

GREEN REVOLUTION IN INDIA

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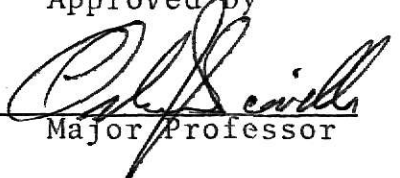
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INTRODUCTION

When India became independent in 1947, agriculture was the main source of livelihood for three-fourths of its population of 350 million. Though independent, the country comprised of 540 princely states. Its per capita income and literacy were among the lowest in the world. Its infrastructure essential to agricultural progress were at a low level of development.

This report is an effort to study the pros and cons of "Green Revolution"-- a word coined for the success of the Intensive Agricultural District (Development) Program, which came into operation as a result of the 'Food Crisis Report' submitted by the Ford Foundation Team in India.

At independence, Indian agriculture was traditional in three respects. It was pre-scientific -- carried on mostly with kinds of inputs that had changed little for many generations. Secondly, it was pre-market-- carried on mainly for internal village consumption plus enough to pay taxes, often paid in kind. Thirdly, as a correlative of its self-sufficiency, agriculture was also pre-market in that custom, tradition and authority had long been important sources of allocative and distributive directives.¹

In 1947, India had yet to develop its institutions for a rapid growth in agriculture. It had to develop (1) economic sources of supply and distributive systems for modern farm inputs; (2) a rapidly growing non-farm sector as a market for

¹INDIA -Directorate of Economics & Statistics, India's Agricultural Progress in the 1950's and 1960's. Apr. 1970, p. 2

sustained increase in production beyond that needed to meet farmer's consumption needs; (3) modern transport and marketing facilities and services needed for linking farmers more closely to non-farm markets; and (4) strong research, education, extension, credit, and other institutions vital for dynamic agriculture.²

Agriculture was the main occupation of over 70 percent of the population, and productivity was exceedingly low in this sector.³ The rural population of about 83 percent, living in over half a million villages, suffered from under-employment and low incomes. The population had increased by more than 50 percent since 1900, but there was no significant increase in the growth of alternative occupations. The country had both unemployed and under-employed manpower on one hand and unexploited resources on the other.

Agriculture in India faced many problems which led to lower productivity. The modes of cultivation were out of date. Only 43 percent of the 615 million acres of cultivable area was cultivated.⁴ There was need for improving the cultivation methods and also extending it to other cultivable lands which were not cultivated. The productivity of both foodcrops and cash crops was among the lowest in the world.

²INDIA -Directorate of Economics & Statistics, op cit., p.3.

³INDIA -Planning Commission, First Five Year Plan-New Delhi, 1952, p.12.

⁴Ibid, p. 153.

The foodgrains production was 57.6 million tons which went down to 52.2 million tons from 1949-'50 to 1950-'51. This included the cereals and pulses. According to an old saying, 'Indian agriculture is a gamble in monsoons', the agricultural production was dependent mostly on rain water. Only about 450 million acre feet out of about 1,356 million acre feet of the available river water resources could be used because of physiographical conditions.⁵ There was great potential for increasing irrigated area.

The fertilizer use was very insignificant. Most of the foodcrops were only manured but not fertilized. Even for those crops which were fertilized, the dosage was far below the recommended dose. The seed material was not given much attention. Usually, the seed material was from the harvests of the previous years. Improvement of seed quality was not considered vital for increasing crop yields. Practically, no hybrid or high-yielding seeds were used.

The cultivation practices were so obsolete that weeding and other inter-culture operations were not taken up seriously. The harvesting of crops was no better operation and some produce was lost in the process. The produce was not processed with a view to prepare for the market but most of the output of small farmers was for their own family consumption. The marketable surplus of foodgrains was not properly stored as also the farmers' own supplies for the future. The spoilage and infestation due to improper storage was quite significant.

⁵INDIA -Planning Commission, Third Five Year Plan - New Delhi, 1961, p.380.

Most of the money for the cultivation expenses for small farmers came from the village money-lenders and landlords. Therefore, the marketing channel for the small farmers was through their money-lenders or landlords, who also acted as money-lenders in most of the cases. The interest on the loans was quite high and once the small farmer was in debt, it was very hard for him to get out of it. There is a popular saying, 'the Indian farmer is born in debt, lives in debt, and finally dies in debt'. Due to the joint-family system, the debts of the fore-fathers and other relatives were binding on the occupants of the family land. This situation left no incentives for the small farmers to improve their farming techniques, as they were aware that any additional yields from their extra labor would be taken by their money-lenders and landlords. Marketing was not regulated and therefore, there were many under-hand dealings in the village 'bazaars'. There always existed great disparity in foodgrain prices from one place to another, due to lack of proper transportation, and also from one period of the year to another. Prices were the lowest at the harvest and the farmers had to give greater quantities of the produce to buy the same consumption goods.

