetist. The other awards received by him were the Indian Journal of Genetics Medal (1964) and Timiraezev Academy of Agricultural Medal (1965). He was also the first Indian to be selected Vice-President of the International Congress of Genetists (1963).

Dr. Swaminathan was born in Kumbakonam in 1925. His father was a medical practitioner. Dr. Swaminathan took to agricultural science. He specialised in genetics because he saw in it the means to increase farm output. His later findings proved him right and showed that great spurts in crop yields could be accomplished through genetic manipulations, in conjunction with changes in agronomic practices.

Among his contributions may be mentioned the "Swaminathan Artificial Stigma Method" for successfully crossing two Mexican tuberbearing potato species. All previous attempts to make this cross had failed and the technique recommended by Dr. Swaminathan was taken up for follow-up action by foreign genetists. Similarly he accomplished the crossing of two jute yielding species which is of great value in improving the yield of jute.

More recently his primary interest has been in experimental manipulation of genes to improve the yields of wheat and cotton. As part of his research he organised a radiation genetics school in the Indian Agricultural Research Institute for studying indirect effects of radiation of plants. This work has a great bearing on the evaluation of the wholesomeness of irradiated food and some of his findings have been recently confirmed by genetists of the Cornell University (U.S.A.).

While all these have secured for Dr. Swaminathan a place among the top men of science, his most significant contribution to Indian agriculture is the initiation of Dwarf Wheat Breeding programme, which offers promise of making the country surplus in wheat output within the next few years.

Dr. Swaminathan believes in the practical application of science to supply the basic needs of the country. An example of this is the Jawahar Jount seed village near the IARI. A creation of his, the whole village is a seed farm engaged in breeding high yielding varieties of wheat and jowar evolved through genetic manipulations.

Dr. Swaminathan is married and has three daughters. He has no particular hobby. Keeping himself up to date with the latest developments in the field of genetics and attending to the needs of his family take up whatever time left after research and teaching work at the Institute.—B.S.P.

(Next: Dr. A. P. Mitra)

The Hindustan Times, Saturday, March 19, 1966 (3)

More Mexican wheat to be grown in Delhi

By a Staff Correspondent

New Delhi, March 18—High-yielding Mexican wheat given last year to Delhi villagers by the Indian Agricultural Research Institute has turned out to be a pace-setter for wheat farmers.

Grown under intensive cultivation methods beside ordinary wheat in Jounti village in the Kanjhawala block, the non-hedging, sturdy dwarf plants, with drooping ears heavy with healthy grain, have dispelled the initial scepticism farmers in the area are preparing for large-scale sowings next season.

Significant results have been obtained with Mexican wheat on a 300-acre mechanized farm in Punjabkhor village. The arid and alkaline soil been reclaimed cultivation at an expense of Rs 3,000 per acre.

The normal yield from Indian wheat varieties ranges from 15 to 25 maunds per acre. The standing crops, now almost ready for harvest, may yield 70 to 75 maunds per acre.

DR. SWAMINATHAN BECOMES MEMBER
World Biological Body

The International Council for Scientific Unions has nominated Dr. M. S. Swaminathan of the Indian Agricultural Research Institute as a member of the committee on the use and management of biological resources under the international biological programme. He will fill the place of Prof. G. Ledyard Stebbins of the U.S.A. who recently resigned from the committee.

The committee has initiated a worldwide programme on the efficient exploitation of all domesticated plants and animals.

Dr. Swaminathan has already left for Paris to attend the annual meeting of the committee.—PTI.

Mysore Motor Vehicle

The Hindustan Times, Monday, March 21, 1966

Farmer Govardhan and his sons working in their field at Jounti, a village in the Union Territory, where the Governm ent has started experimental seed farms as part of the Agriculture Production Year Pr ogramme.—Express photograph.

Jounti farm grows high-yield wheat

By Our Staff Reporter

NEW DELHI, March 18—Standing proudly amidst wheat stalks, Govardhan, earthy and sun-tanned, declared his resolve to ensure that every single grain of the high quality wheat produced on his farm was not consumed but used as seed to produce more seeds. "My family shall neither consume this wheat nor sell it to any one likely to gulp it down."

Govardhan's is one of the experimental farms in Jounti, a village 15 miles north-west of the Capital, where, with the help of the Indian Agricultural Research Institute, an exotic quality of dwarf wheat has been grown from a Mexican type of hybrid seed called Sonore 64.

If Govardhan's statistics are any indication, the results are astounding. He has found that Sonora 64 has raised the wheat yield on his farm from 35 maunds to 60 maunds per acre.

Explaining the high-yielding quality of Sonora 64 wheat, to a visiting Press party, an agricultural expert said that this could be ascribed to the shortness of its stalk. The conventional quality wheat had a much longer stalk. In the case of the new dwarf quality wheat, the soil's fertiliser content was not wasted on the length of the stalk but went to form seeds (or grain).

Furthermore, the expert said, being short, the stalk of the new quality wheat plant did not bend towards the ground and thus the danger of the rust disease was substantially eliminated.

Good seeds essential

A spokesman of the Union Ministry for Food and Agriculture pointed out that now it was being increasingly realised that, more than even provision of water and fertilisers, good seeds were essential for raising agricultural productivity.

Efforts were being made to develop an adequate supply of these high-yielding quality seeds. Therefore, the Sonora 64 wheat, grown on experimental farms in about 1,000 villages throughout the country, should not be consumed but preserved as seed for further sowing to increase its supply. "These farms are basically seed farms."

In the Union Territory there are five such seed farms at Paprawat, Jounti, Punjabkhor, Chattarpur and Mukhmelpur. It is planned to start more seed farms and bring the entire 30,000-acre wheat-growing area in the Union Territory under Sonora 64.

The Seed Corporation, which was formed recently by the Government, will coordinate the work of seed farms in the country and extend help to farmers. Schemes to provide high-yielding quality wheat seeds and propagate their use are the kingpin of the Government's Agricultural Production Year Programme.

The Press party was also shown the working of a multi-purpose cooperative society in Jounti and more experimental farms at Punjabkhor and the Indian Agricultural Research Institute.

