Invited Lecture delivered at the Seminar on "Organic Farming : Resurgence of Traditional Agriculture, 2006, Calcutta, by Ministry of Agriculture Government of India

ORGANIC FARMING : A REFORMED TRADITIONAL AGRICULTURE

***Kunal Ghosh*[1]** *and* ***Chandrika Varadachari*[2]**
[1]Department of Agricultural Chemistry & Soil Science
University of Calcutta, 35 BC Road, Calcutta 700 019
[2]Raman Centre for Applied and Interdisciplinary Sciences
16A Jheel Road, Calcutta 700 075
e-mail : rcais@cal3.vsnl.net.in

ABSTRACT

Historically farming was organic till the advent of chemical fertilizers and pesticides dramatically changed the face of agriculture. The realisation has now dawned that it is essential to make another turnaround if severe environmental damage is to be stemmed. However, the approach is not to return *per se* to traditional methods but to integrate modern knowledge to develop a sustainable system. Existing state of art on organic farming is inadequate to compete with modern methods in terms of yields and economic returns. This is because of inadequate soil and crop management. Intensive research needs to be done to develop technology packages that are crop and region specific. These packages should incorporate managements for all nutrients, pests and diseases. Quality and quantity of inputs are also to be specified. Only thereafter can large scale extension work be undertaken.

INTRODUCTION

Since the day on which man first upturned the virgin soil, agriculture remained organic for millenniums. However, increase in population, restricted cropping area, looming food shortage and frequent famine compelled the think tank to look for newer avenues. Modern science provided a blue print for new agriculture with inputs like improved varieties, chemical fertilizers and pesticides, etc. supported by various kinds of mechanisation. It all started in Europe and then in North America, but the Indian picture remained by and large untouched till the Independence.

THE SEA CHANGES IN FIFTIES AND SIXTIES

The changes undertaken were policy decisions and the slogan was straightforward "hunger needs food". Such changes left no area untouched.

The Indian Council of Agricultural Research (ICAR) had only nine research institutes before independence. The number soon shot up to thirty three and the existing ones were upgraded.

Radhakrishnan Commission (1949) talked of Rural University. The concept of Land Grant Colleges and Federal Research Stations of USA were accepted. First Joint Indo-American Team

(1955), the Second one (1960) and the Cummins Committee Report (1960-62) paved the way for establishment of Agricultural Universities (AU). Seven AUs were established between 1960 and 1965. Kothari Commission (1966) recommended at least one AU per state. In the same year, ICAR was reorganised to play the role of UGC to General Universities. Fourteen more AUs were established by 1978. So much emphasis was given to this human resource factor that by 1968, 4500 faculty members were trained in USA under US AID Scheme to man AUs and ICAR.

Simultaneously, package programmes (1959-1964) were introduced for demonstration. Areas were selected for intensive cultivation, package of practices were provided and credit was made available.

Briefly, the following measures were undertaken, (1) Credit : Cooperative Rural Societies, (2) Land reforms, (3) Agricultural machinery : Agro-Industries Corporation, (4) Farm mechanisation, (5) Rural electrification, (6) Seeds : National/State Seeds Corporation, (7) Chemical fertilizer : Fertilizer Corporation of India, Fertilizer Association of India, Private sector, (8) Plant protection : Private sector, mainly MNCs, (9) Communication (rural roads), (10) Incentive price : Agricultural Prices Commission, Food Corporation of India,

THE TRANSFORMED SCENARIO AND THE GREEN REVOLUTION

The transformation from traditional to modern agriculture was brought about on a super mega scale, unheard of before, and marketing was pushed most aggressively. New crop varieties were introduced that were nutrient hungry, chemical fertilizers were made easily available at low cost (subsidised), so was the other inputs and finance. The overall scenario was apparently farmer-friendly with definite increase in production. The nation accepted it and we had our Green Revolution. Tables 1 and 2 summarise the impact of Green Revolution. Whatever organic agriculture survived thereafter was not by design but by default.

