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~~Recent Trends in Crop Improvement~~
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Pattern of crop improvement

1. ~~Trends~~ in Europe and North America

The trends in crop improvement in Europe and North America are just the opposite of those which are desirable in ~~our country~~ Asia, since they involve a rapid displacement of human labour with machines, extensive rather than intensive farming, development of crop varieties suited to highly mechanised harvesting and post-harvest handling and processing procedures and a sophisticated consumer market. In the United States, about 2 million farmers now produce food for over 200 million people, while in both Canada and Japan substantial inducements are being offered to farmers for reducing the land under wheat and rice respectively. Similarly in Europe, subsidies are offered to those who will kill milch animals and close down their dairies, in view of the formidable "butter mountain" which has already grown. ~~All these~~ Such trends are the result of an unprecedented scientific advance in increasing crop and animal productivity per unit of land.

Germany is contemplating to release a large area of land from agriculture to recreational parks.

2. Needs of India

In India, nearly 70% of the work force will have to depend on agriculture for employment even in 1981. A small farm of less than 2 hectares will have to provide a reasonable

income and provide continuous employment for over 5 persons, if ~~we are to witness~~ there is to be any improvement in the standard of living of rural families and ~~arrest the~~ if the unplanned migration of landless labour to cities is to be arrested, thereby avoiding the creation of more 'Calcuttas'. Further, agricultural development will have to provide a quick solution to the widespread problems of malnutrition and under-nutrition. ~~We have also~~ India has to achieve stability of production, since a fall in production of 19% witnessed during the drought years of 1966 and 1967, if repeated, would have disastrous consequences. If stability is to be achieved, ~~we will have to de-link our destiny~~ the fate of ~~the~~ crops would have to be delinked from the monsoon through better tapping and utilisation of ~~our~~ India's vast water resources on the one hand and by developing a new technology for dry land farming, on the other.

Meanwhile, buffer stock build-up should be facilitated by the development of storage technology

Finally, agricultural research should contribute towards family planning and population control, if the economic and social benefits of the green revolution are to be realised. To summarise, India's crop improvement programmes should be geared to increasing the income and employment potential of small holdings, stabilising and diversifying agricultural and animal production, increasing ~~productivity~~ the yield of crops and animals per unit of land, time and water without detriment to the long term productivity of the soil, banishing under- and mal-nutrition, serving as an instrument of rural prosperity through the creation of agro-industries and aiding in family planning programmes.

3. Agricultural Development as an instrument of rural prosperity

If agriculture is to provide more return and help in uplifting the economic status of small farmers, an ecology-cum-economics based crop planning is essential. Where there is irrigation, scientific multiple cropping can increase several fold both income and employment. Multiple crop "Cafeterias" have now been developed which provide a wide range of choice of crops to farmers and which are designed for reducing pest epidemics and for ensuring a good return from the investment on inputs. About 15 tonnes of food grains can be produced from one hectare in a year by adopting relay cropping techniques. A "Green Revolution" designed for food self-sufficiency alone will however not change the economic position of the farmers. What is important is the introduction of measures which will diversify cropping patterns and increase the efficiency of farming, thereby making prices competetive and remunderative. Improvements in post-harvest technology are urgently needed and this is a field where industry can help by manufacturing and selling at reasonable prices reapers, threshers, driers and storage structures

4. New cropping strategy for capturing export markets

We should initiate a programme of careful tailoring of national cropping patterns to capture international markets, in addition to satisfying home requirements. If new export markets are to be developed, we must do a considerable amount of anticipatory research and developmental work. For example, Europe and North America will increasingly shift to vegetable oils with a high unsaturated fatty acid content, like those from safflower and sunflower due to the growing fear of arteriosclerosis resulting in heart attacks. India can

produce both safflower and sunflower in large quantities through a proper area development plan. A variety of sunflower, Armaviskij, has yielded over 2 tonnes per hectare at several locations, with an oil content of 43%. Similarly, in groundnut we should have separate varieties for oil and table purposes, one with a high oil content and the other with a high protein content. We can greatly increase silk production through the use of soil survey data for mulberry production, since Japan will prefar to import ~~xø~~ silk rather than allot land for mulberry cultivation.