Agriculture was not a paying business due to many reasons given above. The need for an over-all change was felt after the independence and this led to the formation of the Planning Commission, which was assigned the task of planning for development, including agricultural development.

The first decade of planning (1951-'61) saw many changes, which can be summed-up in the following paragraphs.

All the targets of the first two five year plans were not achieved but still the progress was remarkable considering the conditions prevailing before the commencement of the plans.

There was a total expenditure of Rs.6,560 Crores (\$1=Rs.4.75; 10 million=1 Crore), out of which Rs. 821 Crores was spent on agriculture and community development, Rs. 730 Crores on irrigation, Rs. 705 Crores on power and Rs. 218 Crores on village and small industries.⁶ The expenditure on agriculture seems quite low, namely, 12 percent, but expenditure on irrigation projects, power generation and village industries is complementary to agriculture.

The food production went up by 46 percent during this period. It went up from 52.2 million tons in 1950-'51 to 76 million tons in 1960-'61. The national income was up by 42 percent, from Rs.10,240 Crores to Rs.14,500 and the population went up by 21 percent, 361 to 438 million people. The per capita income was up by 16 percent while the index of agricultural production went up by 41 percent (1949-'50=100).⁷

The area under irrigation increased from 51 million acres to 70 million acres, an increase of 36 percent. The increase in the use of inorganic fertilizers was phenomenal. For example, the use of nitrogenous fertilizers went up by 318 percent, from 55 to 230 thousand tons of nitrogen. The increase in other

⁶INDIA -Planning Commission, Third Five Year Plan, op cit.,p.33.

⁷Ibid, p.35.

sectors of the economy was also significant.

The percentage increase seems very spectacular percentage-wise, but in absolute terms, this was not the case. Agricultural productivity was still among the lowest in the world. But one can say that planned development in India had started and some development was better than none. The Indian economy was at such a low base (1950-'51) that any development seemed very spectacular.

The first decade of planning was aimed at extending the cultivation to hitherto cultivable areas which were not under cultivation. The efforts were spread over the entire cultivable area. In the third five year plan, the emphasis shifted toward increasing agricultural production through the technical programs aimed at intensive cultivation. The programs which were given special attention were: (a) irrigation, (b) soil conservation, (c) supply of fertilizers and manures, (d) seed multiplication and distribution, (e) plant protection, (f) better plows and improved agricultural implements, and adoption of scientific agricultural practices.⁸

Several committees and study teams were appointed to look into the matter of increasing food production to meet the demand of increasing population. One such committee was from the Ford Foundation Team in India. The Agricultural Production Team of Ford Foundation, while recommending the selection of certain areas for more intensive efforts for agricultural production

⁸INDIA -Planning Commission, Third Five Year Plan, op cit., p.307.

observed that there were no inherent soil, climatic or other physical reasons for the low yields.⁹ Therefore, the team suggested in its report that those selected crops and those selected areas in each state should be chosen which had the greatest potential.

As a result of the Ford Foundation Team's report, planning in the agricultural sector in India changed its perspective and the success story is presented in the following pages.

⁹INDIA -Planning Commission, Third Five Year Plan,
op cit., p. 316.

THE PROGRAM

Consequent to the failure of the 1957-'58 crop of food-grains, the government of India became seriously concerned about food shortage and its consequences. This was further intensified when the new information of accelerated population growth became available. Among others, the Ford Foundation Team in India was asked to suggest measures for achieving more rapid expansion of food production. The Ford Foundation Team completed the "Food Crisis Report" by April 1959. The recommendations in that report generated the Intensive Agricultural District (Development) Program.¹⁰

The report recommended that food production be given top priority for the inputs needed for expansion and concentration of efforts on the major crops (rice and wheat) in the potentially most responsive areas of these crops. Emphasis was laid on the acceleration of adoption by farmers of locally suitable combination of production increasing technology. It was also strongly suggested that additional research be conducted to insure continued increases in output. It was felt that 'tailor-made' improvement programs should be developed to fit conditions in each area instead of a 'blanket-approach'. Much attention was given to the soil and water conservation and emphasis was shifted from large-scale irrigation projects to minor irrigation and

