Neth. J. Agric. Sci., 16 (1968) : 235—242

Rejuvenating sick agriculture: Indian experience

M. L. Dantwala

Department of Economics, University of Bombay, India

Received 4 September, 1968

In 1967, two Americans, Paddock Brothers felt convinced that several regions of the world were doomed to starvation and considered it their righteous duty to propose a scheme under which American food aid policy could rationally decide whom to save and whom to allow to perish. In that scheme, India headed the list of the unfortunates who 'can't be saved' and must, therefore, be allowed to perish, on the highly rational ground that the quantum of food aid which would in any case be wasted on Indians could be more purposively used to save those who can be saved. Apart from its rational humanism, the scheme, it was claimed, fulfilled the basic tenets of good economics: allocate scarce resources to alternate uses to optimise the result, in this case human welfare.

It is not the purpose of this article to question the propriety of the policy prescription for American food aid. The purpose primarily is to record a few facts regarding India's food and agriculture, evaluate them in an appropriate historical and geographical perspective, and incidentally, highlight some of the problems of modernising traditional agriculture. It is for the Paddocks and the Americans to decide — as the blurb on the book says — whom to save and whom to sacrifice. [1] If India could help it, she should not confront the outside world with such embarrassing choice and ensure that there would be no need to stand in the mendicants' queue. Can this be done? The author cannot claim the perspicacity of the Paddocks to be able to prophesy for 1975, but he can narrate the post-War developments in India with some intimate knowledge.

On attaining Independence, India inherited an agricultural economy with perhaps the lowest productivity in the world. Before World War II, for example, yield per acre of rice in Taiwan was twice as high as in India.
The infra-structure — rural roads, electricity, education, extension, etc. — was insignificant. Practically no chemical fertilizer was used; the so-called improved seeds covered less than 20% of area under food crops, and were sometimes drought-resistant but not high-yielding; pesticide was unknown; there were hardly more than 100 tractors in use; 90% of the meagre agricultural credit was being supplied by moneylenders at exorbitant rates of interest; nearly half the land was owned by absentee, rent-extracting landlords. In 1947–8, foodgrain production in India was 66 million tonnes, one million tonnes less than that in 1901. As a matter of fact, between 1891 and 1947, the foodgrain production in India increased at the meagre average rate of 0.11% per annum; during the latter half of this period, it increased at the rate of

[1] William and Paul Paddock: Famine 1975! Weidenfeld and Nicolson, London, 1968.

0.03%.[2] It was this bankrupt agricultural economy which the country inherited. It was from here that it had to take-off. Since then, the economy has undergone many changes considered essential as pre-conditions of a take-off, and it is this which we should like to record. According to many knowledgeable circles, the take-off is perhaps in sight, but has certainly not materialised as yet. The question is whether it will crash or soar by 1975. Paddocks have answered it one way; is there another at least equally convincing?

Another pertinent enquiry would be: why is agriculture failing in so many developing countries of the world? How is it that barring a few notable exceptions like Taiwan, South Korea, Israel and Mexico, no developing country could summon enough wisdom to develop its agriculture, inspite of the aid and assistance of the United Nations' Agencies like the FAO and reforming zeal of United States' experts? Is it their agricultural policy or population policy that has failed? According to the FAO's 'The State of Food and Agriculture' (1965), during the decade ending 1964–5, the average annual increase in food production of the Developed Region was 2.7% against 2.8% for the Developing Region (Latin America, Far East, Near East and Africa). Per head, however, the increase was 1.2% and 0.4%, respectively. It would thus appear that the agricultural progress in the Developing Countries is comparable to that in Developed Countries but is being swallowed up by the vastly different rates of population growth: 1.3% per year in the Developed and 2.3% per year in the Developing Countries. Sequences in economic development are as important as the stages in economic development. The Developing Countries have experienced a revolution in medical sciences which cut down their death-rate from approximately 30 to 19 pro mille before the revolution in agricultural sciences could materialize.

Another pertinent point to note is that in Developing Countries, where levels of consumption are low, the income elasticity of demand for food is very high: 0.5 to 0.7 against barely 0.1 in rich societies. Thus, the very process of development with its rising incomes generates pressure on land resources, already aggravated by the accentuated rate of population growth. This coincidence of factors poses a challenge to the agriculture of these countries which is probably unprecedented in the history of economic development. In view of this, agriculture in Developing Countries should derive little satisfaction from its current performance vis-a-vis the Developed Countries or with the latter's historical performance in corresponding stages of economic development.[3] It has an obligation thrust upon it to surpass their performance though handicapped by the legacy of colonial rule and strange sequences in scientific and technological innovations. How is India meeting this challenge?