On January 27, 1970, the dreaded rust disease was observed on coffee for the first time in three States of Brazil. There are indications that this disease may become more widespread in Brazil. Indian coffee industry should keep itself in readiness to export more coffee, in case the Latin American crop is badly affected by disease. A critical review and analysis of world trends and anticipatory action would help our farmers to earn more money.

4 ~~5~~. Increasing the efficiency of farming

The efficiency of farming as reflected in the return a farmer gets from his investment on inputs such as fertilizer and water is at present very low. Consequantly, the prices of grains do not fall even when production goes up. Thailand is exporting maize to Japan at ~~Rs.30~~ per quintal, while our internal market price is twice this amount. Weeds take away in many areas during the monsoon season 30 to 40% of the fertilizer applied. In rice fields, there is considerable loss of nitrogen due to leaching. This can be prevented by

A triple ~~An~~ ~~mutual~~ alliance ~~be~~ among weeds, pests and pathogens greatly reduces the return of farmers of monsoon Asia get from their investment on fertilizer. It is hence that the concerned industries should formulate a consortium approach to farming

simple practices such as mixing urea with neem seed powder. Finally, nearly 50% of the water harvested from watersheds, pumped from ground water sources or diverted from rivers are lost by seepage and evaporation from tanks, canals, distributaries and field channels. Inadequately or improperly designed field irrigation system and uncontrolled water application methods are leading to huge losses of water by seepage and deep percolation below the root zone of crops. In many areas not only is the loss of water of concern but the damage it does by waterlogging and accumulation of harmful salts is considerable. Low cost prefabricated structures have now been developed, which if widely used, would help to improve the efficiency of conveyance and distribution of water on the farm. Through the use of efficient water management techniques, 1 lb. of rice can be produced with about 600 gallons of water, instead of the 1800 gallons used now.

6. Promotion of Agro-industries

Crop planning should be designed to promote the rapid development of rural industries such as those connected with the manufacture of farm implements, farm irrigation structures, food processing and packing and animal feed manufacture. In particular, attention should be paid to the mono-culture rice areas ~~such as the districts of Thanjavur in Tamil Nadu, Kuttanad in Kerala, and Burdwan in West Bengal~~ where in spite of abundance of water, there is great poverty. Paddy and poverty can be separated only by a well planned development of industries in these areas and

by introducing during the off seasons crops like cotton, oil seeds and maize, which can support textile and animal industries.

6. Banishing Malnutrition

Under nutrition is the mother of malnutrition in cereal-based diets. Increased intake of calories will become possible under the prevalent economic conditions only if either the purchasing power of the people is raised through the rapid development of agro-industries or if the cost of food grains is brought down substantially. The green revolution, if sustained and extended to un-irrigated areas, will help to increase greatly the availability of food grains. However, increasing food production without a coincident rise in purchasing power could result in an uncomfortable glut of food grains. It is hence that immediate attention to crop planning and to the growth of rural industries is called for.

Research on the genetic upgrading of the quantity and quality of proteins in the major staples has led to the development of an yellow composite in maize which has about 12% protein and 4 gms. of lysine per 100 gms protein. Encouraged by feeding tests in rats, where the rats fed with the new maize grew fatter than those fed with milk, feeding experiments have been undertaken in children of the age group 6 to 36 months. 80 children in a Jhuggi colony in the Nangloi village of Delhi State are being fed with high lysine maize every day since the 1st November, 1970 and another group of 80 children belonging to a comparable socio-economic stratum is being fed with skim milk as a

comparison. The results are yet to be fully analysed but the available data indicate that the children fed with high lysine maize have gained more weight than those children who got their protein through skim milk.