PASSING BY

A TEACHER OF GENETICS FOR 30 YEARS

By A Staff Reporter

When a reputed professor moves out of his university and travels to distant lands he is bound to meet old students at likely, and even unlikely, places. Prof D. G. Catcheside from Australian National University in Canberra, now on a visit to the capital, shares this pleasant experience—though he does not remember it, Dr M. S. Swaminathan, the reputed head of Botany Department at the Indian Agricultural Research Institute, was one of the many students who attended his lectures at Cambridge many years ago.

As head of the Department of Genetics at the John Curtin School of Medical Research at the National University, and as a man who has been teaching the subject and conducting research in it for about three decades, one is tempted to ask Prof Catcheside about the progress in the field since 1928, when his interest in the subject was stimulated. Genetics has progressed tremendously since then, says the professor.

Prof Catcheside

Among the biggest changes he lists the enormous increase in interest in medical genetics, resulting in a wide study of the origin of diseases by medically qualified men in all parts of the world. Such studies have helped in many fields—for instance, a large number of blood groups are now known. Then again, there was the discovery in 1957-58 that the number of chromosomes in man need not always be 46 and that an extra chromosome usually resulted in retarded development, identified as "Mongolian idiocy". The third important change, Prof Catcheside says, is the possibility of specialized study of small organisms. Besides these there is the study of the effect of radiation and chemicals on genes and chromosomes, work on which is being done at the IARI.

A footnote to the story is that the name Catcheside is derived from Catherside in Northumberland. It must have been a hamlet once, but now there is only one house in the place, says the professor. The name, he adds, is only a reminder of his ancestors' acquaintance with Catherside.

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Chaudhuri Bhoop Singh at his seed farm in village Jounti. The blooming wheat crop is a Mexican variety, Lerm Rojo. — PATRIOT photo.

TEACHING MODERN TECHNIQUES TO INDIFFERENT FARMER

Pioneer work by National Farms

Our Staff Reporter

THE Indian farmer is yet to be made aware of the fact that unless modern techniques are adopted, he cannot get maximum yields. But a good beginning has been made by the National Demonstration Farms in the Kanhawala Block of the Union Territory of Delhi, some of which a press party studied on Friday.

The three farms visited were impressive in terms of the improvement effected in production. It was surprising to learn from the experts who accompanied the party that farmers generally were not enthusiastic about new techniques despite the demonstrated advantages.

The first of the three farms is owned by Mr Govardhan Lal, a farmer of village Jounti. It is about 2½ acres in area. Mr Lal expects the per-acre yield to be about 60 maunds. He has sown a Mexican variety of wheat known as Sonora-64. The seed was supplied by the Indian Agriculture Research Institute.

Sonora-64 is a non-lodging variety of wheat which can withstand severe winds. In a 9½-acre area outside the farm, he has sown an Indian variety whose per-acre yield is comparatively low. The entire produce of the farm will be produced by the Government for distribution of seeds to farmers in different parts of the country. Mr Lal has built a persian well for irrigation purposes, costing about Rs 1850.

He said that at the beginning "we were reluctant to offer our land for demonstration farms, but now we have realized we did the right thing. It has multiplied our yearly income".

Further down, about two miles from Mr Lal's farm, stands the blooming seed demonstration farm of Chaudhuri Bhoop Singh. He has sown two varieties of Mexican wheat—Lerma Rojo and Sonora. He expects about 70 to 80 maunds per acre. For irrigation purposes he too has built a persian well. He has about four acres of land under canal irrigation, and the rest under well irrigation. He said it was difficult to have a tubewell because it was costly. Mr Singh said he preferred loans from the Government to loans from the village "mahajan". The Government gives loans at 5.3 per cent whereas the mahajan charges 24 to 30 per cent per annum.

The third farm was that of Kanwar Mohinder Pal Singh, winner of several prizes for highest yields. He won the prize for the highest yield per acre of 57 maunds and the first prize for the best peas grown in Delhi State during the last three years. This year he won the first prize for green peas in class C at the Third All-India Vegetable Show and another first prize for green peas at the Delhi Flower Show.

VARIETIES

He owns a 300-acre farm and has five tractors. He has sown seven varieties of wheat. Canal irrigation is available on his farm. He said that when he began to use chemical fertilizers neighbouring cultivators felt that in due course the soil would become unproductive and extremely saline. But these fears proved wrong.

He is a pioneer in boring shallow cavity tubewells in the area. After many experiments, he has installed eight tubewells which utilize sub-soil water for irrigation and help to lower the rising water table.

The Indian Agriculture Research Institute has a programme to set up seed farms in every tehsil of a district in the country. The National Seed Corporation, recently set up, will help farmers with improved varieties of seeds.

The farmers of Najafgarh Block on Friday observed Field Day at Paprawat village in Najafgarh Block. Nearly 3000 Delhi farmers participated.

Mr Roshan Lal, a prize-winning farmer of Paprawat village who grew Mexican Lerma Rojo variety of wheat, said he expected 55 maunds per acre from his demonstration plot of 2½ acres as against the average of 15 maunds.

P.I.B. 24

GIPNLK—22/P.I.B./63—6-2-64—7,500

THE TIMES OF INDIA SATURDAY, MARCH 19, 1966

THE STATESMAN, MARCH 19, 1966

High-yielding Mexican dwarf wheat, Sonara 64, grown in Jounti village of Delhi.—TOI photograph.

New Cultivation Methods To Increase Production

By A Staff Reporter

If cultivation methods in use at the experimental farms of the Pusa Institute are propagated all over the country, India can meet her food shortages in the near future.

This was the impression gathered by reporters who were taken round the experimental farms on Friday. They were told that wheat production had been considerably raised by employing intensive cultivation and sowing Mexican seeds.

At these farms, in Jaunti, Panjabkhor and other villages near Delhi, the wheat yield has gone up to 60 to 80 maunds per acre. The average yield per acre in the country is 25 to 30 maunds.

Yields as high as 73 maunds per acre have been obtained from Indian seeds but they have been generally found unfit for intensive cultivation. Indian seed looks better than the imported variety but does not yield a good harvest.

Mexican seed does not produce as tall a plant as the Indian stalk, but it has fuller pods. It needs about four times more manure and water than the Indian variety. It resembles the PL 480 wheat in colour.

