"How facts flow to farmers in U. S. A."*

By

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I. The role of the universities: The Universities in North America are important centres of activity for both agricultural research and the transmission of results of research to the farmer. Between the farmer and the university, there is a two-way traffic, with the farmer taking his problems to the university and the university contacting the farmer with the solution to his problems. The College of Agriculture, of U. S. universities is organised with three main functions: (1) Resident instruction in agriculture. (2) Experiment station and research work. (3) Extension service, which is the propaganda section as we call it in India. Resident instruction provides for major specialisation in agriculture and in its numerous allied fields. The Experiment stations are the means through which many contributions to a more productive and pleasant farm life are made. The Extension service, including its staff of county agricultural agents, home extension agents and club agents, which are their equivalents of our agricultural demonstrators, disseminates the information derived from the Experimental stations and College laboratories.

(1) *Resident instruction*: In the Michigan State College, which is the oldest agricultural college in the U. S. A., there were in 1948 1,085 students working for their Bachelors degree in agriculture, 190 postgraduate students and 743 students undergoing short courses. These short courses form an important part of the college activity, being designed to give every type of farmer or his sons and daughters an opportunity to keep abreast of the latest developments in his type of farming. They provide a variety of courses running to 200 and more, to suit every type and branch of farming, lasting from a few days to two years' duration, according to the needs of the student or farmer.

(2) *Research*: There is no need to emphasise here the quality and quantity of agricultural research in U. S. A. Given the same equipment and facilities as exist in the U. S. A., agricultural research workers in India can also produce as much results as American scientists and can place India definitely on a position of prestige in research. One other reason for this attainment of research is the spirit of camaraderie that exists between the American research worker and the farmer. The research worker in American U iversities is on such close term with the farmers with whom he deals that he keeps his researches abreast with the farmers' problems. This is helped not only by the direct contact of the research worker with the farmer but also by an intimate liaison with the Extension service which forms a part of the University.

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(3) *Extension Service or Propaganda*: The extension work in many states covers both Agriculture and Home Economics and is a co-operative enterprise carried on by the universities, the United States Department of Agriculture and the countries of the State (which are comparable to the districts of our province) but entirely under the supervision of the University. This Extension Service reaches every county and township (which is comparable to our villages) through the county agents who are *specialists in agriculture*, *home economics* and *youth training*. In U. S. A., the farmers' home is treated as an economic unit and the farmers' children as the future generation of scientific farmers. It is the corner stone of the agricultural propaganda in America that the farmer and his home must be planned and managed in harmony to produce effective results, without which agricultural improvements will never get "down to the earth". This is the reason why there is so much of home economics in every American university, always allied with agriculture.

Further, specialists and demonstration agents can achieve little by themselves unless there is a local rural leadership to co-operate and this is the basic reason for the county agents also to be specialists in *youth training*. In fact, the farmers and home-makers are mainly reached by the specialists and demonstration agents through these local leaders. In Michigan, in 1948, for instance, leadership training meetings numbered nearly 2,000 with more than 30,000 local leaders taking part and carrying information back to their townships.

(4) *Work of some of the departments in the College of Agriculture*: A few instances may be mentioned here of the types of work carried on by the research departments in the universities, to see that the farmer gets what he needs in time. Every year the farm management department analyses hundreds of farm business records to advise the farmers on the economic trends of farming. In 1944, anticipating a back-to-the-land movement following the war, this department in the Michigan State College, provided information to guide ex-servicemen, industrial workers, and others, considering farming as a vocation. The Dairy Department in the same college developed a programme of state-wide artificial insemination of cattle, in co-operation with the Michigan Artificial Breeders' Association and in the very first year, 1945, 20,000 cows were successfully inseminated. The Agricultural Engineering Department of the same college introduced recently a mechanical sugar-beet harvesting equipment, and what can perhaps be described as a field-size "Vacuum Sweeper" for harvesting seeds and seed-heads of crops that lie on the ground, by sucking them up with the help of a motor-driven fan and by collecting them in a large canvas bag for subsequent threshing and cleaning. One of the usual features of the Agricultural Engineering Department is the constant remodelling of farmers' homes.

(5) *The Public Relations Department*: Here we come into a characteristic feature of America, of specialisation in publicity, based on the principle that the people should know as much as possible, to make them efficient farmers, and citizens. Each university has a public relations department whose duty is to supervise and turn out publications of all kinds, from the most scientific, to the most popular so as to suit all types of readers. This department also makes the best use of audio-visual aids to convey information and takes every care of the visitors and invites visitors who are interested. Such a department in the university does very useful work for the agricultural college and an evidence of the intensity of work are the numerous leaflets, bulletins and magazines, that are sent out regularly every now and then, and with which the members of the Madras Agricultural Department are so familiar. In 1948 at the Michigan State College, 112 new Extension Service Publications were produced and nearly a million copies distributed from the Bulletin office. More than 1,300 different information stores were released to Press and Radio outlet during the year. Manning this department are personnel highly trained in the various branches of literary work, printing, publishing, photography, audio-visual aids etc.

