The Intensive Agricultural Development Program in India

By Carl C. Malone and Sherman E. Johnson

A pilot Intensive Agricultural Development Program, popularly known as IADP, or Package Program, was undertaken by India in cooperation with the Ford Foundation in 1960. It was designed for participation by all farmers in selected districts. Assistance in adoption of a locally adapted "package" of improved technology was to be combined with adequate supplies of fertilizer and other inputs, credit to buy them, and assurance of remunerative prices. The program was only partially implemented and many unforeseen problems were encountered, but considerable progress was made before the advent of higher yielding seeds. The program has led in adoption of new research results, including the new seeds.

Key words: India; intensive agriculture; economic development; Package Program; high-yielding rice varieties; high-yielding wheat varieties.

A very short crop of food grains was harvested by India in the 1957/58 crop year. (Crop years begin July 1, and include the monsoon crop and the succeeding winter crop.) Indian leaders became seriously concerned about an impending food shortage and the effects on their economic development. The concern was intensified by new information on accelerated population growth. Among other things, the Ford Foundation representative was asked to bring a U.S. team to India early in 1959 to work with an equal number of Indian associates to help formulate suggestions for achieving more rapid expansion of food production.[1] The team arrived in January, and completed what came to be known as the "Food Crisis Report" by mid-April 1959 *(4)*.[2] The recommendations in that report generated the Intensive Agricultural Development Program, which is briefly summarized and evaluated here.[3]

Previous Efforts

The Indian Government with some foreign assistance had laid considerable groundwork in the preceding decade. For example, steps were taken in the first 5-year plan (April 1, 1951, to March 31, 1956) to increase the land under irrigation and to reclaim idle land. A community development program also was undertaken to revitalize the rural villages. Each district was divided into blocks of about 100 villages with a block development officer in charge.[4] The block staff included agricultural and cooperative extensive officers, together with a village level worker (VLW) for each 10 villages, to reside in one of the villages in his circle. The typical VLW had a secondary school background and 1 year of generalized training in extension, including agriculture. He was given responsibility for the principal contacts with the villagers.

The Ford Foundation had provided assistance to India in agriculture, education, and other activities since 1952. It had helped to launch the community development program, and when a food shortage threatened in the fall of 1958 India's leaders turned to the Foundation for further assistance.

The Food Crisis Report

The production team concluded that strong measures would have to be taken to avoid a food shortage. They

[1] Dr. Douglas Ensminger was the Ford Foundation representative. The U.S. team consisted of Marvin A. Anderson and Gerald Huffman, Extension; E.M. Cralley, Plant Breeding; A.A. Johnson, Seed Improvement; Charles E. Kellogg and Omer J. Kelley, Soil and Water; George M. Beal, Sociology; Harold Miles, Credit; Ellen L. Moline, Home Economics; Frank K. Naegely, Cooperation; Arthur D. Weber, Livestock; Norman Wengert, Public Administration; and Sherman E. Johnson, Agricultural Economics (Chairman). Although the U.S. team assumed full responsibility for the report, it could not have been prepared without the able assistance of the Indian associates, and many other Indians whose counsel was sought and freely given.

[2] Italic numbers in parentheses refer to items in the References, p. 35.

[3] An "Expert Committee on Assessment and Evaluation" was organized to evaluate current progress and to suggest improvements. The committee's fourth report, "Modernizing Indian Agriculture" *(6)*, provides a summary appraisal of the years 1960-68. This report, along with *(2)*, was reviewed in Amer. Jour. Agr. Econ., *(7)*. Several discussions of the program are found in Indian literature. A recent Reserve Bank of India report emphasizes the credit aspects *(10)*. Two American authors, Brown *(1)* and Mellor *(9)*, reach conclusions somewhat different from those presented in this paper.

[4] India has 330 administrative districts, with about 1 million acres of cropland in a typical district. An appointed administrative officer, usually known as a collector, is in charge of all State government activities in the district, including the community development program.

recommended that food production be given top priority for the inputs needed for expansion, but recognizing that fertilizer, trained manpower, and other key inputs would be very limited for some time, they also recommended concentration of effort on the major crops (rice and wheat) in the potentially most responsive areas for these crops.

The report emphasized programs to accelerate adoption by farmers of locally suitable combinations of production-increasing technology. But it strongly recommended additional natural science and economic research to insure continued increases in output.[5]

In view of prevailing agricultural practices and the low average yields of food grains, Indian agricultural specialists were convinced that food production could be increased substantially if farmers could be induced to adopt the then known improved technology (chemical fertilizers, pesticides, and better seed). The U.S. team concurred in this conclusion, but stressed the need for developing "tailormade" improvement programs to fit conditions in each area rather than a blanket approach.

Recommendations for improvement of extension programs emphasized that programs should be focused on local conditions, and that the local combination of farming methods necessary to achieve production potentials should be ascertained as far as possible.