Several farmers in Jaunti village said that they would be happy to sow Mexican seed, but could not do so because the amount of manure and water needed for it was not easily available.

Some farmers said that they could not dig their own wells because their holdings were scattered over a large area. During his visit to the village the former Chief Commissioner had assured farmers that their holdings would be consolidated. But the promise was yet to be fulfilled.

Mahinderpal Singh, whose 300-acre farm in Panjabkhor is probably the largest single holding in the Union Territory, has more than doubled his yield with the help of new methods, eight tubewells, five tractors and other mechanised farming implements.

When he was allotted the farm as compensation for 10,000 acres of land he once owned in West Pakistan more than half of it was arid. He has reclaimed much of it. The reclamation cost has worked out to Rs. 3,000 per acre.

SEED CO-OP. VILLAGE

Dr. M. S. Swaminathan, Chairman of the national committee for the co-ordination of the results of nationwide agricultural demonstrations, said that Jaunti was being converted into a seed co-operative village. Hybrid seed evolved at Pusa would be grown there and distributed in other villages.

He said that high yields had been obtained at Pusa even on alkaline soils without adopting any technique which could not be used by the average farmer. IARI would set up 1,000 demonstration farms for paddy and wheat this year.

Efforts were being made at Pusa to change the colour of Mexican seed by treating it with atomic radiation. A Mexican hybrid resembling the Indian seed in colour was likely to be produced in a couple of years.

The Government imported last year 200 tons of Mexican seed for increasing yields. The hybrid produced at Pusa were the best in the country and were reserved for sowing.

New Wheat Seed Yields A Rich Harvest

By A Staff Reporter

Jounti, about 15 miles west of Delhi, could be just a village anywhere in India. But its rich wheat fields, standing out prominently in contrast to the sparse crops near by marks it out as a different village.

It is no miracle that has brought about this change. No tubewells were dug there, nor any fleet of tractors used. Instead, scientists of the Indian Agricultural Research Institute (IARI), New Delhi, merely advised farmers to introduce a different variety of wheat seed known as Sonora 64, a hybrid of Indian and Mexican wheat.

According to Dr M. S. Swamtnathan of IARI, who accompanied a party of journalists from Delhi to Jounti and another village, Panjabkhor, which are among the five national demonstration blocks of IARI, the Indian wheat varieties cannot stand a heavy dose of fertilizer and water, especially just before they ripen. The Indian wheat bends—"lodging", as it is technically known—when it is about to be harvested. This leads to a lower yield. But the dwarf Sonora 64 is a "lodge resistant wheat". There is more grain in the crest of the plant.

RICH HARVEST

Repeatedly the farmers of Jounti, who had sown Sonora 64 wheat seed, spoke of a rich harvest. There was Goverdhan who showed a 2.5-acre field of his, full of ripe wheat, and adjacent fields with bending ("lodging") wheat.

In Panjabkhor village, Kanwar Mahinderpal Singh took the visitors proudly round his 300-acre farm, showing the yellowing hair of his wheat crop. He stopped at one place to show the patch where he had not sown the "lodge resistant" hybrid wheat. Here the plants were almost touching the ground, as if overcome by their own weight.

According to Dr Swaminathan, it would be very easy to double the present yield of wheat and some other crops if the farmers took to sowing the dwarf varieties of seeds —like Sonora 64. In Jounti, for instance, an acre of land now yields about 80 maunds of the "new" wheat, but other fields with the Indian wheat yield a maximum of 30 maunds per acre.

A GOOD PLAY WELL PRESENTED

Sangeet Matsyagandha

By Our Drama Critic

The tenth drama festival of the Song and Drama Division, now in mid-career, makes a number of interesting points. The Rangmanch, in the Exhibition grounds, is a large barn of theatre of brick and galvanized tin sheets, with a cloth roof that flaps like a captive animal in a rough breeze. The auditorium seats perhaps 600, on tightly-packed, stiff-back and hard-bottomed chairs. And yet, every evening for the last one week the theatre has been packed, and a full house is advertised till the end of the festival, a month from now.

One explanation, not very charitable, could be that these shows are free; invitations and place cards were there for the asking. This factor is however balanced by the out of the way location of the theatre and the difficulty of getting to it. The festival undoubtedly commands an audience, most of them know what to expect, and what they expect is given to them, and they are satisfied.

These are not altogether sophisticated audiences, but they are enthusiastic, and the credit goes to H. V. Gupte and his devoted group of people for keeping them so. That the plays, in various languages, have a didactic purpose, makes the Song and Drama Division's achievement all the more creditable.

EASY-PACED FEAST

Friday's play, Sangeet Matsyagandha, by the well-known Marathi playwright, Professor Kanetkar, offered the story of Satyavati and her two loves, if her marriage to King Shantanu could be also so described. It is an easy-paced play, with songs and music in the usual tradition of the Marathi stage. Characterisation is well-observed, the dialogue has flight, the play has a fine range of emotion.

The Goa Hindu Association's production of Sangeet Matsyagandha, directed by Master Dataram, was lovingly and spaciously mounted. The settings were attractive, the music chaste. Of a very good company, Ashalata Wabgaonkar offered an expressive Satyavati: mobile of face, sensitive, and musically accomplished. Parashram Samant' Dhiver, Ramdas Kamat's fleeting Rishi Parasher, Master Dattaram's own Devavrata, and Shripadrao Nevrekar's Shantanu were particularly persuasive. Another show on Saturday, 6-30 p.m.

Times of India.
8-7-'66
Page 4. Col 3.

Dr. M. S. Swaminathan

Swaminathan Takes Over As IARI Chief

By A Staff Reporter

Dr. M. S. Swaminathan took over on Monday as Director of the Indian Agricultural Research Institute.

Dr. Swaminathan, who was until recently Head of the Division of Botany in IARI, is known for his outstanding contributions in biological sciences, specially in the field of genetics. He was awarded the Shanti Swarup Bhatnagar Memorial Award in 1961.

He received the Mendel Medal of the Czechoslovak Academy of Sciences for his special studies in the growth of genetics and the Birbal Sahni Medal of the Indian Botanical Society for his research in applied botany.