(6) *University contacts with the farmers*: The universities with agricultural colleges are so anxious that the farmers should visit their agricultural departments and see what they are doing, that they organise annual events for the farmers. At the Michigan State College, I had the privilege of attending a Farmers' Week in 1948, conducted by the university, which was attended by 30,000 farmers, and which gave the rural people of Michigan short courses in new ideas of farming and home making. There was an Annual Farmers' Day and 4-H Club show in August, which attracted whole families of farmers.

II. The role of the Government: (a) *The State Government*: While the work of the State Universities detailed before is the concern of the State Government, each state has also the State Department of Agriculture and the State Department of Conservation. With the help of the State Soil Conservation Committee, ways and means are found of taking to the farmer's door, demonstration and information on soil conservation. Besides this many states have Land Use and Zoning Acts to prevent unwise use of the land, especially lands of low fertility.

(b) *The Federal Government*: The farmer is so important to the Nation as a whole that his problems are of national concern to the American Government. The agencies of the U. S. Federal Government for helping the farmers are too numerous to mention but just a few important aspects of this work may be given. One of the most important features of Federal Service to the farmer is that whatever the type of help given to the farmer, it is almost invariably accompanied by

recommendations for improvements, such as greater emphasis on appraisal, farm management, auditing, statistics, research and information and education services to the farmer.

(1) *The U. S. Department of Agriculture*: This department is the largest agency of the Federal Government, having numerous activities, some of which are listed below:

(a) *The Bureau of Plant Industry, Soils and Agricultural Engineering, Beltsville, Maryland*: This is the most important branch of U. S. Department of Agriculture, with field locations for research spread all over the states and in ten Latin American countries, and co-operating with State Experiment Stations of 44 states, and having a 14,000-acre agricultural centre. It is significant that included in its four main lines of work is "Designing farmhouses and other farm buildings that make for comfortable living and profitable farming". The Bureau has also one of the best publicity departments of U. S. A., issuing leaflets and bulletins in thousands, taking care of innumerable visitors and specialising in visual aids for conveying information to farmers.

(b) *Bureau of Agricultural Economics*: This is a federal research agency of the U. S. Department of Agriculture, to collect, analyse and interpret production, economic and social information affecting agriculture; to act as adviser to the Secretary of Agriculture and to agricultural committees on national policies and legislation. The staff is located in Washington D. C., and in each state, while the agricultural specialists are at the agricultural colleges. It prepares many hundred publications each year, including special reports on commodities, research bulletins, a monthly check list of publications, all used by trade, farm organisations and the agricultural colleges.

(c) *U. S. D. A. Market News Service*: This agency collects and reports information on the volume and prices of livestock and agricultural produce and prepares reports for distribution to press, radio and to individuals.

(2) *U. S. Soil Conservation Service*, furnishes help and information regarding the soil practices, contour farming and strip cropping etc.

(3) *The Rural Electrification Administration*, another agency of the Federal Government, aims to bring more and more farms every year under electrification and informs the farmer of all the progressive uses that electricity could be put to in a farm.

(4) *The Tennessee Valley Authority*. What the T. V. A. has done to revitalise the American farmer with all that is modern in research, is a story that would belong to a seperate chapter. But, it is of importance

to mention here, about the test-demonstration farms used as an educational device, at the Tennessee Valley region for achieving the agricultural development of that region. In June, 1946, there were 38,800 of them in active operation. Through the test-demonstration farms, practical farmers can learn through their own action and by observation, the methods and benefits of proper application of soil minerals and of altered farm practices and farm management. In this way, the neighbours of test-demonstration farmers can see actual results. The demonstrations are of two types. One is the "Unit" test demonstration farm, in which individual farmers, usually selected by their neighbours, test and report on results of new methods in farming operation which are planned by the farmer with the help of his county agent. The other is the "area" demonstration in which entire farming communities participate. In such communities, agricultural developments becomes a co-operative effort and leads usually to a quickening of the community spirit and community life. These test demonstration farms have been copied in several states of the nation, by Experimental Stations and Extension Services so that today three million acres are under test demonstration farms. Such test demonstration farms would be very useful under Indian conditions also, as they produce a new pattern of farming which develops and utilises most effectively the natural resources of water, soil and crops, the capital resources such as buildings, fences, power, machinery, equipment; the farm family resources such as labour, skills and knowledge; and community resources such as marketing, distribution and processing facilities, churches and schools. This development is essential in freeing the farmer from the limitations of poor land, lack of power, machinery and livestock, inefficient agricultural practices, and limited skills and a narrow outlook and in opening the way to an effective democratic way of life on the farm and in the farm community.