¹⁰Malone, Carl C., and Johnson, S.E., The Intensive Agricultural Development Program in India, in Agr. Econ. Res., Vol. 23, No. 2, April 1971, p. 25.

proper use of the available water supply. Top priority was given to increase the supply of chemical fertilizers.¹¹ Stable prices at remunerative levels were recognized as crucial incentives for increasing production of foodgrains.¹² The need for credit availability was stressed so that the farmer could buy the new inputs and to assure him that with average crop conditions, he could repay his debts with the added income that would result from the adoption of improved practices. The report suggested that each state should take up an experimental program to ascertain how food production could be increased if cultivators were given adequate educational and technical assistance, if needed inputs were made available locally, and if credit and price assurances were provided.¹³

The Intensive Agricultural District Program was a key recommendation in the 'Food Crisis Report', and was based on one basic and five supporting premises.

The basic premise ---

That India needed to organize its local agricultural development with enough resources to make it effective.

The supporting premises ---

1. There would be greater return for each unit of agricultural input--improved seed, fertilizer, water, pesticides, credit and technical manpower--if these scarce inputs were

¹¹Malone, Carl C., and Johnson, S.E., op cit., p. 26.

¹²INDIA -Ministry of Food and Agriculture, India's Food Crisis and Steps to Meet it, New Delhi, April 1959, p.25

¹³Ibid., pp. 248-250.

concentrated in the better agricultural areas having an assured water supply for irrigation. It was recognized that field testing would be required to determine the most profitable input-output rates.

2. There would be greater response from the inputs if they were applied as a package of practices.

3. If cultivators were to obtain and effectively apply the agricultural inputs, the cultivators would need to be served by a package of services--co-operatives, credit institutions and competent administrative staff.

4. The package of recommended practices was to be based on field tested research findings.

5. Accepting, as one must, that the cultivator is the primary decision maker, it would be necessary for one top agricultural officer to be in complete charge of all phases of the agricultural program at the district level and for the State to establish a committee to coordinate all State programs related to the district.¹⁴

The government of India requested the Ford Foundation to invite three Americans to join with Indian experts in developing plans for a pilot program. A program was outlined with recommendations to adopt known improvements in technology which should be strengthened with new research when it was available. The program recognized that the farmer should be supplied with the package of services, which gave this program the name, 'package program'.

¹⁴Ensminger, D., An Evolving Strategy For India's Agricultural Development, New Delhi, June 1968, pp. 6-7.

This package included the provision of new inputs, credit and price assurances, as the respective institutions were not available to supply these.

The central government would provide the overall outline of the plan, see that financial and technical assistance was provided, give program leadership and guidance, coordinate the different departmental roles, and assure remunerative prices. The state would select the pilot district in the state, and provide budget with the help of the central government. It also handled the creation of additional staffing and supervised the availability of inputs and production credit locally.

Seven districts in seven states were selected as pilot projects. The project was run by a Project Officer at the district level. He had a small staff of specialists, who jointly developed a locally adapted package of production-increasing practices. They saw that fertilizer, other inputs, and credit were made available to the farmers. Three additional agricultural officers were stationed in each block to work directly with the village level workers in providing the assistance farmers needed to adopt improved technology. The number of the village level workers was doubled, with one worker for every five villages. This organization as a whole was meant to reinforce the existing community development program with the addition of staff to plan, and help carry out the new program.

A district program for accelerated adoption of improved technology involved in taking steps to fulfill the objectives

set out in the food crisis report.

Seven districts in the selected areas were like seven experiments, each under different conditions. As can be seen, the Intensive Agricultural District Program (IADP) required direct governmental action as a continuous process at various levels; at the center where economic policies are made and implemented and where the over all supply of technical inputs and production credit is determined and arranged for; in the various states where the government decides how the agricultural effort will be organized, staffed, financed and administered; at the local level where farmers live and work and where the agricultural program, both technical and supporting, must operate in harmony if it is to be effective.¹⁵

The IADP plan called for dealing with all these aspects simultaneously to meet the farmer's needs and also to work out a more general use of the scheme. The central government discussed the proposed IADP with the seven selected states including the criteria for selection of each IADP district. The basic conditions included an assured water supply through irrigation or rainfall or both and a minimum of natural hazards. The village institutional development should be adequate including that of the co-operatives to provide the production credit and distribution of technical supplies locally on time to farmers as needed. The seven selected districts included four rice producing, two wheat producing and one district producing wheat and millets.¹⁶

¹⁵Malone, Carl C., A Pragmatic Venture in Development-The IADP, in South Asia Center, K.S.U. Pub. No. 1, Sept. 1969, p. 23.