THE IMPACT

In research, the focus shifted overwhelmingly towards inorganics and that too mostly to trials. Not just the organics but the basic research was severely affected.

On environment, the following effects were most prominent, (1) susceptible varieties, (2) chemical pesticides, (3) high water needs, (4) pollution of ground water and air, by chemical pesticides and fertilizers, (5) depletion of soil nutrients, and (6) reduced fertilizer use efficiency. Apart from these concerns, Table 3 (Kaushal 2005) questions the very base of opting for 'modern' or 'inorganic' agriculture. All these culminated into organic agriculture movement.

Invited Lecture delivered at the Seminar on "Organic Farming : Resurgence of Traditional Agriculture, 2006, Calcutta, by Ministry of Agriculture Government of India

THE DELIBERATIONS

The major objectives of organic farming as outlined by the International Federation for Organic Agriculture Movement (IFOAM) are, (1) to produce high quality food, (2) to work in natural environment (system), (3) to encourage biological cycle and to maintain biodiversity, (4) to maintain long term soil fertility, (5) to use renewable source of energy, (6) to avoid pollution, (7) to be livestock and human health friendly, and (8) to assure adequate return to the producer.

However, the above objectives cannot be achieved by carrying out traditional agriculture. It needs to be reformed.

REFORMED TRADITIONAL AGRICULTURE

The basic idea is to combine modern methods with traditional knowledge. Table 4 highlights the avenues of reformation. In addition to traditional wisdom, local knowledge and indigenous technology, a global knowledge base is available. The inputs can also be procured globally instead of locally; local varieties can be replaced by improved ones. Modern management practices can be adopted. Along with composts and manures, biofertilizers may be introduced; such biofertilizers may be produced by improved methods preferably with value addition. Vermicompost can be another important input. Instead of banking on locally made biopesticides, formulations prepared elsewhere in the globe may be tried out, if required as concentrates. Microbial pesticides may also be applied. The call of the day is to carry out research on the specificity of these natural pesticides on various pests and diseases. The overall objective is to optimise the yield and to make it economically viable in the open market.

THE REFORMIST'S DILEMMA

Some major ones are discussed hereunder. (1) High yielding crops are likely to require nutrients at a faster rate than they are released from organic inputs. Such incompatibility in release and requirement at various growth stages may affect the plant growth. (2) Even a soil of low organic matter and poor productivity contains about 2000 kg/ha organically bound nitrogen. We add only about 100 kg/ha nitrogen as urea and crops respond such addition. If so, can the modern agriculture rely entirely on organic inputs? (3) The common recommendation is to follow organic-inorganic combination. Nature is a great leveller and acts against this prescription. Organisms fix nitrogen only under starvation; once soluble inputs like urea is added to the soil, they cease to function.

Invited Lecture delivered at the Seminar on "Organic Farming : Resurgence of Traditional Agriculture, 2006, Calcutta, by Ministry of Agriculture Government of India

IS THE BRIDGE TOO FAR?

Organic producers generally expect higher value for their produce because of lower yield, better quality and health safety. This holds good only for selective buyers as it is now. Once the market is expanded and reaches all the stratum of the society, such demand may not be satiated.

Another question often haunts "do we have enough organic inputs?" No, if we consider our total demand. The safest alternative is to take up cereals at last and to concentrate initially on cash crops, fruits, vegetables, etc. where, in addition, the selling price is negotiable.

However, the higher cost of production and lower yield are not tenable. In the long run, 'organic' produce will be compelled to play with the 'inorganic' at the level playing field. It cannot be protected eternally under the aegis of health or environment. The task is not insurmountable.