Much attention was given to soil and water conservation, with a recommendation for shifting emphasis from large-scale irrigation projects to minor ones. Top priority was recommended for increasing supplies of chemical fertilizer, by building new plants, and importing the supplies that could not be produced domestically.

Stable prices at remunerative levels were recognized as crucial incentives for increasing production.[6] The need for credit to purchase the new inputs, and for gearing it to prospective increases in output and income, also was emphasized.

Finally, the report suggested that each State undertake 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 assurance were provided (*4*, p. 248-250).

The 1959 Technological Situation

The available "improved varieties" of food grains had been developed by Indian researchers for use under traditional cultural practices. The Rockefeller Foundation had begun cooperative research work on strains of hybrid seed corn adapted to India's agriculture, but the available rice and wheat varieties had been bred for disease resistance and low fertility conditions. Their low yield response to heavy application of fertilizer was not realized at first.

Although some fertilizer trials had been made in different areas, and the U.S. Government foreign aid staff was promoting use of fertilizer, the supplies were very limited, and frequently not locally available to farmers. In terms of plant nutrients, only 183,700 metric tons of chemical fertilizer (including plantation use) had been distributed to farmers in 1957/58, or just over 1 pound of nutrients per acre of all crops grown. (About 40 pounds per acre were used in the United States at that time.) India's third 5-year plan had a target of 2,450,000 metric tons by 1965/66, which was strongly endorsed in the Food Crisis Report. This would have brought the per acre application to an average of about 14 pounds of nutrients. (The accomplishment came to 806,300 metric tons).

Pesticides were rarely used in food production.

The estimated irrigated area in 1958/59 was about 67 million acres, compared with 87 million in 1967/68.

The Proposed Intensive Development Program

The Government of India accepted the suggestion for an experimental program, and requested the Ford Foundation to invite three Americans to join with Indians in developing plans for a pilot program.[7]

A program was outlined which concentrated on adoption of known improvements in technology with the expectation that new research adapted to local areas would be incorporated as it became available.[8] The outline placed major emphasis on the organization and operation in selected districts of a program that would provide educational, technical and service assistance to farmers in obtaining and using the new inputs in yield increasing combinations; in other words, an adapted "package of practices." The program also recognized that because adequate institutions for providing the new

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[5] The Food Crisis Report (*4*, ch. IV, part III) states that: "Special attention should be devoted to types of farm management research that can provide guidance to the food production program" (p. 102). The succeeding chapter on research and education recommends ascertaining the gaps in present research programs and undertaking new projects to fill them. It emphasizes team research and relating the findings to farmers. It is interesting to note in the chapter on improvement in cereal production (part III, ch. IX) that breeding rice for "strong straw" was recommended for high response to fertilizer; also breeding for early maturity under different growing conditions.

[6] "To encourage increases in food grain production, the cultivator should be assured of a price which will enable him to invest in fertilizer, seed and new equipment knowing that, with average crop conditions, he can repay any debts with the added income that results from adoption of improved practices" (*4*, p. 25).

[7] Sherman E. Johnson, Carl C. Malone, and Dorris D. Brown constituted the three-man team.

[8] The Rockefeller Foundation was already engaged in cooperative natural science research, and the new universities were entering that field. The pilot program was designed to concentrate on adoption breakthroughs.

inputs, credit, and price assurance were not available, the central government (the Center) as well as the State governments would have to take the responsibility. They would have to provide a "package of services" that would be available to farmers in pilot districts *(3)*.

The Center would provide the overall plan, see that financial and technical resources were available, give program leadership and guidance, provide interdepartmental coordination at the Center, and assure remunerative prices.

The State would select the pilot district within its borders, and with help of the Center provide budget and other support. It would create posts for additional staff in the pilot district, recruit the personnel, see that fertilizer and other inputs were locally available, and make sure that production credit was available as needed.

The district would be the center for local agricultural development. A district project director would be appointed and would have a small staff of specialists under his supervision. They would jointly develop a locally adapted package of production-increasing practices, see that fertilizer, other inputs, and credit would be available to farmers, and initiate a broadly based program to get them into use. Three additional agricultural officers would be stationed in each block to work directly with village level workers (VLW) in providing the assistance farmers would need to adopt improved technology. The VLW staff would be doubled, with a worker for every five villages.

The suggested district organization thus involved reinforcement of the existing community development program, with the important addition of a project director and specialist staff who would be capable of organizing and leading the new program, and seeing that it was carried out.

A district program for accelerated adoption of improved technology involved taking the following steps, some of which were only partially carried out with consequent retardation of progress:

1. Working out simple farm plans with farmers to determine how the suggested new technology was likely to affect their production and income.
2. Helping farmers learn the skills needed for adoption.
3. Seeing that sufficient fertilizer and other inputs were locally available when needed, and that credit to buy them would be present if necessary.
4. Providing assurance of markets at adequate prices.
5. Giving all farmers in the district an opportunity to participate, small as well as large, tenants as well as owners.