He is a Fellow of the National Institute of Sciences of India and the Indian Academy of Sciences.

New director of IARI

NEW DELHI, July 4 (PTI)—Dr M. S. Swaminathan took over as Director of the Indian Agricultural Research Institute here today. He succeeds Dr A. B. Joshi who has been appointed Deputy Director-General of the Indian Council of Agricultural Research.

Dr Swaminathan, who was until recently the head of the Division of Botany in IARI, is a well-known scientist respected all over the world for his outstanding cotnributions to biological sciences. He was awarded the Shanti Swarup Bhatnagar Memorial Award in 1961 for contribution to biological sciences. He was also awarded the Mendel Medal of the Czechoslovak Academy of Sciences for his special studies in the growth of genetics and the Birbal Sahni Medal of the Indian Botanical Society for his research in applied botany.

Science symposium

Plea for gradual mechanization

Tim... Hindu 30-4-

By a Staff Correspondent

New Delhi, April 29—Union Minister for Irrigation and Power Fakhruddin Ahmed today advocated a slow and gradual process of mechanization for India and other underdeveloped countries.

Mechanization in India, he said, must be rural-oriented and within the "competence and comprehension of the average villagers. He was addressing the Afro-Asian science symposium at the National Physical Laobratory.

"If we miss the middle step in our jump to mechanization, it will only lead to displacement of a large number of workers and create a multiplicity of problems," he said.

For a gradual process of mechanization, it was necessary to take up rural electrification and introduce electricity and power in all the 500,000 villages, he said.

He asked scientists and technologists to find more economical solutions to this problem.

Under-developed African and Asian countries must endeavour to collaborate with each other and not seek the collaboration of developed nations. Towards this end, Mr Ahmed suggested the setting up of a standing body for pooling resources, technical skill and knowledge and exchange of engineers and other scientfic personnel.

"Mere sincerity and good intentions" were not enough and efforts must be made for providing scientfic and technical knowledge on a larger scale in the country.

Mr V. K. Krishna Menon said collaboration with advanced countries had not yielded any substantial results. "The rich countries are only getting richer and the poor countries poorer," he said.

Collaboration, however, could not be achieved by merely "sending ambassadors" to other countries. Certain concrete steps should be taken by nations to study each other's problems, he said.

Dr N. P. Gupta, speaking on the medical and health problems of Asian and African countries, said non-availability of medical personnel in developing countries was making the problem more complicated. The number of doctors could be increased by 'importing' personnel from other countries. But the reverse was happening. In India alone, nearly 1,000 doctors left for advanced countries every year.

"India has to produce three times the present output of doctors for at least 25 years to make up the deficiency," he said.

Asian and African countries should collaborate and set up drug industries in the public sector to produce drugs which were at present being purchased from advanced countries at exorbitant prices.

A training programme which could produce efficient medical men in three years' time should be introduced in these countries, he said.

Dr M. S. Swaminathan said Asian and African countries must work together for rapid development of agriculture. The two continents had over 30 per cent of the world's population but produced and consumed only 30 per cent of the world's total food output.

Statesman
5 July 66

4 SCIENTISTS GIVEN TOP I.C.A.R. POSTS

The Indian Council of Agricultural Research has been strengthened by the creation of four top scientific positions at the Council's headquarters, reports UNI.

The four eminent scientists appointed to these positions are: Dr A. B Joshi, Deputy Director-General (crop sciences), Dr K. K. Iya, Deputy Director-General (animal sciences), Dr J. S. Kanwar, Deputy Director-General (soils, irrigation and agricultural engineering) and Dr O. P. Gautam, Deputy Director-General (education and Centre-State relation).

They will provide, under the overall guidance and direction of the Director-General, technical and administrative co-ordination and leadership in the planning of research and educational programmes and the execution of approved policies in their respective fields of responsibility.

New I.A.R.I. Director

Dr M. S. Swaminathan took over as director of the Indian Agricultural Research Institute on Monday. He succeeds Dr A. B Joshi, who has been appointed Deputy Director-General of the Indian Council of Agricultural Research, says PTI.

Dr Swaminathan was until recently Head of the Botany Division in IARI.

Statesman 6/7 July

डा.स्वामिनाथन पूसा संस्थाके डायरेक्टर

नयी दिल्ली, ४ जुलाई (प्रेट्)। भारत के प्रसिद्ध वनस्पति-शास्त्री डा० एम. एस. स्वामिनाथनने आज भारतीय कृषि अनुसंधान संस्थान (पूसा इंस्टीट्यूट) का डायरेक्टर-पद संभाल लिया। उन्होंने डा० ए. बी. जोशीका स्थान ग्रहण किया, जो अब भारतीय कृषि अनुसंधान परिषद्के डिप्टी डायरेक्टर जनरल नियुक्त हो गये हैं।

डा० स्वामिनाथन अब तक पूसा इंस्टीट्यूटमें वनस्पति-शास्त्र विभागके अध्यक्ष थे।

Statesman
5 July 66

A WAY TO KE... CHAPATIS FRESH

From Our Special Representative

BOMBAY, July 4.—Chapatis and Naans packed in polythene bags, can be preserved e... fresh for about 50 days through gamma irradiation.

This has been revealed by experiments conducted at the Atomic Energy Establishment, Trombay. The experiments have also shown that potatoes and onions could be stored for six months and ... and prawns up to five months.

The experiments were carried out by the Biology Division of the Atomic Energy Department with the aid of two experimental cobalt-60 gamma sources presented by the Canadian Government.

For the Farmer's Note-book

By Our Agricultural Correspondent

Irradiation to Aid Farmers

The arduous task of evolving improved varieties through crop breeding has been occasionally made easy by naturally occurring variations (mutants) with desirable traits. It is, however, possible nowadays to generate such mutants artificially and more frequently too, to suit the needs of the crop scientists.

X-ray and chemicals like colchicine have been employed to create such new varieties ever since the effect of these on plants was discovered in the twenties of this century. Of late, thermal neutrons, Beta rays from radio-active phosphorus and Gamma rays are freely used in India and other countries to promote research in this field.