¹⁶Ibid., p. 25.

The basic criteria laid down were intended for general guidelines. Most of the districts generally met the criteria but no IADP district fully satisfied all the conditions. But most districts could be considered generally satisfactory in view of the level of rural and agricultural development then pertaining in India.

IADP in Operation :

This was a large scale trial and demonstration of a new way of working with farmers in helping them modernize and increase production and income. The emphasis was on new technology and development of organization to provide information, guidance and assistance to the individual farmer's needs. The size of the program, 2.6 million farmers operating 16.5 million acres of crop area, has been a problem as well as an opportunity. The area included five million acres of irrigated rice, four million acres of rice without irrigation, a million acres of wheat, two million of corn, sorghums and millets and eight million more in a variety of other crops including pulses, oilseeds, cotton, sugarcane, chillies, bananas, tobacco and others. This acreage included 3.5 million acres of double cropping. Some districts have one or two important crops, others eight or ten.¹⁷ Main emphasis was on cereal production.

The job of the project officer and his staff was to study the local conditions in each district, analyze the resources and new production opportunities, and develop a 'package of improved

¹⁷Malone, Carl C., op cit., p. 25.

production practices' for the selected crops. Once this was done, the job was to set the priorities, plan the program, train the staff of 500 workers to move to action. The technical staff jointly estimated the fertilizer, plant protection and production needs for the year, and arranged to have them available on time. The inputs were moved into positions before crop time. The availability of storage for inputs and produce was also worked out for future needs.

The evaluation of the previous year's yields and production experience lead to the changes and modifications in the program for future. The IADP staff soon developed skills and professional enthusiasm which contributed to the progress. The local staff in the villages were instrumental in keeping close touch with individual farmers, which built confidence in the staff.

The farmers were receptive, whether literate or illiterate and whether large, medium or small. They all were cautious in applying the new practices and ideas. The fourth evaluation report says, "One of the important results of the IADP is that the myth that the Indian farmer is tradition-bound has now been safely laid to rest. That the farmer, large or small, responds to economic incentives has been demonstrated conclusively".¹⁸

Experience showed that the districts were not uniform enough to permit an over all program for the entire district. For example, West Godavari in Andhra Pradesh, a leading IADP district has eight quite distinct zones with different problems

¹⁸Malone, Carl C., op cit., p. 26.

and opportunities. Therefore, the program was modified to adjust to the different zones in the district.

Early Accomplishments ;

In the early phase, many obstacles were encountered. The lack of infrastructure required for increased production was realized, as the implementation commenced. The inadequacy of the prior local development became more apparent. One such example was that the fertilizer storage buildings were too few and were quite far away. The requirement of 'fertilizer within the bullock-cart distance' could not be met. The procedures for provision of credit were lengthy and time consuming.

In spite of the set-backs, the early accomplishments were quite significant in the villages in which the program operated. Tables 1 and 2 summarize the progress achieved.

The increase in the fertilizer use in the wheat growing IADP districts was more significant than the same in the rice growing ones. The fertilizer use in the two wheat districts, namely, Ludhiana in Punjab state and Aligarh in Uttar Pradesh, increased almost 16 times during those eight years (1959/60 to 1967/68). This is because both the districts had substantial irrigation facilities to start with, which increased further as the program went on.

The comparison between the IADP districts and the rest of the districts in the respective states is given in table 1, and shows the increase in the fertilizer use.

Table 1.-Quantity of fertilizer used in six IADP districts and rest of the six states containing these districts, 1959-60, 1963-64, and 1967-68.

A R E A	Fertilizer used per development block*		
	Before IADP	During I A D P	
	1959-60	1963-64	1967-68
	metric tons	metric tons	metric tons
In 4 rice districts	108	285	607
In rest of these 4 states	51	99	285
In 2 wheat districts	52	244	825
In rest of these 2 states	56	155	383

* Blocks average about 60,000 acres of cropland. Fertilizer quantities are for plant nutrients.

Source: District data from district records and state data from compilations of the Directorate of Economics and Statistics, Ministry of Food, Agriculture, Community Development and Co-operation; quoted from Malone, Carl C., and Johnson, S.E., op cit., p. 30.