Size and Scope of IADP

The program was initiated as the Intensive Agricultural District Program, usually known as IADP, or the Package Program. More recently, it has been renamed the Intensive Agricultural Development Program, which identifies it more fully, but keeps the IADP initials.

India began to organize the program in the spring of 1960 and started work in the pilot districts growing winter crops that fall. The Ford Foundation provided financial assistance and a team of 10 advisory consultants, but the Indians assumed full responsibility for organizing and operating the program.

Indian agricultural leaders were convinced from the beginning that the pilot program had to be large in order to have significant impact on an agricultural industry with 50 million farms and 400 million acres of arable and tree cropland. The program was started in one district in each of seven States. These seven districts included 141 blocks and about 1.1 million operating farmers (one and a half times the number in all of Taiwan). The districts had nearly 11 million rural people in 1961, and 9 million acres of arable and tree cropland of which 4.1 million acres had some irrigation. When the program was expanded to 15 districts in 1962 it included 2.6 million farms, 7.4 million farmworkers, and a total rural population of 23 million.

The farms in the pilot districts are small, averaging 6.3 acres, but individual farmers decide whether to adopt improved technology. Providing an opportunity for all farmers to participate was one of the main objectives of the program.

When the districts had become fully staffed the number of farms per professional worker ranged from 200 to 600 but was most frequently about 300 (assuming that VLW's spent 70 percent of their time on agriculture).[9]

The district program was designed as a development program rather than the usual type of extension or educational program. Dissemination of knowledge about production-increasing opportunities was an important part of the development plan; but it was recognized that farmers also needed assurance that prices would be adequate to cover the risks involved in trying out the new farming methods; and once given that assurance, the new inputs and the credit to buy them had to be available when needed. In other words the program as originally outlined included provision of knowledge, incentives, and means. But these plans were only partially fulfilled in practice.

The original program was designed to build a district organization with roots in the earth at the farmer and village levels. If it proved operationally successful it could be extended to other districts as soon as trained manpower and other inputs were available. But even the attempt to reach 2.6 million farmers in the 15 districts was a stupendous endeavor. In many other countries a

[9] Experience has indicated the need for intensive staffing to obtain rapid adoption, especially by small farmers *(13)*. Typical Corn Belt counties in the United States have one college-trained worker for 150 farms, and supplies, credit, and marketing services are facilitated by other agencies in the Corn Belt.

program of this size would have covered the entire nation. In India the program is small in relation to need, but it is nevertheless an enormous pilot program.

Although IADP was focused on farmer problems in pilot districts, it was also concerned with State and Center problems of agricultural development. By working with farmers, the urgent need for adequate supplies of fertilizer and other scarce inputs, for adequate price assurance, and for improvement of marketing and credit facilities, has come into focus. To the extent that these services were lacking, the original program could be only partially implemented. Consequently, leaders of IADP have been active in obtaining State and Center consideration of these problems.

The Intensive Program in Action

The IADP was only a part of total agricultural development when it was established. The usual agricultural efforts continued in the other 315 districts. Completion of the basic community development organization was being pushed forward; it was about 60 percent organized at the time. The new agricultural universities were moving forward and more were planned, agricultural research was being strengthened, and large financial allocations were made to add to irrigation facilities. The budget for the added IADP effort, in fact, amounted to less than 2 percent of the total agricultural and community development budget (not including budgets for large- and medium-size irrigation projects).

Among the items financed by the Ford Foundation was a sizable evaluation of IADP by the government, but the operational plan left much to be desired. Some effort was made to study participating farmers and their progress. But no arrangement was made for studying year-by-year effects of the program on participant farms. This was a serious omission. The special information that was collected centers around a random sample of yields of major crops and technical practices in these fields. Hence, most of the analysis relates to the whole district or major parts of it, rather than to representative farms and farmers, where the changes were underway.

Each district project officer set out to reach two main objectives as he began his new work. The first and most immediate objective, emphasized by government, was to increase crop production rapidly, especially food grains, using IADP as the means for doing this. The second objective, longer run and more basic, was to build as rapidly as possible a productive agricultural system in the district which would make full use of available science and technology that could be applied profitably to the agriculture of the area. This objective put the emphasis on developing the productive capacity of farms, farmers, farmworkers, and the institutions serving them, or that should serve them. If this effort were successful, the yield and production levels to be expected at any given time would depend on the productivity of the new and improved practices then available which were adapted to the area and the prevailing climatic and economic conditions.

As IADP became operative in the selected districts, the inadequacy of prior local development became apparent. Some of the community development blocks were not yet organized, or only partly so. Many local service cooperatives which were to provide production credit and distribute supplies had little if any staff for this purpose. Many more lacked a suitable building for storing fertilizer and other supplies. In Raipur district, for example, such a storage facility was available in one village in 60 at that time, while in Tanjore, the best organized district, storage was available in one village in 10. The requirement of "fertilizer within bullock-cart distance of each farmer" could not be met for quite some time. Fortunately, the system for getting crops to market, while often crude, could move a somewhat larger output. Over time, project officers could add to storage for inputs. But improving the credit system moved slowly almost everywhere, unless direct government credit were provided, which was seldom the case. In many districts only a fraction of the roads were passable during the monsoon, and in one a third of the district could not be reached by headquarters from July to November, as neither bridge nor ferry was available then. Thus, even in carefully selected districts, the underdeveloped infrastructure was more of a problem than was foreseen.