The Indian Agricultural Research Institute, New Delhi, is well-equipped for this line of research with facilities including a Gamma Garden, where plants can be exposed to Gamma-rays (emitted from radio-active Cobalt) throughout their life-cycle. Many promising mutants isolated in barley, wheat, cotton, sesame, tomato, potato, tobacco and several other ornamental plants are evidence to the potentialities in this field of investigations.

Irradiation of red-coloured Mexican dwarf wheats like Sonora-64, and Lerma Rojo induced variations with amber grain colour. Thus, within two years of the introduction of these exotic varieties into India, it has been possible to rectify some of their defects (in this case the red grain colour) and make them widely acceptable to farmers and consumers.

The recently set up Gamma field at Trombay went into trial in 1965 and has within a short time brought out a number of useful mutants. An early flowering variation of the rice variety GEB-24 (kichidi) has given satisfactory performance with 17 to 20 per cent increase in yield in wide-based trials under diverse conditions in Maharashtra and other States.

A large-sized groundnut mutant producing 30 per cent more than the normal is another addition to the list of useful products. Encouraging results have been obtained in imparting drought resistance to bread wheat varieties.

Mango, guava, pomogranate, citrus and other fruit trees have been planted in the field for inducing mutations in these and further follow-up studies.

In U.S., radiation has also been utilised to eradicate crop pests by either killing them outright or preventing them from multiplying further.

The campaign to do away with screw worms in the South-West and South-East U.S. through mass release of male insects, sterilised by gamma radiation, had been successful and encouraged Agricultural Research Station scientists in the pursuit of similar methods to tackle other pests.

The omnivorous leaf-roller, impervious to insecticides and the Codling Moth, a serious pest on several crops like apple, pears and walnuts are the latest in the growing list of pests that may yield to the sterility technique of insect control.

In India, the effects of radiation on the development of insects are also being studied at Trombay with a view to producing sterile males of the insect pests like Red Cotton Bug.

ADDITIONAL SUBJECTS
12759 64 65.
13018 20.

The Indian Express 5/7/66

New director of IARI

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Dr Swaminathan, who was until recently the head of the Division of Botany in IARI, is a well-known scientist respected all over the world for his outstanding cotnributions to biological sciences. He was awarded the Shanti Swarup Bhatnagar Memorial Award in 1961 for contribution to biological sciences. He was also awarded the Mendel Medal of the Czechoslovak Academy of Sciences for his special studies in the genetics and the Birbal Sahni Medal of the Indian Botanical Society for his research in applied botany.

50 M.P.s VISIT MODEL FARMS

About 50 members of Parliament said on Saturday that with the adoption of modern agricultural practices, Indian farmers would be able to increase production by at least 100%, reports PTI.

The MPs visited some demonstration plots in farmers' fields in a Delhi village where the new Mexican varieties of wheat are being harvested. They were told by farmers that the new seed had yielded about 50 maunds of wheat per acre against an average yield of 20 to 25 maunds per acre with the ordinary seed.

At a mechanized co-operative farm, the members were told that a yield of 75 maunds of wheat per acre was possible.

At the demonstration plots at the Indian Agricultural Research Institute in New Delhi, Dr M. S. Swaminathan, head of the Botany Division, told the MPs that the students of the institute had been working in some villages of Delhi to show the farmers how to increase output.

The Indian Express 29.4.66

More farmers want better seeds

By a Staff Correspondent

New Delhi, April 28—The Agriculture Ministry's national demonstration projects started a year ago have raised both hopes and fears.

There have been dramatic increase in yields. A farm near Delhi raised 6.2 tons of wheat with better seeds and more fertilizers.

Dr M. S. Swaminathan, chairman of the National Committee for Co-ordination of Agricultural Demonstrations, told reporters today that the demonstrations had shown there were great possibilities for improving yields. Moreover, the success of the new hybrids and dwarf varieties of seeds had made a deep impression on the minds of farmers.

Those who had seen the success of experiments, in demonstration blocks were keen to adopt the practices. There had been a spurt in the demand for better seeds.

But Dr Swaminathan admitted, while answering questions, that he had faced some difficulties also. Most of these were administrative. Improvement in yields called for a radical change in farming techniques involving soil management, irrigation and plant protection.

The soil was fast losing its fertility, and this had happened in many places in Punjab. Plants were becoming more susceptible to damage by pests.

He said the demonstration plots could show results only if they were backed by a dynamic research programme covering plant protection, irrigation and soil management.

Dr Swaminathan and his colleagues were critical of the way extension workers functioned. They have asked the Government to recruit more agricultural graduates as block development officers (the suggestion is for five against one for each community development block now) so that they were more closely associated with farmers. At present village level workers were the only link between the block office and farmers.

Unique scheme

According to Dr Swaminathan, the programme of demonstrations is unique because for the first time agricultural scientists went to farms without the aid of farmers and even extension workers to try new strains.

A limitation, he admitted, was the most of these demonstrations had to be conducted near the agricultural research institutes.

In nearly all demonstrations, he said, the yields far exceeded expectations. The biggest achievement was that it kindled enthusiasm and a spirit of adventure not only among agriculturists but also among extension workers.

Local varieties in some areas did not give any yield because of the unprecedented drought but hybrids showed some yield under the same conditions.

To celebrate the International Rice Year under the auspices of FAO, the Ministry will organize this year 1,000 national demonstrations. A two-day workshop of workers and scientists will begin tomorrow at the Pusa Agricultural Research Institute to finalize the programme of demonstrations.

The Indian Express July 5, 66

More funds for farm research urged

By Our Staff Reporter

NEW DELHI, July 4—Dr M. S. Swaminathan, Director of the Indian Agricultural Research Institute, today deplored that barely 5 per cent to 6 per cent of funds allocated for research was spent on agriculture.

He said that compared to other fields like atomic energy and defence science this was too little. Other countries were spending much more on agricultural research. Australia allocated 39 per cent of its research budget for agriculture.

He was speaking on 'Farm Revolution" after taking over as the Director of the Institute.

He told those engaged in research to create an atmosphere which would help larger participation. He said that if some farm worker in the Institute suggested something it should not be ignored but should be taken into account. They should also endeavour to increase the per acre earnings of farmers.

The experiments undertaken at the Institute by which farmers could earn as much as Rs 1,000 per acre should be popularised.