III. **The role of the Press and the Radio:** While the national magazines and newspapers continuously feature topics for the farmer, the Community Press, as it is called, is the most influential in getting to the farmer the latest in farming developments. Every township or a small group of township run their own dailies, featuring news for the farmer. Besides this, papers like the Hoard's Dairymen at Wisconsin, play an important role in educating the farmer. The Hoard's Dairymen has a wide national circulation and has an editorial staff of nine specialists who seek the latest findings of the agricultural colleges. The managing editor of the Hoard's Dairyman, Mr. A. J. Glover, runs a practical 200-acre dairy farm, just to be sure of what he says in his magazine. Besides these are the numerous agricultural monthlies, run on popular lines. The radio also plays its tremendous part, and many of the universities with agricultural colleges own broadcasting stations from which are beamed forth information for the agriculturists and warnings about weather, pests and diseases, day in and day out.

IV. **The role of the 4 H-Club:** This is a well-known club for the sons and daughters of farmers, who are to be trained as the future farmers of America. The movement is one of the great contributory causes of the continued prosperity of the American agriculturist. The number of projects that are tackled by these youngsters in raising the best crops, fruits, vegetables, poultry and livestock under competition, with the guidance of the county agents and the enthusiasm with which the boys and girls take to these projects is astounding. What happens by way of introduction of the latest methods of agriculture to the children of the farmer cannot be easily ignored by the farmer himself. The 4 H-Club has contributed so much to the progressiveness of the farmers that the County Boards of Michigan last year, voted a total of 300,000 dollars (10 lakhs of rupees) to the programmes of the 4 H-Club. A great youth movement, it reached 60,000 boys and girls from ten to twentyone years of age in the one state of Michigan alone. The Agricultural Extension Service, is closely knit with the 4 H-Club.

V. **The role of private enterprise:** There are numerous large industries depending upon agriculture as its raw material and in all these cases, the industries establish special departments of agricultural research to help the farmers. The Gorber Products' Company, the largest baby food plant in the world situated at Fremont in Michigan, is an example. This company processes a great variety of fruits, vegetables, soups, meats etc., for children and it has a department of agricultural research to obtain quality products. The International Harvester Co., which manufactures and distributes a wide variety of farm machinery in the U. S. and foreign markets, uses literature, films, exhibits, and demonstrations not only to sell their products but also to increase farm efficiency and farm income and to save labour and energy in form operations. Swift and Co., in Chicago, the largest meat packing concern in the world has one of the largest departments of agricultural research for any private co[redacted] in the world and by direct contact with their farmers, see to it that the results of research are assimilated into their practices. The Dow Chemical Company, one of the largest of its kind, publishes magazines for farmers to keep them informed of the latest developments in the application of plant hormones and chemicals to agriculture. Kellogg, the manufacturer of the famous Kellogg's Corn Flakes and breakfast cereals has established what is known as the Kellogg Foundation, worth nearly 50 million dollars, most of which goes towards increasing the welfare and efficiency of the farmer. In addition to these, there are several private institutions, entirely supported by private funds for research in agriculture and plant sciences and with an organisation to see that the results actually reach the farmer. The Boyce Thompson Institute at Yonkers, New York, with Dr. Zimmerman, the wizard of plant hormones, is a great private institution whose contribution to American agriculture is significant and very widely known.

VI. The role of the farmer: (a) *Farmers' organisations*: The role that the farmer himself plays in keeping abreast of the results of agricultural research is almost incredible. The organisational capacity of the American farmer, in the interest of his group is astonishing. In Michigan alone, which is comparable to a province in India, there are 23 Livestock Associations, 6 Dairy Cattle Associations, 9 Dairy Produce Organisations, 10 Poultry and Rabbit Organisations, 4 Farm Crops Associations, 5 Agricultural Engineering Organisations, 4 Muck Farmers' Associations, 1 Farm Management Association, 1 Soil Conservation Association, 12 Horticultural and Floricultural Organisations, and 18 Agricultural Economics Organisations, making a total of 96 different agricultural organisations to take care of different interests. This is apart from 2 Forestry Associations and 6 Veterinary Medical Associations which are treated very often in America as part of Agriculture. The aim of all these organisations, is to get the best out of research in their fields, from whatever source it is available, so as to keep continuously modern and efficient in production and marketing methods. They invite speakers to their groups, welcome demonstrations in their fields, organise trips for their members to colleges, research centres and private farms run on scientific lines, hold exhibitions and publish their own magazines or information bulletins, pool their resources to persuade the government to enact beneficial laws in times of need or to cancel enactments that would harm their industry.