Most States moved with commendable speed in getting the additional IADP positions sanctioned and filled at district and block levels, over 80 percent of the positions being filled within a few months. Less could be said for the competency of many of the recruits, especially the technical knowledge of the district specialists, a new position in India. Few agricultural workers had training in a specialty. But a more serious limitation lay in the seniority promotion system which often advanced a man with no special training, while leaving a younger but better trained man to wait. This situation put a heavy burden on inservice training, which had to be specially organized at several levels to serve the needs of IADP.

As project officers moved into action, they were faced with three main tasks: (1) designing and extending profitable, yield-increasing "production packages" for the main crops; (2) attracting large numbers of farmers into the program so it might have a significant impact; and (3) seeing that supplies and production credit were available locally in time for farmer use. To accomplish these, the project officer first had to develop an operating strategy so that the time of his staff would go to the high priority needs of the new program. Second, he had to organize the needed technical and management information and train his field staff in using it, a staff of about 550 workers in the average district. Third, he had to plan and place orders well ahead of time for seasonal needs of fertilizer,

pesticides and production credit, all of which required allocations by government at higher levels. Moreover, fertilizer often had to be moved into position well ahead of the monsoon because local roads become impassable after the rains come.

The operating program combined promotion, education, carefully planned pressure, and sometimes direct action—renting additional storage space, constructing storage buildings, moving fertilizer on time, and the like. Crop demonstrations of the recommended "practice packages" were used on a large scale, as were village meetings. These were followed by the use of simple farm (crop) plans for all participating farmers, prepared with the help of VLW's. Many weaknesses developed in the preparation and use of farm plans, but they had three special benefits. They required the extension worker to deal with farmers as individuals with respect to improved practices, instead of promoting generalized production information for everyone as had been the practice. As a result, the VLW gained farmer confidence and learned enough about farms to be a better adviser. Further, the farm plans gave the project officer a check on planned input and credit needs which is important when these must be requisitioned and allocated.

Experience showed that much of the first 2 years was needed to develop staff understanding and reasonable proficiency at various tasks. In the process, a number of gaps were uncovered that were little known at higher levels before IADP. For example, it was found that the technical recommendations being made were seldom a very close "fit" for local conditions and did not pay very well at the prices prevailing in the early years of the program. This posed a problem since little information was available for revision. As mentioned above, the low yield ceiling, especially of rice, even with good practices was a serious handicap to progress. But correction had to await the development of higher yielding varieties. The weakness of the credit cooperatives has already been noted. In general, IADP had to live with the credit problem, which was especially serious in higher risk areas, and with small farmers in all areas.

The administrative system was another major gap. "One of the most serious obstacles that the IADP has had to face is the archaic administrative system that obtains in the country. This system, based essentially on checks and balances, evolved in a different time and for a different purpose, has proven woefully inadequate for any operation, the aim of which is not to maintain the status quo but to change it" *(5,* p. 433). The project officer does not have control of the IADP field staff, but must deal with them through the office of the district collector, his superior, who has charge of them. He can neither select his staff nor hire or fire them. Also, he operates under a rigid budget system that gives him little control over the budget assigned to IADP. Notwithstanding these and other limitations, the more capable project officers did instill a degree of esprit de corps among the IADP staff seldom found among Indian workers.

Early Accomplishments

Discovery of the numerous obstacles encountered in attempting a production breakthrough is an important accomplishment because it reveals the problems to be overcome in later programs. But despite the many gaps as compared with the original plan, the record shows significant progress—even before the advent of high-yielding varieties. Most of the following information on early progress relates to six of the first seven IADP districts (Pali being omitted because of almost continuous drought). Because rice is the main crop in each of the second group of eight districts, the results are not unlike those of the rice districts reported here except for the shorter record.

The six early program districts are representative of many of the Indian development problems. Two rice districts, Tanjore and Raipur, are largely one-crop areas. Tanjore is a fairly progressive area and raises two irrigated rice crops during the year on a part of the land area. Raipur is a rather backward area and raises one rice crop, mostly without irrigation. Rice also predominates in Shahabad and West Godavari districts, but they have a more varied cropping pattern in total. Shahabad, a rather backward area, raises rice during the summer (about 80 percent with rather uncertain irrigation), and wheat and gram during the winter. West Godavari, a fairly progressive area, has two rice crops, mostly irrigated; also substantial acreage in cash crops of sugarcane, tobacco, chillies, and bananas. All four are large districts and together grow about 4.8 million acres of rice on some 932,000 farms averaging 6.3 acres.