Scientists help farmers double yield

Express News Service

NEW DELHI, April 28—Agricultural scientists have taken the message of science to farmers in nation-wide demonstrations and proved that small differences in cultural practices could make a big difference, usually an increase of 100 per cent.

Dr M. S. Swaminathan, Chairman of the National Committee for the Co-ordination of Nation-wide Agricultural Demonstrations, told a Press conference here today it had been found possible to get about 10 tons of grain per hectare per year by adopting a two-crop rotation in irrigated lands.

Since such yields had been reported chiefly from experimental stations, there was some scepticism about the possibility of reproducing these results in the fields. It was also necessary to ascertain whether there were any limiting factors.

In a series of nation-wide demonstrations it had been shown that a dramatic increase in yield exceeding 100 per cent of the best yields, was now possible. Since the new strategy of agriculture revolved around the use of high-yielding strains along with the requisite quantities of other inputs, it was considered desirable that the efficacy of the strategy advocated was actually demonstrated in the fields of the farmers.

There were 153 demonstrations in rice, 75 each in wheat and bajra, 74 in jowar and 69 in maize. Specific yield target based on the yield which ought to be obtained was fixed for every demonstration. The targets fixed ranged from 2 to 6 tons per hectare depending on the crop and location.

In nearly all the demonstrations the yields far exceeded those stipulated. In general, the demonstrations made a very striking impact on the minds of farmers.

Encouraging results

Dr Swaminathan said the high yields obtained throughout the country during an unusually dry year were indicative of the great production potential of Indian agriculture.

In wheat the reports were encouraging. In Delhi, the highest yield was obtained with 6.2 tons in one hectare with the new dwarf variety S.227. At five other places yields ranging between 5 and 6 tons per hectare were obtained.

Dr Swaminathan said this year it was proposed to organise 1,000 demonstrations as it was the International Rice Year. An all-India workshop meeting would be held at the IARI to finalise the programme.

dt-/29/4/66. 'Ind-Exp'

"The Times of India"
dt- 29/4/66.

Need To Introduce New Farm Techniques

WAY TO GET MAXIMUM YIELD IN FOOD CROPS

By A Staff Reporter

Dr. M. S. Swaminathan, Chairman of the National Committee for the Co-ordination of Nationwide Agricultural Demonstrations, said in Delhi on Thursday that new farm practices would have to be introduced along with the release of new strains to enable the new varieties "to attain their maximum yield potential."

During the past three years new possibilities for enhancing the yield of major cereal and millet crops had been opened up through the development and release of hybrids of maize, jowar and bajra and the introduction of dwarf varieties of wheat and rice.

In 1965 the Food and Agriculture Ministry decided that a national agricultural research and development programme should be initiated for focussing attention on urgent research problems and bridging the gap between research and extension.

SCIENTISTS' ROLE

An important part of this programme was a series of national demonstrations to show to farmers as well as extension workers that a dramatic increase in yield could be achieved.

For the first time scientists were entrusted with the direct responsibility of demonstrating in fields that the results obtained by them at experimental stations had wide applicability and utility.

Dr. Swaminathan said that the demonstrations had had a very striking impact on the farmers. They had established that the targets fixed under the new strategy of agriculture were easily attainable provided the necessary inputs were available.

About 75 demonstrations were organised in the major wheat growing areas. Report received so far had been most encouraging. In Delhi the highest yield was obtained at a farm at Punjabkhor where 6.2 tons of wheat was harvested in one hectare with a new dwarf variety.

Dr. Swaminathan said that the Food and Agriculture Organisation had designated 1966 as International Rice Year to focus attention on rice production problems. It was proposed to organise 1,000 demonstrations during the year as part of India's national programme.

29/4/66 Hindustan Times

More farmers want better seeds

By a Staff Correspondent

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But Dr Swaminathan admitted, while answering questions, that he had faced some difficulties also. Most of these were administrative. Improvement in yields called for a radical change in farming techniques involving soil management, irrigation and plant protection.

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The Statesman
29 April 1966

STEPS TO GET HIGH FARM YIELDS

From Our Special Representative

NEW DELHI. Thursday.—To get spectacular yields in agriculture the farmer must be given the temptation of spectacular returns, two experts of the Union Agriculture Ministry told reporters here today.

The experts, Dr M. S. Swaminathan and Dr T. R. Mehta, said that the chief advantage of the "high yielding varieties scheme" was that itoffered the farmer the hope of big jumps in his income.

At the same time, Dr Mehta explained, the risk of loss if the effort failed was equally great. This was an additional spur for the farmer to be alert.

LARGE STAKES

It was this element of "large stakes" that had helped the scheme to spread rapidly among the farmers even though official demonstrations were confined to only a few fields.

Dr Swaminathan, who is the Chairman of the "national committee for the co-ordination of nation-wide agricultural demonstrations", added that the demonstrations they hd conducted in some selected fields in the use of high yielding varieties resulted in a crop of administrative problems that needed to be straightened out.

Theoretically, Dr Swaminathan said, it should be possible with the new varieties to produce 100 million tonnes of foodgrains from about 10 million hectares of land. But in practice it was not so simple since numerous other technical difficulties came in the way. Even so large increases are now possible, he said giving figures.

The Statesman

WHEAT IS NOT HIS BREAD ALONE

By A Staff Reporter

Borlaug is a magic word in wheat research and wheat cultivation, not only in India but in many countries in Asia, the Middle East and South America.

It is the name of a tall, gentle American who in his 27 years of service in Mexico, as part of the International Wheat Improvement Programme of the Rockefeller Foundation and the Mexican Ministry of Agriculture, has set in motion a revolutionary genetic research programme in wheat and developed hybrid types which have turned Mexico from a country importing 60% of the wheat it needed into a State with a surplus and which now thinks in terms of controlling the area under wheat production.

Mr Norman Borlaug spent the first eight years in Mexico collecting information which would enable him to plan a broadphased attack on all problems relating to wheat production.

Having laid this strong foundation, Mr Borlaug set to work on breeding the smallest-growing wheat plant with the largest appetite for water and fertilizer. The limit in either direction, or "the top of the curve" as he calls it, has not been reached yet but the newer breeds he is perfecting are considered architectural wonders with enormous genetic plasticity and a capacity for world-wide adaptation.