THE ROAD

We have carried out decade long experiments (Ghosh & Varadachari 2005), initially with soils, then pot trials and finally field experiments. We observed that organic inputs improve soil pH, salinity, organic matter, total nitrogen, available phosphorus and potassium, and water holding capacity. Pot experiments substantiated better germination, plant height and weight, and increased total nitrogen. Field experiments showed higher seed weight and nitrogen content, increased soil moisture and total nitrogen, and most importantly productivity. On critical analysis, it was concluded that yields as high as 'inorganic' agriculture can be achieved.

THE TASK

Technology packages are to be developed which will be crop and region specific. Quantity and quality of inputs are to be prescribed in detail; value addition is essential. Strict management schedule is to be adhered to. To achieve this objective, intensive mega scale research programmes are to be launched. Contrary to popular belief, our knowledge of organic farming borders ignorance.

THE PIVOT

Soil and allied chemical and biological research holds the key because science is mostly manipulated here. An example will make it clear. It is for the same reason, the breeder comes to the fore in varietal development although all branches of agriculture are involved in it.

THE CURRENT POLICY

Under the National Project on Organic Farming, the following exercises are sponsored by Government of India : (1) Training of certification and inspection, (2) training on production and quality control of inputs, (3) training of field/extension workers, (4) training of farmers, (5) field

demonstration, (6) farmers' fair, (7) guidelines for service provider, and (8) model organic farm. Except the last item, others are extension work. The only place where research is possible, is the model organic farm. Only Rupees four lakhs are sanctioned over a period of three years to run such farm of which a pittance can be siphoned for research.

THE PROPOSAL

(1) Develop knowledge base : Intensive research.

(2) Develop technology packages : Region specific and crop specific.

(3) Assure soil, crop, nutrient and pest management.

(4) Assure inputs.

(5) Assure sale.

(6) Support on mega scale.

THE VISION

First step : **Science** : Involve soil scientists. Intensify research on soil organic matter and soil biology.

Second step : **Technology** : Involve also agronomists. Develop technology packages and continuously improve them. Demonstrate successful examples.

Third step : **Extension** : Involve further extension workers. Educate farmers. Create proper socio-economic conditions. Keep faith in common man. Make organic agriculture a way of life.

REFERENCES

Ghosh, K & Varadachari, C (2005) Organic farming for improving soil fertility. *In* : National Policy on Promoting Organic Farming (eds. Bhattacharyya, P & Kumar, D). National Centre for Organic Farming, Government of India, Ghaziabad.

Kaushal, GS (2005) Myths in organic farming. *In* : National Policy on Promoting Organic Farming (eds. Bhattacharyya, P & Kumar, D). National Centre for Organic Farming, Government of India, Ghaziabad.

Table 1 : Green Revolution

	Rice (Mt)	*Wheat* (Mt)	*Millets & Maize* (Mt)
1966-67	30.4	11.3	24.1
1971-72	43.0 (42%)	26.4 (134%)	24.6 (2%)
1976-77	42.8 (-0.5%)	29.1 (10%)	28.5 (16%)

Table 2 : Over Twenty Years

	Rice		*Wheat*	
	Area (Mha)	Production (Mt)	Area (Mha)	Production (Mt)
1960-61	34.1	34.6	12.9	11.0
1970-71	37.6 (10.3%)	42.2 (22.0%)	18.2 (41.1%)	23.8 (116.4%)
1980-81	40.2 (6.9%)	53.6 (27.0%)	22.3 (22.5%)	36.3 (52.5%)

Table 3 : Some Hard Realities

(1970-71 to 1993-94)

Input increase (%)	*Output increase* (%)
Irrigation : 69	Food grains : 89
Chemical fertilizer : 616	All commodities : 92
Chemical pesticides : 242	
Electricity : 742	
Institutional credit : 1128	

Table 4 : Organic Farming

Traditional	*Reformed*
Traditional wisdom Indigenous technology	Global knowledge
Traditional practices	Modern management
Local varieties	Improved varieties
Composts & manures	*Also* Biofertilizers (improved method + value addition) Vermicompost
Local natural pesticides	*Also* Biopesticides (global/ concentrates/ specific + Microbial)