The two wheat districts are in multicrop areas, with wheat as a winter crop. Corn, millets, peanuts, cotton, and sugarcane are other important crops. Ludhiana in Punjab State is a progressive area, while Aligarh in Uttar Pradesh is more typical. Both had substantial but by no means complete irrigation, much of it from tube and even farm wells at the start.[10] The two districts grew about 550,000 acres of wheat in 1960/61 and had 181,000 farmers on farms averaging 9.6 acres. In Ludhiana the average was 18 acres, about the largest average in India.

Tables 1 and 2 summarize progress with respect to key IADP activities at two time periods: villages in which the program operated; farmers participating as evidenced by a farm plan; use of commercial fertilizer on all crops as evidence of "package" use, and loans extended by all local cooperatives for agricultural purposes. Fertilizer was a key part of every crop "package," and its use increased rapidly.

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[10] The program encouraged farmers to increase irrigation, and power for tubewells became more readily available, with consequent increase of 300,000 acres of irrigated wheatland in the two districts by 1966.

Table 1.—Number of villages and farmers in six IADP districts, 1960/61, and number participating in the program, 1963/64 and 1967/68

Item	Total, 1960/61 (before IADP)	Participating in IADP[1]	
		1963/64	1967/68
	Number	*Number*	*Number*
Villages:			
In 4 rice districts	10,500	6,660	9,720
In 2 wheat districts	2,750	2,700	2,750
Farmers:			
In 4 rice districts	932,000	400,400	631,900
In 2 wheat districts	181,000	122,200	135,300

[1] Although total numbers of villages and farmers in 1963/64 and 1967/68, the third and seventh years of the program, are not known, they would be substantially the same as shown for 1960/61.

Source: Data from district records and State data from compilations of the Directorate of Economics and Statistics, Ministry of Food, Agriculture, Community Development and Cooperation.

Table 2.—Quantity of fertilizer used and value of cooperative loans in six IADP districts and in rest of the six States containing these districts, 1959/60, 1963/64, and 1967/68

Item	1959/60[1] (before IADP)	During IADP[2]	
		1963/64	1967/68
	Metric tons	*Metric tons*	*Metric tons*
Fertilizer use per development block:[3]			
In 4 rice districts	108	285	607
In rest of 4 States	51	99	285
In 2 wheat districts	52	244	383
In rest of 2 States	56	155	825
	Rupees	*Rupees*	*Rupees*
Cooperative loans per farm:[4]			
In 4 rice districts	77	95	112
In rest of 4 States	n.a.	n.a.	n.a.
In 2 wheat districts	174	188	336
In rest of 4 States	n.a.	n.a.	n.a.

n.a. - Not available.
[1] Base year for fertilizer use; the base year for cooperative loans is 1961/62.
[2] IADP accomplishment at end of third and seventh years.
[3] Community development blocks vary in size but average about 60,000 acres of cropland. Fertilizer computed in plant nutrients (potash omitted—very little was used.)
[4] Based on all farmers in each district whether members of cooperatives or not. In one wheat district, direct government credit was also supplied but data on amount of loans are not available.

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 Cooperation.

The project officers found that with an intensive effort, their staff could quickly reach large numbers of villages and farmers in all parts of the district, even where roads were poor. Farms of all sizes participated, including substantial numbers with 1½ acres or less in the rice districts. One rice district where farms average 4½ acres checked on its 60,000 participants for 1 year, using a random sample, and found that the farms were representative as to size and tenure. Other districts, where the project officer put less emphasis on bringing all farmers into the program, may not have done as well. It was found, however, that difficulty of obtaining credit and fear of incurring losses were the key limitations for the small farmer rather than his lack of interest.

Crop Yields and Production

As noted earlier, an adequate random sample of cr yields was obtained in IADP districts but only for major

crops. Rice and wheat were of chief interest because of their importance and because nationally they were in short supply.

In table 3 the four early program rice districts are compared with the other rice areas in these four States. The four districts account for 13 percent of the rice acreage and 16 percent of the production in the four States. Two sets of yield trends were calculated by the least squares method, one for 7 years prior to IADP and the other for the IADP period before much adoption of the high-yield varieties (after eliminating the influence of an unusual drought, such as the one that occurred in 1965/66). Acreage trends for the two periods also were calculated. In table 4 the same calculations are shown for the two wheat districts together and for the remainder of these two States.

Table 3.—Rice: Acreage, yield, and production in 1952/53 and changes before and after introduction of IADP in 1960/61, 4 rice districts and rest of 4 States containing these districts [1]

Item	4 IADP districts	Rest of 4 States
1952/53:		
Acreage .....1,000 acres	4,400	27,180
Yield .....cwt. per acre	13.0	10.5
Production ..... 1,000 tons	2,860	14,250
Change, 1952/53 to 1959/60:[2]		
Acreage .....percent	9.0	14.0
Yield .....cwt. per acre	2.5	2.4
Production .....percent	30.0	40.0
Change, 1960/61 to 1966/67:[3]		
Acreage .....percent	5.0	10.0
Yield .....cwt. per acre	3.1	.2
Production .....percent	22.0	12.0

[1] Rice yields and production in terms of rough rice.
[2] Changes in 7 years before IADP, based on trend.
[3] Changes in 6 years after IADP began, based on trend.