Mr Norman Borlaug

We in India use two of the "dwarf" varieties he has developed. In fact, his "Lerma Rojo" and "Sonora-64", along with other half-developed and undeveloped mixed varieties from the foundation for wheat research in our own agricultural institutes. Mr Borlaug, on one of his regular visits to see how his "dwarf" children were doing and whether they had had further progeny, thinks we are certainly turning the corner in wheat production.

But he sees the future of Indian wheat not in terms of the two dwarf varieties he has introduced, which he considers only a "stop-gap" arrangement, but in terms of the new types being created in our own agricultural institutes by aggressive crossing between Indian and Mexican varieties which will, in about three to five years, produce types which will revolutionize wheat growing in India, if—and this is a very important if—we are able to provide them with the chemical fertilizer they will need.

We Are Not Going To Peris
Says C. Subramaniam

Evolution of New Varieties of Paddy and Wheat

(From Conqueror Special Correspondent.)

Conqueror has got the happiest news on the food front. We are on the verge of an agricultural break-through. The news conveyed to our Special Correspondent by two agricultural scientists, Dr. Swaminathan and Dr. S. Y. Padmanabhan, that success has been achieved in evolving new varieties of paddy, wheat and millets, which would increase production, in some cases even fourfold, was confirmed by the ever optimistic Union Food Minister, Mr. C. Subramaniam.

The Minister answered critics of his wheat import policy and concluded the exclusive interview with our special correspondent in characteristically dramatic fashion. "It is a question of 'produce or perish' and we are not going to perish"

New Delhi, May 3.

In an exclusive talk with Mr. C. Subramaniam, Union Food Minister here yesterday, I asked him if as Minister and administrator, he would confirm the assessment made to me by two eminent agricultural scientists of India, Dr. Swaminathan of I. A. R.I. and Dr. S. Y. Padmanabhan, Director of Central Rice Research Institute, Cuttack, that the Country was on the verge of an agricultural break-through.

"Yes. It is true. I confirm that" said the dynamic Minister, around whom controversies have raged.

At the outset, I congratulated Mr. Subramaniam on his effective speech in Parliament answering his critics on the import of wheat and said, "but for the dynamic moves made by you in importing wheat and maintaining a steady flow into the markets, the country would have faced a very bad situation and the same critics would have used worse language". The Food Minister's reply was only a pleasant smile.

Revolutionary Change

Mr. Subramaniam said that with regard to the evolution of new varieties of paddy, wheat, and millets, it was a revolutionary change just as automobiles brought about a change in the sphere of transport and communication,

"This will immediately increase the yield per acre three to four times more from the present marginal production. This will also change the picture of the economy of the small farmer. With the increase in yield, per acre, even a small farmer could earn an income which will lift him from the present subsistence level. Using these new varieties and with a little more of irrigation facilities, multicropping could be the pattern of agriculture," he proceeded.

In Pant Nagar Agricultrural University in Uttar Pradesh, it has been established that through the use of new seeds and fertilizers nnd double-cropping the per acre production of 20 to 30

maunds can be stepped up to 120 maunds. "On this basis, a two acre small farmer can have an income of Rs. 2,000 to 2,500 per acre. This is the potentiality of the new breeds. And in my view, this is the only way to raise the lower strata of agricultural landowners and agricultural labourers. With increased agricultural production, labourers can also get a better deal", added the Minister.

"You cannot ask a poor farmer to pay higher wages. From the social point of view also this would make a big difference", stated Mr. Subramaniam.

New Energy

Asked whether after all the recent depressing talk of near calamity on the food and agriculture front, he could definitely say that the situation was being brought under control, Mr. Subramaniam said "It is not exactly bringing under control. I should say a new energy is being put into agriculture. You can call it a new buoyancy".

Asked about the continuing controversy on the fertilizer policy, the Minister said "This is a political question and political prejudices come into the picture. Some people have an idea that America is trying to dominate Asia, and India in particular. I do not think that after our fight with one of the greatest Imperialist Powers of the world and successfully driving it out of the country, we should be afraid of any other country. We are sure of the direction in which we want to move. As a matter of fact, developing countries of the world have faced situations like this in the past and it is only a bold approach which can yield results."

As for the availability of improved seeds for the six million acre target fixed for the first year of the Fourth Plan, Mr. Subramaniam said it had been fixed on the basis of availability. There might be a shortfall in wheat, but we would be importing the same to fill the gap.

Then I asked Mr. Subramaniam. "You have been for the past one or two years constantly emphasising the role of agricultural scientists. Are they being effectively mobilised, particularly after the reorganisation of the Indian Council of Agricultural Research?"

"We have reached the point when scientific resources in the country will have to be mobilised for a total national effort", the

Major Agricultural Break-through

Scientific Experts' Disclosure

(FROM CONQUEROR SPECIAL CORRESPONDENT)

New Delhi, May 3

"We are on the verge of a major agricultural break–through in India", two leading agricultural scientists of India told me in a special interview. It was this that I referred to while interviewing the Food Minister as reported on Page 1.

I met Dr. M. S. Swaminathan, head of the Botony Division of the Indian Agricultural Research Institute and Chairman of the National Committee for the coordination of agricultural demonstrations. Dr. S. Y. Padmanabhan, Director of the Central Rice Research Institute, Cuttack, joined in the interview at a later stage. Together they made this reassuring statement.

Soft-spoken Swaminathan, who has made a distinct contribution to Indian Agriculture through the evolutions of high yielding strains of wheat and other cereals, traced the history of Indian agriculture from stagnation or static agriculture to the present improved production technology.

Pressure on Production

Dr. Swaminathan said that till the beginning of the century there was no pressure for greater agricultural production. The population and the agricultural yield were more or less matched. With the increase in population, the demand for food increased and this was proportinately reflected in our imports reaching the pinnacle this year. But our per acre yield remained more or less the same, comparatively one of the poorest in the world", he said. The scientist then traced the history of the growth of Indian Agricultural Research from the modest beginning of the Indian Agricultural Research Institute at Pusa, The Royal Commission on Agriculture, the constitution of the Indian Council of Agricultural Research and the all-out greater agricultural production to meet the needs of the growing population of India.