Between 1950 and 1965, area under cultivation increased by 24%. Much of the increase, however, took place in the earlier period upto 1955; thereafter, the pace has slackened appreciably. The Index (1949 = 100) increased by 15 points in 5 years between 1950 and 1955, but by only 9 points in the next 10 years. During the next two years, it declined to 120 and 122.

In 1950, 22.4 million ha were irrigated: 9.6 million through major and medium irri-

[2] George Blyn: Agricultural trends in India, 1891—1947. University of Pennsylvania Press, Philadelphia 1966.

gation, and the rest through minor irrigation. During the three Five-Year Plans, irrigation potential through major and medium irrigation alone has been enhanced by 7 million ha; the increase in actual utilisation comprises 5.5 million ha. The estimates of additional potential and utilization during the subsequent two years 1966–7 and 1967–8 are about 1.5 and 1.7 million ha. In more recent years, greater emphasis is being placed on minor irrigation works. The area irrigated by these sources at the end of the Third Five-Year Plan was 20 million ha. Another 2.4 million ha are reported to have been covered in the following two years. It is estimated that in 1967–8, the total expenditure on minor irrigation schemes would be of the order of Rs 1.56 billion. It is expected that as a result, 200,000 masonry wells, 42,000 private tube-wells and filter pumps, 1,000 State tube-wells and over 200,000 pump-sets will have been installed, and will benefit an area of 1.37 million ha. Rural electrification programmes are being speeded up to provide cheap electric power for lift-irrigation. During 1965–6 and 1966–7, nearly 250,000 electric pump-sets were energised bringing the total to 730,000. In 1960–1, the number of irrigation pumps, electrically energised, was only 160,000. As a result of these additions, though the area under irrigation has gone up by 60% since 1950, it constituted only 23% of the total cultivated area, as against 55% in Japan and 57% in Taiwan. Over the bulk of the cultivated area, production remains a gamble in rains. The major deficiency, however, is the highly inefficient use of the irrigational facilities.

In 1950–1, Indian agriculture utilised only 56,000 tonnes (N) of nitrogenous fertilizers. The use of phosphatic (P_2O_5) and potash (K_2O) fertilizer was negligible. In the current agricultural year 1968–9, utilization of all types of chemical fertilizers is expected to reach 2.8 million tonnes, as against 1.75 million tonnes utilised in the previous

[3] It took United States 70 years to achieve a break-through in grain yields as the following table will exemplify.

Change in grain yield per acre in selected countries for selected historical periods, 1866–1963

Country	*Annual compound rate of change (percent)*			
	Earliest period to 1901–05 [1]	*1901–05 to 1936–40*	*1936–40 to 1951–53*	*1951–53 to 1961–63* [2, 3]
Australia	—0.3	+0.5	+2.6	+0.8
India	N.A.	—0.1	—0.9	+2.1
Japan	+1.2	+1.1	—0.1	+2.6
United Kingdom	+0.1	+0.3	+1.7	+2.7
United States	+0.3	0	+1.5	+4.8

[1] The years covered in this period are: Australia, 1886–90 to 1901–05; Japan, 1878–80 to 1901–05; United Kingdom, 1884–85 to 1901–05; United States, 1866–70 to 1901–05.

[2] For India, 1948–50 was substituted for 1951–53 since yields in both 1951 and 1952 were, in all probability, the lowest of this century.

[3] For Japan, 1963 was omitted because yields of winter grains in 1963 were less than half of normal.

Source: Lester R. Brown: Increasing world food output. Problems and prospects. Foreign Agricultural Economic Report No. 25, U.S. Dept. of Agriculture, April 1965, p. 15.

year. As late as 1962, fertilizer input per ha in India was just 3.5 kg against 190 kg in Taiwan and 270 kg in Japan. Though the use of fertilizers is making rapid strides, the progress made in establishing domestic production capacity has been rather disappointing. Installed capacity for production of fertilizers in 1967–8 was only 690,000 tonnes, and actual production 500,000 tonnes ($N + P_2O_5$). By 1969, about a million tonnes (N) of additional capacity is likely to be established. By 1970, installed capacity for nitrogenous fertilizers is expected to reach 2.2 million tonnes. Upto the present, however, the magnitude of unfulfilled targets has been larger than that of fulfilled ones.