Source: Data from compilations of the Directorate of Economics and Statistics of the Ministry of Food, Agriculture, Community Development and Cooperations; also from sample surveys in IADP districts.

Table 4.—Wheat: Acreage, yield and production in 1952/53 and changes before and after introduction of IADP in 1960/61, 2 wheat districts and rest of 2 States containing these districts

Item	2 IADP districts	Rest of 2 States
1952/53:		
Acreage .....1,000 acres	480	12,300
Yield ..... bu. per acre	18.1	13.3
Production ..... 1,000 tons	260	4,900
Change, 1952/53 to 1959/60:[1]		
Acreage .....percent	+12	+16
Yield ..... bu. per acre	-3.6	-0.3
Production .....percent	-11	+14
Change, 1960/61 to 1966/67:[2]		
Acreage .....percent	+20	+8
Yield ..... bu. per acre	+13.8	+1.6
Production .....percent	+106	+18

[1] Changes in 7 years before IADP, based on trend. [2] Changes in 6 years after IADP began, based on trend.

Source: Data from compilations of the Directorate of Economics and Statistics of the Ministry of Food, Agriculture, Community Development and Cooperation; also from sample surveys in IADP districts.

Before IADP, rice production generally increased faster than wheat production. Acreage of both increased and rice yields rose through the use of improved simple practices such as the use of small amounts of fertilizer in some areas. Wheat yields generally were about level, but they were declining in the IADP districts for reasons that are not evident.

Beginning with 1960/61, IADP brought about substantial change in its districts, slowly in the case of rice where some improvement had already been made, and more rapidly with wheat where some of the Indian varieties had considerable merit. In IADP districts, nearly all potential riceland was already in rice and a significant acreage increase had to await the coming of short-season, stiff-strawed varieties that would permit more double cropping. The yield increase of 3.1 cwt. per acre in 6 years is about the rate of yield increase on U.S. rice farms, 1944 to 1954, before acreage ceilings lowered acreage and encouraged higher yields.

In the wheat districts, IADP emphasized two changes: the use of the full "package," and the expansion of acreage which was readily possible with more local irrigation. By 1966, about 300,000 additional acres of wheatland were irrigated. The increased yield and production results bordered on the spectacular. Production more than doubled in IADP wheat districts (before the advent of higher yielding varieties).

Outside of the IADP districts in these States, rice production increased 12 percent compared with a 22 percent increase in IADP districts. Wheat production increased 18 percent compared with the 106 percent increase in IADP districts.

In the fall of 1963, the Indian government selected about 100 districts for more intensive development using a modified IADP approach. But before the Intensive Agricultural Areas (IAA) program got well under way, serious drought was encountered and little progress was made.

The Drought and After

In the summer of 1965 and continuing into 1966, India suffered the worst drought of this century. It greatly slowed all developmental progress. In the first year, production of all food grain declined about one-fifth from the previous year. The following year it was little better. Raipur IADP district was among the worst hit, with only one third of a rice crop in 1965 and only two-thirds of a crop in 1966. Shahabad had less than one-half of a rice crop in 1966. Wheat suffered much less, the crop as a whole being down less than 15 percent.

Since nearly all farm families obtain most of their food from their own crops, a great many farmers had little or nothing to sell during the drought. Overdues to cooperatives mounted sharply. Where the drought was severe, it took some time for farmers to recover, and for IADP to get moving again. But there were some gains. In the words of S.R. Sen, "This calamity also marked, as it were, a watershed in the history of Indian agriculture. It shook the Indian people and Government out of their complacence and made them anxious to modernize their agriculture as never before" *(12)*. 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, even at the cost of large amounts of foreign exchange. There was a strong move to expand irrigation, especially from tubewells where ground water was available.

The new, high-yielding varieties of rice and wheat were introduced during the drought, and they got an enthusiastic reception. Three varieties of rice and many tons of two varieties of Mexican wheat were imported. A crash seed production program was carried out to provide seed for the 1966/67 crop. A High-Yielding Varieties Program (HYVP) was laid out to introduce high-yielding varieties on 32.5 million acres in 5 years. The main emphasis was on rice and wheat, but hybrid varieties of corn, sorghum, and millet were also included. Technical "packages" suited to the new varieties were designed and adequate supplies of fertilizer, other inputs, and credit were to be made available. Selected irrigated areas were chosen in the main for the HYVP, most being either in IADP or IAA districts, 30 rice and 53 wheat districts being on the original list.

The Mexican wheats proved to be both high-yielding and dependable, and were immediately popular all over the wheat belt and even outside its borders.