Before the introduction of the IADP scheme, rice production generally increased faster than wheat production. The acreage, however, was increasing both for rice and wheat crops, as shown in table 2. The increase in rice production could be attributed to the use of simple improved practices like the use of small amounts of fertilizer alongwith the organic manures in some areas. When Japanese method of rice cultivation was introduced in the early 1950's, the rice production went up considerably in areas where it was implemented. A comparison of the similar periods of time before and after the implementation of IADP are given in table 2.

Table 2.-Rice and Wheat: Acreage, yield and production in 1952/53 and changes before and after introduction of IADP in 1960/61, in 4 rice districts and 2 wheat districts compared with the rest of the respective districts.

I T E M	R I C E		W H E A T	
	4 IADP Dists.	Rest of 4 states	2 IADP Dists.	Rest of 2 states
<u>1952/53</u>				
Acreage... 1000 acres	4,400	27,180	480	12,300
Yield* ... per acre	13.5	10.5	18.1	13.3
Production 1000 tons	2,860	14,250	260	4,900
<u>Change, 1952/53 to 1959/60</u>				
Acreage... percent	9.0	14.0	+12	+16
Yield* ... per acre	2.5	2.4	- 3.6	- 0.3
Production percent	30.0	40.0	-11	+14
<u>Change, 1960/61 to 1966/67</u>				
Acreage... percent	5.0	10.0	+20	+ 8
Yield* ... per acre	3.1	0.2	+13.8	+ 1.6
Production percent	22.0	12.0	+106	+18

* Yield of rice is in cwt. per acre and wheat is in bushels.

Source: Data from compilations of the Directorate of Economics and Statistics, Ministry of Food, Agriculture, Community Development and Co-operation; and also from sample surveys in IADP districts; -quoted from Malone, Carl C., and Johnson, S.E., op cit., p. 31.

THE DROUGHT AND AFTER :

India suffered two successive droughts in 1965 and 1966. Large quantities of foodgrains had to be imported. Added to this, the Indian rupee was devalued in January 1966 by 50 percent, and the industrial recession started some months later. It shook

the government's and people's faith in the certainty of largely uninterrupted planned development.¹⁹ Raipur IADP district was the worst hit, with only one third of the rice crop harvested in 1965 and only two thirds of the crop in 1966. Consequently, economic policy became much more farm production oriented, with emphasis on favorable prices for producers and large increases in the supply of fertilizer and other inputs.²⁰ Irrigation was expanded, especially from tubewells where ground water was available.

The new high yielding varieties were introduced during the drought, and got an enthusiastic reception. Three varieties of rice and two varieties of Mexican wheat were imported. Main emphasis was on rice and wheat but hybrid varieties of maize, sorghum and millet were also included. New technical 'packages' suitable for new high yielding varieties were developed and were implemented through a program called High Yielding Varieties Program (HYVP). Selected irrigated areas were chosen in HYVP and the list included 30 rice and 53 wheat districts.

The Mexican varieties of wheat proved to be dependable and soon became popular. The rice varieties, some of which were imported from the International Rice Research Institute in Manila, had some trouble in the initial stages and took a while for their adoption by the farmers. The adoption of high yielding varieties in the IADP districts was better than in the non-IADP ones.

¹⁹Eastern Economist, The Green Revolution, Annual Number, New Delhi, Dec.27, 1968, p. 1147.

²⁰Malone, Carl C., and Johnson, S.E., op cit., p. 32.

In the winter of 1968-'69, the Expert Committee on Assessment and Evaluation made a thorough study of the IADP experience. In its extensive report, the committee said, "the program in general has lived up to its promise in the setting in which it operated. It has shown that where effectively organized and where improved technology was available, it has been able to move agricultural production forward more rapidly than did earlier approaches and to reach a wider range of farmers, large, medium, and small. Most important of all, it has demonstrated a significant new approach for modernizing the Nation's agriculture".²¹

In the next chapter, the effect of the success of the high yielding varieties on the country's agriculture in general and on the economic, social and political conditions in particular, has been analyzed.

²¹Malone, Carl C., and Johnson, S.E., op cit., p. 33.

THE ANALYSIS

For India, IADP was an ambitious program intended to break the slow pace in the increase in food production. The goals set by the program were quite bold but the efforts were quite moderate. When consideration is given to the conditions under which the IADP was started, the growth could be considered satisfactory.

SPECTACULAR GROWTH :

The India News of the Embassy of India, Washington, D.C., in its issue of October 15, 1971, reported that Ludhiana, an IADP district of Punjab, has produced 6,600 pounds of wheat per hectare. Such news are very encouraging for the entire country.