Of all the agricultural organisations, the general trend of the co-operatives is the most encouraging feature of American agriculture. The best examples of such co-operatives are the California Fruit Exchange (deciduous fruits) and California Fruit-Growers' Exchange (citrus). These exchanges are grower-owned, co-operative marketing organisations, and they own and operate numerous packing houses, located in every fruit district of California, and several by-product industries and they [illegible] the growers the latest in methods of production.

At the national level, there are organisations to take care of the interests of the whole group of farmers of the nation. The American Farm Bureau Federations was organised in 1919 to "represent the business, economic, social and educational interests of the farmers of the nation and to develop agriculture". It publishes a magazine called "Nation's Agriculture". It has been responsible for many legislative measures of the Congress to benefit the farmer. The National Council of Farmer Co-operatives is a public relation and legislative agency for the farm co-operatives and prepares materials for distribution to members as "Washington Situation", a weekly release, and represents members at legislative hearings as a voice of organised agriculture.

The farmers' aptitude for research and his promptness in application of results: Most of the American farmers have an interest in research and this is one of the contributory causes to American efficiency in agriculture. They are themselves often trying and evolving new practices and forcing the Experiment Stations to keep ahead of them. The California Citrus Industry is a tribute to the pioneering spirit of the citrus growers of California. The famous Henry Wallace is a practical farmer of Iowa and was one of the persons responsible for the development of Hybrid Corn, which has revolutionised agriculture in the mid-west regions of the U. S. A. The American farmers are also quick to seek and adopt results of research. Artificial insemination for cattle breeding, the general use of chemicals and plant hormones, the spraying and dusting for pests and diseases by aeroplane and the highly mechanised agriculture are all examples of the receptivity or the American farmer to progressive ideas.

What we can do in India: Briefly, the reasons for the very successful education of the American farmer, are the following:—

(1) Between the research worker and the farmer, there is a comradeship, made possible because of the high educational level of the American farmer.

(2) The American policy of agricultural research reaching the farmer is to treat the farmers' family as an economic unit on the basis that only if the family is prosperous can there be a question of the farmer carrying out improvements.

(3) The American policy is not to be satisfied with the efficiency of the present generation of farmers but to ensure also that the future generations keep up their efficiency with the times.

(4) There is a conviction that the Extension Service (i.e. Propaganda division) cannot by themselves achieve much, unless there is local leadership to assist. Hence the American emphasis on leadership training as the cornerstone of Extension policy.

(5) The Press in America has realised the importance of the farmer. The Community press to serve the farmers is a feature of American agriculture.

(6) The Radio is equally of service to the farmer by keeping him posted with up-to-the-minute developments.

(7) The Private Industries which thrive on agriculture in America attempt to return the debt they owe to the farmer.

(8) The American farmer is well-educated, modern and well-organised, so that he can produce and market efficiently.

(9) Lastly, the Americans are experts in publicity and they leave no stone unturned to see that the information they have, reach the farmer. In this, the latest methods of visual aids are a great feature.

From all this it is evident that we cannot entirely duplicate the results of America in India, because the Indian farmer is not on the same educational level, to be receptive to developments to the extent that we would wish, and to organise himself to develop as a group. Education and organisation of the farmers should be the keystone of our agricultural policy. That a whole generation of farmers cannot be made overnight to read and write is not a matter of despair. Audio-visual aids come to our rescue and if these aids are properly used and if men with ideas are utilised to develop the material required in script and presentation, there is a tremendous possibility. Besides this, the Indian tradition is so full of village dramas, rural folk songs and dances that we can utilise them to the advantage of the former. As far as organisation of the farmer is concerned, training of local leaders becomes a matter of utmost importance —leaders who are trained to be scientific farmers, and who are respected by the local community.

Deficiencies of minor elements responsible for diseases of crop plants in this province*

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Crop plants remove considerable amounts of mineral nutrients from the soil during their life. A small percentage of these may be returned to the soil by the disintegration of those parts left in the soil. But the major proportion contained in stem, leaves, fruits and seeds does not come back at least to the same place. Consequently replenishment of the loss is necessary. For this purpose manures have to be applied to the cropped areas. Knowledge of the nutritional requirements of plants have undergone change in recent years. At one time it was thought that the plants were in need of only ten essential elements for growth. Recent work especially during the last three decades has however resulted in the development of our knowledge of the part part played by various other elements in the life of the plants and has led to the addition of more elements under this category. These later additions are usually termed as "minor elements" "trace element" or "micronutrients" and have been found to be equally essential though they are required only in extremely small quantities. Though the role of these elements fall within the realm of physiological studies, the absence or deficiencies of these elements lead to the development of pathological symptoms of crop plants

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