Rice proved to be far different, even under good technical guidance at the farm level. The new rice varieties were about as promising as the Mexican wheats in the research stations, but in practice farmers got widely different yield results even in the same community. The most popular rice variety proved to be the Indian-developed ADT-27, which even though medium yielding was quite dependable, just as the Mexican wheats were. The following year, another high-yielding variety (IR-8) was brought in from the International Rice Research Institute in the Philippines. It seems best adapted for the second crop (winter). Rice farmers are now more cautious and insist that the varieties be more carefully tested locally to avoid serious errors.

In 1967/68 the three IADP districts with irrigated wheat land (one is also a rice district) had 56 percent of 1.1 million irrigated acres in Mexican based varieties which averaged 41 bushels per acre, while 500,000 irrigated acres growing native varieties averaged 21 bushels. The 11 IADP districts with irrigated rice grew 1 million acres of high-yielding varieties out of 5 million irrigated acres. High-yielding varieties averaged 25.5 cwt. of rough rice per acre and native varieties 18.4 cwt. Several thousand acres of IR-8 did much better with an average of 38.9 cwt. Because 1967/68 was a relatively poor rice year in IADP districts, these yields may be as much as 20 percent below normal.

Out of some 31 million acres of irrigated rice land outside of IADP districts in 1967/68, about 12 percent (3.8 million acres) was in the new varieties compared with 20 percent in IADP districts. The wheat record was better. Nearly 6 million acres of wheat were in Mexico-based varieties out of some 17 million irrigated acres outside of IADP, or roughly one-third of the acreage compared with 56 percent in IADP districts. The IADP organization demonstrated that it could move fast in encouraging more rapid adoption of the new varieties than in other districts. By 1968/69, about 95 percent of the wheat acreage in Ludhiana district was in high-yielding varieties. In Tanjore district, about 80 percent of a much larger early rice acreage was planted to ADT-27, the locally improved variety.

In the winter of 1968/69, the Expert Committee on Assessment and Evaluation made a thorough study of the IADP experience. Committee members visited each district as well as the State officials responsible for IADP in each State. They interviewed small, medium, and large farmers in several villages in each district, as well as IADP staff, district and block, and local officials and leaders. In its extensive report, the committee said: "The heart of the IADP concept was the use of the district, which is the key administrative unit in the country, as the focus of the agricultural development program. . . . The Committee's appraisal of eight years of experience shows that 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" (*6*, p. 2).

Bold Goals But Modest Efforts

For India, IADP was an ambitious program intended to have a key part in a break with the previous slow increase in food production. The Indian leaders who were to run it thought it not overly ambitious—it could be carried out as planned. Though the plan was bold, action proved much more timid.

IADP proposed, for example, that the narrow margin between food grain prices and costs of technical inputs be widened to provide farmer incentives to use the new methods. But they were still narrow as the 1964 crop was planted 4 years later. It took food shortages and inflation to raise farm prices to incentive levels, policy did not do it. Another example is that cooperatives failed to come through with adequate loans for IADP farmers, partly because the Reserve Bank was overly protective *(10)*. There was much talk but less action; only one State provided supplemental IADP government loans on a continuous basis. This was effective; fertilizer use by 1964/65 was a multiple of 10 over the base period in this district, and a multiple of 4½ in the early IADP districts as a whole. While IADP called for a districtwide intensive agricultural development push, a plan the project officers worked hard to make real, top administration narrowed their concern largely to technical progress with the main cereal crops, especially on the better situated farms. This was much less challenging to staff and villagers alike.

Why did this happen? Few Indians think it was due to weaknesses in the development design. One reason was that the capable, enthusiastic Indian administrator who mainly organized IADP left the program within 6 months after its initiation. Although his job was reassigned, he was never replaced by a strong, enthusiastic leader of high status. Another reason was that the early 1960's were years of good crops and policymakers relaxed with respect to food needs.

The principal reason, however, is probably the fact that the highly organized administrative system of India is geared to stability rather than growth and development, and this affects any ambitious program. Whether rapid progress is possible in any sector on a continuous basis without effective administrative reform is one of India's unanswered questions. IADP experience indicates that such reform will be necessary. That too little has yet happened is shown from the Expert Committee's statement: "The increasing availability of modern technology and the need to adapt it locally to bring about modernization of agriculture is creating the need for drastic administrative changes in favor of more local direction of agricultural programs. . . . The advances in agriculture which are taking place call for different administrative relationships than what obtained in the past in IADP districts and still exist in most other districts" *(6)*. Ford Foundation and Government of India staff have jointly studied this problem and have made recommendations that are under consideration in some States.

Contribution to National Agricultural Development

It is now generally recognized that high output per acre results from application of a locally adapted combination of improved technology (a package of improved practices). Availability of locally adapted combinations depends first of all on technical research, including crop varieties that are responsive to fertilizer, adequate moisture, and other improved practices. Locally adapted research also is needed to determine the most economic of the high input-high yield combinations of practices.