The most significant development, however, has been in the adoption of high-yielding varieties of seeds. Apart from evolution and introduction of some very successful hybrids for maize, jowar and bajra, the imported dwarf varieties of wheat and paddy are being constantly adapted to local conditions. This is a very recent development and its impact was felt for the first time on the 1967–8 crop. The earlier seed-improvement programmes were oriented towards development of their drought-resistance capacity. Their yield response to higher dosages of fertilizers was poor. The plants grew tall and became susceptible to lodging. The introduction of high-yielding varieties has changed the entire complexion of the development strategy. As the success of the programme depends critically on the availability of assured water supply, heavy application of fertilizers, pesticides and, above all, alert and intelligent husbandry, what is known as a 'package' approach has to be developed. Further, as all the major development inputs — irrigation, fertilizers, pesticides and the new seed — are in short supply, promotional efforts have to be selective and concentrated in areas with promising potential. In this there is a danger of aggravating regional disparities for the time being, but the solution to this problem is not the abandonment of the selective approach, but compensatory action in the less favoured regions.

In 1966–7, the area under high-yielding varieties was barely 2 million ha. Next year, the coverage increased to 6.0 million ha. The target for 1968–9 is 8.5 million ha and that for 1970–1 13 million. It now appears that the Mexican varieties of wheat have struck roots in Indian soils, the new paddy varieties are still posing problems of adaptation. The hybrids are displaying excellent performance in many regions. In any case, India's best hope is in the new high-yielding varieties of seeds.

But the crucial question is what has been the impact of all these commendable developments on production? A vast array of statistical material can be paraded to prove one thing or the other. Let us scrutinize some of it. Reported foodgrain production in 1951 was 52 million tonnes and that in 1968 was 95.6 million tonnes. But during this period, statistical coverage of reporting also increased, hence Index Numbers are constructed which eliminate the non-genuine increase. This Index Number series has, as its base year, 1949–50 (100). The Index Numbers for foodgrain production are given below:

1955–6	1960–1	1964–5	1965–6	1966–7	1967–8
115.3	137.1	150.2	120.9	124.6	159.5

It may be mentioned that population during this period (1951–67) increased by 148 million.

Table 1 All-India compound growth rates of production (% per annum)

Cereal	*Period*						
	1949–50 to 1964–65	*1949–50 to 1966–67*	*1952–53 to 1966–67*	*1955–56 to 1966–67*	*1956–57 to 1966–67*	*1957–58 to 1966–67*	*1957–58 to 1967–68*
Rice	3.37	2.51	2.01	1.53	1.34	1.29	
Sorghum (Jowar)	2.50	1.74	1.05	1.46	0.60	—0.36	
Bulrush millet (Bajra)	2.23	1.98	1.25	2.02	2.33	1.45	
Maize	3.79	3.52	2.68	3.25	2.68	2.65	
Finger millet (Ragi)	2.80	1.48	0.53	—1.31	—1.70	—2.31	
Wheat	3.97	3.40	2.67	2.29	2.16	2.26	
All Cereals	3.16	2.42	1.84	1.54	1.33	1.19	1.69

Source: Report of the Agricultural Prices Commission on Price Policy for Kharif Cereals for 1967–68 Season. Ministry of Food and Agriculture. Government of India, 1968, p. 2.

Estimates of growth-rate based on the Index Number Series reveal vastly differing picture depending on the choice of the base and terminal years. Table 1 gives a more adequate idea of what is happening.

More than the sluggish rate of growth, it is the uncertainty and the vast year-to-year fluctuations in production which give jolts to the economy and damages its image. The last quinquennium has been the worst in this respect and has caused the Paddock type of scare. After reaching a level of 89 million tonnes in 1964–5, production fell precipitously to 72 million in 1965–6, due to an unprecedented drought. By all normal expectations, the following year should have given a good crop. But by another rare coincidence, it too proved a flop, production rising by only 3 million tonnes. Apprehensions ripened into despair and the Cassandras triumphed. The record production of 95.6 million tonnes has once again revived hopes of survival.