Besides maize, progress in protein improvement has been made in other crops as well. In barley, two mutants with 18% protein have been isolated. High protein lines have also been found in wheat and rice. In Colombia, a tapioca variety called Llanera with 8% protein has been discovered. Triticale, a hybrid cereal derived from the cross between wheat and rye has excellent protein properties and is likely to make a significant contribution to the nutrition of dry land farmers. Mushroom cultivation is being popularised. Nutritional seed kits containing seeds of high yielding cum-high quality cereals, millets, pulses, vegetables and fodders are being developed for the different parts of the country.

8. Achieving stability of production

Greater stability of production can be achieved only through the development of suitable pest and disease control systems, better harvesting and storage procedures, an enlightened pricing policy, and a new technology for dry land farming. Great possibilities now exist in dry areas for increasing production through the use of quick-yielding varieties of cereals, pulses, oilseeds and cotton, aerial application of fertilizer and the use of pelletted cultures of bacteria in pulse crops. Simple water harvesting procedures are also now available and there is no scientific excuse for delaying the introduction of the new technology. In India, fertilizer industries can help to increase wheat production greatly during the current season, if they make arrangements immediately for the aerial supply of nutrients to dry land crops.

8. Cross-breeding coupled with the genetic upgrading of pasture and fodder quality have opened up unusual possibilities in increasing milk, egg and wool production. The cross-bred animals are more economical in the utilisation of fodder and feed and the introduction of high quality fodder helps to cut down the cost of concentrate feeding.

8. New ~~offe~~ vistas in Animal improvement

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9. Agricultural Research and Population control

Some experts like Dr. S. Chandrsekhar are of the view that the green revolution itself may act as a contraceptive. The reason for this view is the associated changes in attitude among rural communities and the growth of a greater economic sense due to the shift to a market economy. Better feeding will, however, extend the average life span and if the green revolution is taken to its logical conclusion, we can anticipate a further fall in death rates. Hence, the task of reducing birth rates becomes even more urgent. It is now clear that our rural population is willing and ready to adopt birth control measures, provided a cheap, reliable and acceptable contraceptive method can be developed. The oral 'pill' seems to hold great promise of becoming a very potent instrument of birth control, provided the cost of the pill can be brough down appreciably. Scientists at the Central Institute of Horticultural Research, Bangalore, I.A.R.I., the National Botanical Garden, Lucknow and the Ford Foundation are now busy developing a high yielding strain of a wild plant from Western Himalays, Diascorea deltoidea, which contains Diosgenin, an active principle used in oral contraceptives. Examination of a large collection has shown that the diosgenin content varies from 0-5 to 8% and hence there is great scope for increasing the yield of diosgenin through breeding.

9.4

~~10~~. New Vistas in Agriculture

We have now the scientific tools and competence to achieve a major technological change in our agriculture. If we follow the path of science, old varieties in all crops can soon give place to new ones characterised by a greater

capacity for yield per day and per unit of water, new methods of breeding soils for high and sustained productivity can be introduced, sunlight can be tapped to the maximum both by new plant types and multiple cropping, plant protein can become similar to animal protein in nutritive quality, even crops other than pulses and legumes can be made to fix atmospheric nitrogen, ploughing can be reduced to the minimum, most of the factors causing instability in production can be scientifically destroyed, pest control can be practised without polluting the environment, dry land farming can become profitable, deserts can be developed and animal productivity can be greatly enhanced. We have to achieve all this as soon as possible since we are sitting on the top of a volcano of malnutrition, undernutrition, poverty and unemployment, which is showing signs of erupting and destroying the foundation of progress already laid with so much labour. Such progress will however be possible only through a gigantic educational effort and mass participation. This is where a national television net-work can be of great value. We have the means and the technical capability to launch such a mass movement of agricultural transformation and rural upliftment. What we need is ~~xx~~ only the will to act. I hope the participants and visitors associated this Food Production Conference will act as catalysts in generating this will as well as the wherewithal for action