Table 3 shows the increase in the area under high yielding varieties of rice and wheat from 1965/66 to 1969/70.

Table 3.-High yielding varieties of Rice and Wheat -
Acres planted.

Y E A R	R I C E	W H E A T
	<u>Acres</u>	<u>Acres</u>
1965-66	17,650	7,400
1966-67	2,195,000	1,270,000
1967-68	4,408,000	7,270,000
1968-69	6,625,000	11,844,000
1969-70	10,800,000	15,100,000

Source: U.S. Department of Agriculture, Foreign Economic Development Service, Imports and Plantings of High Yielding Varieties of Wheat and Rice in the Less Developed Nations, January 1971, pp. 35-36.

As can be seen from table 3, the adoption of wheat varieties was more spectacular when compared to those of rice. This slow adoption of rice varieties is due to many reasons, including the coarseness and the cooking quality of the high yielding varieties. Also they were more susceptible to diseases and insect attack.

In 1970-'71, the planting of high yielding varieties of cereals reached 32 million acres. That means, the acreage under high yielding varieties is one third the total area under cereal production in comparison to the meagre 7 percent in 1966-67.²³

India's fertilizer consumption increased from 765,000 nutrient tons in 1965-'66 to 2.2 million in 1970-'71, an increase of almost 200 percent in 5 years. About 45 percent of the fertilizer used is from domestic production. The revised targets for the period ending the fourth five year plan (1973-'74) are for the consumption of 5.5 million tons of fertilizers.²⁴ The use of fertilizers can be increased through the effective use of the 65 soil-testing laboratories. At the end of 1968-'69, there was a capacity of 1.08 million soil samples which could be analyzed to determine the nutrient deficiencies. Only 64 percent of this capacity was used. Another important factor for consideration is the availability of fertilizers within easy reach of the farmers. This calls for better storage facilities for fertilizers, planning the approximate quantities to be used in the next

²³USDA-ERS. -The Agricultural Situation in the Far East and Oceania, Review of 1970 and Outlook for 1971, Washington, D.C., April 1971, p. 13.

²⁴INDIA -Planning Commission, Fourth Five Year Plan, New Delhi, 1969, p. 131.

season, and to make them available in time for the farmer to be able to use them. The slow down in 1969 was attributed to the imposition of 10 percent excise tax by the central government. The prosperous farmers, nevertheless, increased the application of fertilizers and planted more area under double and multiple cropping. The co-operatives and nationalized banks provided more credit for the purchase of fertilizers, but small farmers still found the difficulty to obtain credit. Even in the year 1970-'71, only one fourth of India's 60 million farmers used any chemical fertilizers.²⁵

PROBLEMS OF GROWTH :

Economic Problems : To continue the growth rate and to increase its pace to keep up with the tremendous growth in population, it is necessary to see that the complementary facilities also grow. Some of the vital factors which need more attention are given in the following paragraphs.

With higher yields, comes the need for increase in the storage capacity. In 1968-'69, when the foodgrain production was well under 100 million tons, it was not possible to store all the produce properly. This resulted in the damage of large quantities of foodgrains. Storage facilities should be increased to handle the storage of improved seed materials, so that they do not germinate due to absorption of moisture while in storage. The storage capacity should be large enough to accomodate increasing quantities of agricultural production and also the storage

²⁵USDA-ERS. -The Agricultural Situation in the Far East and Oceania, op cit., p. 14.

of large quantities of chemical fertilizers. Storage of the agricultural commodities is handled by the central and state government agencies, co-operatives, market centers, and by the individual producers. There is a need for an all-round increase of storage facility.

Transportation is very vital for the inputs to reach the farms and produce to be transported from the farms to the consumption areas. The development of village roads should be taken up on a priority basis. Most of the villages in the irrigated areas are not approachable after the commencement of the monsoons and these are the areas where hope for greater increases in production lie. Special emphasis has been laid in the fourth plan on the development of rural roads and the state governments have agreed to spend 25 percent of their plan outlay on road development for rural roads. It is necessary to help the local personnel to see that the resources are mobilized to repair and construct the approach roads in the rural areas.

The pricing of agricultural commodities is a very important item for consideration. It is vital to have a price which could give the farmer the necessary incentive to increase his investment in farming. The prices of farm products should give a reasonable profit to the farmer so that he could pay for the additional investment in better cultivation practices, purchase of better seeds and fertilizers and provide enough for investment in long-term improvements in land, irrigation facilities, etc.