On paper, the strategy of transforming traditional into modern agriculture can be easily spelt out. That such transformation is not merely a technical process is well-recognised. It involves transformation of the entire society, particularly its attitudes and habits of work. While it should be conceded that even a traditional farmer, like any farmer in the Western world, responds to economic incentives, it would be erroneous to believe that once such incentives are provided, individual efforts would automatically ensure the transformation. An entirely new framework of institutional arrangements would be needed to facilitate the transformation process. This too is well-recognised. But it is believed that all that is necessary for the establishment of the supporting institutional set-up and make it work is political wisdom. Hence, when the expectations are not realised, the outcome is attributed to the ineptitude of the people and the government concerned. The fact is that all the ineptitude, inefficiency, the petty corruption and occasionally, even rank stupidity are, in a way, symptoms of the very malady which the inadequate phrase 'backwardness' seeks to identify. It is absurd to consider the symptoms as an obstacle for the cure of the malady. What about the elite in these societies whose responsibility it is to initiate and accomplish the transformation? They at least can be presumed to have overcome the crippling penumbra of backwardness. By all accounts, there is in most of the underdeveloped countries a highly educated, intelligent and articulate class of social scien-

tists, technicians and free-lance as well as committed intellectuals. At best, they can spell out problems with perspicacity, but when it comes to 'doing' anything on a mass scale, the crippling environment of general 'backwardness' asserts itself. It is this sociology of transformation which has to be taken into account in assessing the current and prospective performance of under-developed countries. Right policies, no doubt, have not been invariably adopted, vested interests have influenced decisions, after the first flush of Independence the very political process has promoted second-rate leadership, at lower levels the bureaucracy is inept and often corrupt. But the most frustrating experience is that even the right policies have either failed or have become perverted in the process of implementation.

Transformation of agriculture involves a vast mass of people, not only, as in the case of India, millions of farmers, but also a large contingent of institutional workers: the Village Level Worker (VLW), Block Development Officer (BDO), the District Agricultural Officer, the subject-matter specialist, the agronomist, the soil chemist, secretary of the primary cooperative society, the veterinary officer and a host of others. Ultimately, it is the responsibility of these men to transmit the new technology and strategy to the mass of peasantry. The area of their operation is often a distant village with few modern amenities and arduous transport and communication. Let any one try to be efficient in this environment and he will realise how frustrating the effort can be. The process of transformation will inevitably be slow, halting and punctuated with setbacks. There are no instances of a mass of men turning efficient overnight.

The inter-relationship between the establishment of adequate institutional set-up and agricultural development is also far from clear. The cross-sectional analysis of agricultural development in different regions of India does not provide a firm hypothesis. Thus, Punjab, Madras and Andhra Pradesh, which have revealed demonstrably higher growth-rates are all known for their defective land tenure situations. Maharashtra, on the other hand, which has a progressive tenancy legislation comparatively better implemented, and one of the best cooperative credit and marketing organization in the country, has a very poor record in growth-rate. But, Gujarat with comparable tenure and cooperative structure as well as poor irrigation facilities has a much better production record. The higher percentage of irrigated area in Punjab (44.6), Madras (40.2) and Andhra Pradesh (27.2) and the consequent larger use per acre of fertilizers probably explain the higher agricultural growth rates in these States. But Uttar Pradesh (31.1) and West Bengal (26.3) with comparable irrigation facilities — and the latter a highly industrialized State — have been poor performers. Uttar Pradesh, which is contiguous to Punjab, did not apparently experience the demonstration effect. The concessional PL 480 imports of wheat on a massive scale from the United States are alleged to have a depressing effect on wheat prices, and consequently on the incentive of wheat-growers, and yet the all-India compound growth-rate of production of wheat has been consistently higher than that of rice: 1.29% per annum for rice and 2.26% for wheat between 1957–8 and 1966–7.

The mechanics of growth thus still remains unexplored. To suggest that technology, organization, infra-structure and economic incentives — high prices, subsidies and low taxation — are necessary conditions for a break-through and all these should be integrated into a purposive policy framework and intensively implemented, does

not amount to much. Apart from being itself a tall order, something somewhere always goes wrong which we identify and explain with a hindsight, but can rarely predict and safeguard against, in advance.

And yet, the future of agricultural production in India is not that uncertain and certainly not in the 'can't be saved' Paddock category. In terms of the medical 'Triage', it is 'walking wounded'. In Rabi [4] 1968, India produced 16.5 million tonnes of wheat which is 33% higher than the best past production of 12.3 million tonnes of 1964–5 and 5.5 million tonnes above the average of the previous five years. In agriculture, a severe drought or widespread floods can destroy crop, but the best of weather can at best boost the average by 10%. There is, therefore, a clear evidence of technological break-through. Field demonstrations have revealed that the response of the high-yielding dwarf varieties of wheat to fertilizers remains profitable upto as high a dose as 130–150 kg per ha, and the yields approximate 42 to 50 quintals per ha. These yields are about five times higher than the average current yields. In this, therefore, there is hope, if not promise.