Must Improve

He said, " We have arrived finally at two distinct conclusions today, that our production technology must improve through intensive research and that this research in practical terms should be conveyed to the farmer". He frankly admitted that till the last two or three years, our extension services were not making any impact, for the simple reason that we had nothing much to extend in terms of competent technology. The picture was now changing, said the eminent scientist

Dr. Swaminathan then stressed the all important and almost decisive role of the small farmer holding only one or two acres.

Incentive To Small farmer

" Unless the small farmer is stimulated, and powerfully motivated, our yield per acre will not go up. How can he be stimulated? He will never be stimulated unless he sees something dramatic, something spectacular right in his fields in yield and income" he added.

Until recently spectacular results have been confined to certain cash crops like sugarcane. The same results will have to be demonstrated in the field ofwheat, rice, jowar, bajra and other cereals. Then the smaller farmer would adopt all improved practices.

"Strangely he is a believer in an "all or none", attitude, Dr. Swaminahan said. "Dramatic or spectacular results are now being progressively achieved through the hybrid seeds of all the major food crops. Increase of three to four times of the yield has been "normal". From the average 10 maunds yield per acre it has gone upto 30 to 40 maunds. A few amongst the farmers are producing even 60 maunds per acre. National demonstrations right in the farmers' field have opened their eyes. They give expression to their feeling with the exclamation that they had never dreamt that it would be possible. The new variety of strains acted as a catalyst to produce a whole set of new practices like fertiliser and better irrigation of the area.

Dr. Swaminathan then stressed the need for greater Agricultural Production from an angle different from a politician. There were two chains, from man to plant and from plant to man. The second chain of consumption was qualitatively far more superior and that was by and large tne consumption practice in European countries which produced far healthier men. Of course in this second chain some 20 per cent of the agricultural produce would have to go towards feeding the animals which are later consumed by man! But countries like Japan were improving foodgrains to feed the animals so that they could adopt this chain of consumption wherein the quality of food improved considerably, and for feeding the animals and gradually shifting to this second chain of consumption

• (10) Dr. M. S. Swaminathan, Head of the Division of Botany at the Indian Agricultural Research Institute, New Delhi, visited Australia recently to see something of the work of the Australian Commonwealth Scientific and Industrial Research Organisation. Shortly after arriving in Sydney he was taught to play a parlour game called "Squatter" and in a radio talk which he gave for the Australian Broadcasting Commission he said the game helped him to understand problems and methods of pasture improvement and sheep farming in Australia. The game is based on actual sheep farming methods. Each player starts as the "owner" of an unimproved sheep station, fully stocked. The object is to increase the carrying capacity first by improving pasture, then by irrigating the property. Income can be earned for these purposes by shrewd buying and selling of stock and wool, and the winner of the game is the first player to have the maximum number of sheep on a fully irrigated property. The picture shows five Indian post-graduate students playing "Squatter": (from left) Mr. J. C. Anand, who is studying for a Ph.D. degree in microbiology, and Mr. M. V. Kilkarni, who is taking a post-graduate course in animal husbandry, both at the University of Sydney; Mr. G. D. Patil, a candidate for a Ph.D. degree in agricultural botany at the University of New South Wales; Mr. B. G. Patil-Kulkarni, whose post-graduate work at the University of Queensland is in plant pathology; and Mr. V. G. Katti, a post-graduate student in genetics and plant breeding at the University of Sydney.

The Financial Express July 5, 1966

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IARI's New Chief

NEW DELHI, July 4 (PTI).—Dr. M. S. Swaminathan took over as director of the Indian Agricultural Research Institute here today. He succeeds Dr. A. B. Joshi who has been appointed a Deputy Director-General of the Indian Council of Agricultural Research.

Dr. Swaminathan, who was until recently the head of the Division of Botany in IARI, is a wellknown scientist respected all over the world for outstanding contributions in biological sciences.

He was awarded the Shanti Swarup Bhatnagar Memorial award in 1961 for contribution in biological sciences. He was also awarded the Mendel Medal of the Czechoslovak Academy of Sciences for his special studies in the growth of genetics and the Birbal Sahni Medal of the Indian Botanical Society for his research in applied botany.

Amrita Bazar Patrika July 5, 1966

Dr. Swaminathan

From Our Special Correspondent

NEW DELHI, July 4.

Dr. M. S. Swaminathan took over today as Director of the Agricultural Research Institute.

He is one of the famous Indian scientiests respected all over the world for outstanding contributions in biological sciences, specially in the field of genetics. He is a fellow of both the National Institute of sciences of India and the Indian Academy of Sciences.

The Press Journal Bombay 5 July 66

Dr. Swaminathan takes over as IARI chief

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Deccan Chronical

July 5, 1966

Dr. M. S. Swaminathan

NEW DELHI July 4.

Dr. M. S. Swaminathan, Head of the Botany Division of the Indian Agricultural Research Institute, today took over as Director of the Institute.

Dr. Swaminathan, who is a world famous scientist known for his original contributions in the field of plant genetics, replaces Dr. A. B. Joshi who had been functioning as acting Director since Dr. B. P. Pal left the Institute to head the reconstituted Indian Council of Agricultural Research.

Dr. Joshi has joined the Council as one of its Deputy Directors.—UNI.

Malayala Manorama

Kottayam 5/7

ഡോ. സ്വാമിനാഥൻ

ന്യൂ ഡൽഹി, ജൂലൈ 4—ഇന്ത്യൻ അഗ്രിക്കൾച്ചറൽ റിസർച്ച് ഇൻസ്റ്റിറ്റ്യൂട്ടിന്റെ ഡയറക്ടറായി ഡോ. എം. എസ്. സ്വാമിനാഥൻ ചാർജെടുത്തിരിക്കുന്നു. ഡോ. എ. ബി. ജോഷി ഇന്ത്യൻ കൗൺസിൽ ഓഫ് അഗ്രിക്കൾച്ചറൽ റിസർച്ചിന്റെ ഡപ്യൂട്ടി ഡയറക്ടർ ജനറലായി നിയമിക്കപ്പെട്ട ഒഴിവിലാണ് ഈ നിയമനം.

(പി.ടി.ഐ.)