²⁶INDIA -Planning Commission, Fourth Five Year Plan,
op cit., p. 144.

The fourth plan envisages the policy of minimum prices as an incentive to agricultural production.²⁶ But in the past, the experience has been that the machinery for purchase of food-grains, such as Food Corporation of India, the State Trading Corporation and the co-operative marketing agencies, were very inadequate. This led to the ineffectiveness of the price policy.

On July 19, 1969, fourteen major commercial banks of the country were nationalized. The Prime Minister expressed the hope that the nationalization of banks would mark a new and more vigorous phase in the implementation of the plans and policies. Among the objectives spelled out was the provision of adequate credit for agriculture, small-scale industries and exports.²⁷ The relation between the commercial banks and the co-operatives should be of partners and not competitors. The village money-lender cannot be replaced overnight and therefore, for the time being it is better to channelize the credit to the small farmer through the 'man on the spot'. Credit for the big farmer is not a problem. The case of the small farmer needs thorough scrutiny and he should be given all the help he needs.

Mechanization of the farms is possible only if they are large enough for power-drawn equipment. About 82 percent of the total farms are under 10 acres in size. Due to the joint family system, the land is divided among the heirs equally from each separate piece of land. This has led over centuries to the present

²⁶INDIA -Planning Commission, Fourth Five Year Plan, op cit., p. 144.

²⁷Eastern Economist, Banking: The Beckoning Seventies, Annual Number, New Delhi, Dec.26, 1969, p.1186.

day farms, which are very badly sub-divided and fragmented. They are not only prohibitive to cultivate individually but also create problems in management. The joint family system also is a major cause for the dependency of the entire family on the family land holdings. Rapid mechanization will yield bigger problems of unemployment and under-employment. While mechanization is essential for efficient farming for increased food production, the problem of labor cannot be ignored. The example of Japanese farm practices can be followed where labor intensive operations can also yield higher returns.

Rural electrification is quite essential for the rural development. The use of electrical power for pumping water is very economical. This is very significant specially when the emphasis is shifting from large irrigation projects to minor irrigation projects and tube-wells. Again, the small farmers should be provided credit for the purchase of electric motors, construction and deepening of existing wells and other improvements for better cultivation.

The above mentioned are some of the important problems which need careful planning and budgeting for proper allocation of finances and efforts.

Social and Political Problems : The green revolution has led to the increased earnings in the farm families affected. This was specially the case in Punjab state. With increased farm incomes, part of the money was spent for mechanizing the farm operations. For example, more than 70 percent of the nation's 100,000 tractors

are located within 250 miles from Delhi.²⁸ The demand for the industrial products also increased in the rural areas where the crop returns are better. This extra income should be mobilized for establishing and improving the agro-based industries. With more and more farmers getting higher returns from farming, the credit facilities should improve for the other farmers. As seen in the present day rural India, specially in areas near the markets, major portion of the agricultural income is spent for the purchase of non-productive goods. The public communication system should strengthen itself to arouse interest in the farmers through their programs to make them realize the importance of investment in the productive goods.

Green revolution has brought more income to the already rich and thus enlarged the gap between the rich and the poor. This has led to the riots and political turmoils in the areas where there is a concentration of educated and small farmers, like in the states of Madras and Kerala. The need, therefore, is to keep a proper balance in the development so that while the production should increase, the political problems can be avoided due to unemployment.

The IADP and HYVP have in some ways increased the gap between the rich and poor because these programs were taken up in areas which were already better-off when compared to the rest of the country. One of the ways to help the poor cultivators will be through effective land reforms. There exists a great

²⁸USDA-ERS -The Agricultural Situation in the Far East and Oceania, op cit., p. 15.

number of land-less laborers in addition to tenants and part time farmers. Absentee landlords are non-existent as per law, but in reality they do. The government should impose the land reforms effectively so that there is some equity achieved between the land-less and the rich absentee landlord. As per Prof. Galbraith, if a farmer knows that extra yield will go to the landlord, there is no need for him to worry about increased production.²⁹ Land reforms should be strictly implemented.

The non-farm employment in the rural areas should be carefully looked into. The projections show that there will be 53 million more people living in rural areas by 1974 than in 1969.³⁰ That means, while the effort for higher productivity is important, it is also important that the extra labor should be syphoned out of farming to non-farming employment. This is necessary because due to better techniques of production, the productivity per capita will increase. The labor thus released can be used for extensive as well as intensive farming practices. But the extra labor consequent to the increases in population should be taken out of farms, so that the farm population could be kept constant, if not reduced.