According to the U.S. President's Science Advisory Committee, achievement of self-sufficiency in foodgrain production by 1976 'is certainly within reach technologically, provided all the necessary farm inputs are made available in a balanced and timely sequence. Nevertheless, it calls for an effort on a scale that has not been paralleled elsewhere in the world over so short a period.' According to this Committee, foodgrain production needed for self-sufficiency by 1976 — taking into consideration projected increase in population as well as per capita income, together with elimination of imports — would be 135.5 million tonnes, which with the deduction of 31.4 million tonnes for seed, cattle feed and post-harvest losses (17.3%) would yield a net availability of 104.1 million tonnes. This would require production to grow by 5% per year over a 9-year period, 1967–76, as against its 14-year trend line growth-rate of 2.36% per year. Increase in yield per acre would need to be trippled. [5]

The dark spot of the future, however, is not food, but the farmer himself. In 1961, 132 million workers — or about 70% of the total work-force — were engaged in agriculture. Based on the population projections currently in use, and assuming that the ratio of agricultural work-force to the total as well as the participation rates remain unchanged, the work-force in agriculture will grow to 192 and 219 million by 1976 and 1981 respectively. The assumption of constant ratio of agricultural to non-agricultural work-force may appear unreasonable, because with rapid economic development, the ratio is generally expected to decline. It did not, however, so decline between 1951 and 1961. As it is, there is a lot of unemployment in the non-agricultural sector of the economy, and even on the assumption of constant ratio, the non-agricultural sector will have to absorb an additional 26 million people in

[4] Crop season - from October/November to April/May.

[5] The world food problem. A Report of the President's Science Advisory Committee. Vol. II. The White House, Washington, D.C., U.S.A., May 1967, pp. 675, 689 and 693.
Note: Gross foodgrain production of 135.5 million tonnes is assumed as equivalent to the net local supply of 104.1 milion tonnes, indicating a disappearance factor of 23% (seed + feed + post-harvest loss of 17.3%), almost twice the percentage conventionally adopted (12.5) by the Government of India. At the latter rate, gross production needed for a net supply of 104.1 million tonnes would be only 119 million tonnes.

the years between 1961 and 1976 and 38 million between 1961 and 1985. If the growth of employment in this sector over the last 16 years since 1951 is any indication, fulfilment of the above requirements of additional employment will itself be a formidable task. According to an estimate, additional employment opportunities in the non-agricultural sector generated during the Third Five Year Plan were just 23.5 million. There is, therefore, not much hope of relief to the agricultural work-force from migration to non-agricultural employment. According to the somewhat shaky estimates of the Planning Commission, the backlog of unemployment has grown from about 3.3 million at the commencement of the First Plan to 9.6 million at the end of the Third Plan, and is likely to increase to 14 million by 1970.

The consequences of a massive addition of 60 to 87 million persons to the agricultural work-force within the short span of 15 to 20 years can indeed be very serious. It will not be possible to precisely spell out in this article all the consequences of this phenomenon on the income and welfare of the agricultural population and on the agrarian structure and relationship. The net area under cultivation in 1964 was 136.3 million ha: less than 0.80 acre per person. As already pointed out, in more recent years, the rate of addition to the net cultivated area has slowed down considerably. Opinions about the future potential in this regard differ. The President's Science Advisory Committee postulates addition to net area at 0.28 million ha per year between 1963 and 1985, as against the actual of 1 million ha between 1956 and 1963. In any case, for several years to come, by any criteria of investment, that in land reclamation will have a low priority. There is, however, scope for a significant increase in double-cropping and the gross area sown, and this should be fully exploited. Even so, since the additions to labour force will be larger than the additions to (gross) area, the land-man ratio will decline. As it is, though only 12% of land is operated in units of 50 acres and more — irrespective of its quality — as many as 19.4% of holdings are in units of 1 acre and below. The percentage of holdings below 5 acres is 63. The crowding in agriculture in 1981 and thereafter perhaps for another few decades will be staggering. If the incomes of these millions in agriculture are to be maintained even at the current abysmally low levels, productivity of labour will have to increase at a sustained rate of about 2.5% per year. This can happen initially at best for 5 or 10 years, but it cannot be sustained longer without a fresh mutation in science and technology.

But should one despair of such mutation? A report prepared by the Stanford University has estimated the potential benefit to agriculture that might result from the development of capability to make an accurate two week weather forecast, with the assistance of meteorological satellites. The benefit on nine selected crops would amount to more than $ 3 billion. The largest beneficiary next to U.S.A. would be India.