Summing up, IADP and HYVP have demonstrated in pilot districts the feasibility of developing Indian agriculture to make it self-sufficient. The theme should be to make all rural people benefit from the government sponsored programs. In the carrying out of the various programs for rural development in

²⁹Galbraith, John K., Economic Development in Perspective, Harvard University Press, Cambridge, 1962, p. 9.

³⁰Malone, Carl C., and Johnson, S.E., op cit., p. 35.

India, (through research, teaching and extension) the Agricultural Universities should work out arrangements to take over the role of centers for integration of all the agricultural efforts in the country.³¹ The agricultural universities should be assigned the responsibility to train the rural development workers in addition to producing agricultural graduates, who will be useful in the rural areas immediately. The rural people thus benefited, should include owners, tenants and landless laborers. Improved tenures on land and wage agreements should be supervised by the government. Non-farm work, like construction of roads, de-silting the wells and tanks, can be taken up in the slack season so that the rural employment opportunities can increase and also help in the increased agricultural production. While it is necessary to see that the welfare of the rural population is kept in mind it is also necessary to have programs to increase production both in farm and non-farm sectors to have over all development of the economy. The balance between production-oriented and people-oriented programs should be carefully planned and implemented.

³¹Ensminger, Douglas, Putting the Indian Agricultural Universities to Work to Develop Rural India, Fourth Annual Conference of the CUSURDI, Columbia, Missouri, July 1971, p. 8.

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GREEN REVOLUTION IN INDIA

BY

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ABSTRACT

When India became independent in 1947, its agricultural productivity was among the lowest in the world. It was quite traditional in that the inputs had not changed for centuries. The production was not market-oriented as most of the produce was either for domestic consumption or for exchange with other commodities in the village. The per capita income and literacy were lowest among the developing countries. The infrastructure essential for agricultural progress were at a low level of development.

The first decade of planning (1951-'61) saw many changes. Food production went up by 46 percent and the national income was up by 42 percent. The over-all progress seemed spectacular but the base year was so low that the agricultural productivity was still among the lowest at the end of the second five year plan. Due to the failure of the 1957-'58 crop of foodgrains, government of India got seriously concerned about food shortage and appointed several committees to study the various ways and means of increased food production. One such committee was from the Ford Foundation Team in India, which submitted its evaluation in "Food Crisis Report" in April 1959. This report spelled the need for giving top priority for inputs needed for the expansion and concentration of efforts on the major crops, rice and wheat, in the potentially most responsive areas of

these crops. Seven districts were selected in seven states which had the potential for intensification of agricultural production. It was felt that improvement programs should be 'tailor-made' for each area to supply the farmers with the 'package of services' which included the provision of new inputs, credit facilities and price assurances. The Intensive Agricultural Development Program was administered by a Project Officer and his staff of specialists. The emphasis was on the new technology and development of an organization to provide information, guidance and assistance to the individual needs of the farmers.

The early accomplishments were quite significant in spite of many set-backs. The use of fertilizer went up along with increased area under irrigation leading to increased yields in major food crops. The continuous droughts in 1965 and 1966 proved to be big blows to the Indian economy as large amounts were spent on importing foodgrains. The balance of payments were also hurt due to the devaluation of the Indian rupee in 1966. The Indian planners then turned to the high yielding varieties, which were mostly imported. The High Yielding Varieties Program took up the development of new technical packages suitable for high yielding varieties. The program was introduced in selected irrigated areas including 30 rice and 53 wheat producing districts.

The IADP and then HYVP proved very successful considering

the infrastructure available for development. In 1970-'71, one third the total irrigated area under cereal production was covered by high yielding varieties. With the expansion of the IADP and HYVP programs came the problems of shortages of various inputs of the 'package'. The nationalization of the 14 major commercial banks in 1969 improved credit facilities in the agricultural sector. The fertilizer consumption went up very significantly and the emphasis was shifted from the large-scale to small-scale and minor irrigation projects for quick results.

Indian planners are faced with two basic problems in the expansion of agricultural productivity, namely, production and equity. At this point of the agricultural situation in India, productivity is more important when compared to the equity problem of providing the small farmer and land-less laborer with enough opportunities to come up. The 'Green Revolution' has helped the country to increase its agricultural productivity and thus given a hope for self-sufficiency in foodgrains. The increases in production will help the big as well as small cultivators with more food production and increased employment for all including the land-less laborers.