It is not so generally recognized, however, that adoption by most farmers is not automatic, even when a research breakthrough promises exceptionally high increases in yield over prevailing practices. The knowledge, the incentives, and the means for adoption must be brought to farmers from sources outside of their native villages; such sources are not readily available in an underdeveloped country such as India. The need for reorganizing the administrative structure to bring the

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message of yield-increasing technology to *all farmers* is usually overlooked. The profitableness of the new combination is frequently taken for granted, whereas farmers with limited resources require assurance that prices at harvesttime will cover additional costs and risks. In the United States and other developed countries, fertilizer, seed, and other inputs are locally available, and funds to buy them can be obtained; but in India in 1959, new supply and credit facilities had to be organized.

IADP pioneered a program to reach all farmers in the district with potential results of the new technology, to ferret out the major obstacles to adoption, and to overcome as many of them as possible. The intensive district organization still has many weaknesses because it had to be grafted on the existing district administration, but it is a vast improvement over the organization in other districts.

Some writers reasoning from experience in developed countries imply that if highly productive and profitable combinations are available the farmers will demand the institutions which can provide the essential services *(11)*. Perhaps they will over a period of 10 to 20 years, but in India changes are needed now, and IADP has demonstrated that government activity to provide the essential services is a prerequisite to rapid change, especially on the small farms.

The High-Yielding Varieties Program in India was organized along the lines pioneered by IADP. It emphasized the need for combining the new high-yielding seeds with fertilizer, water, etc., into a suitable package, as in IADP. Prices have been favorable since 1964/65, and seed and fertilizer have been available in most areas, but the missing link has been the lack of a district administrative structure that would provide the assistance needed for adoption by all farmers in an area. Consequently the HYVP has attracted mostly the larger operators, who could inform themselves about the new production possibilities and assume the risk of adoption.

Because the larger operators control more resources, this approach could be defended in a food emergency. The smaller operators required more help in shifting their production, and trained manpower would accomplish more by concentrating on the larger operators. But serious equity problems have arisen. A reorganization in the use of trained manpower would have enabled the program to enlist all farmers in the effort.

One of the most important contributions of IADP was the provision for participation by all farmers, small as well as large. The highly stratified village structure in India has not permitted much upward mobility by the small but able owners and tenants. Consequently, the program revealed rather early that the smaller operators were just as anxious to adopt improved technology as the larger operators *(11)*.

Despite the rigid structure of "noncompeting groups" in an Indian village, IADP has demonstrated the feasibility of organizing the participation of entire villages for adoption of intensive agriculture. This was done on an experimental basis in several IADP districts, especially Raipur, which was noted earlier as relatively backward. Intensive farming here is not possible because rainfall is light and no irrigation is available from December to May *(13)*. The size distribution of farms in 36 special program villages of Raipur district, and farmer participation in the program, is shown in table 5.

The program included (1) more advanced farming practices under an individual farm plan, with substantial increases in use of the new varieties, resulting in yield and production increases in all three size groups; (2) village development projects; and (3) women and youth programs. A byproduct was to increase hired work per village from 1,920 to 7,630 man-days per year.

The importance of enlisting all farmers in an improvement program is seen more clearly because 82 percent of the 50 million farms in India are under 10 acres in size. Although they operate only 40 percent of the land in farms, India cannot afford to ignore the problems of over four-fifths of her farmers. Programs must be organized which provide technical assistance, credit, tenure improvement, and other services needed by small farmers, as recommended in the original IADP proposal.

Table 5.—Size distribution of all farms in 36 special program villages, Raipur district, and number and percentage participating in the early IADP and the special village programs

Size class	Number of farms	Farms participating in—			
		Early IADP		Special village program	
		Number	Percent[1]	Number	Percent[1]
Less than 1 acre	500	74	15	210	42
1 to 5 acres	1,660	550	33	1,450	87
Over 5 acres	1,580	910	58	1,500	95
Total	3,740	1,534	41	3,160	85

[1]Percentage of all farms in each size class that were in the specified program.

The operators of small farms have been "left behind" in the march of progress in the United States; but they have not constituted the great majority of farmers, and the escape road to the cities has been open most of the time. In India, however, projections indicate that 53 million more people will be living in rural areas in 1974 than in 1969, despite optimistic assumptions on the growth of nonfarm employment. Consequently millions of small farmers and landless laborers are stranded in the village environment.

From Pilot Program to National Modernization

IADP has demonstrated in pilot districts the feasibility of developing a modernization program in India that can be made acceptable and beneficial to all farmers. The Expert Committee on Assessment and Evaluation of IADP suggested building on the IADP foundation to develop a national "Intensive Agricultural Modernization Program" *(6)*.

The writers believe that a crucial element in national modernization is recognition that the program should benefit *all rural people*—owners, tenants, and landless laborers; and that benefits from government-sponsored improvement programs should be shared in proportion to efforts and resources expended.

This means that India should be prepared to move from a production-oriented program to a people-oriented program. IADP has pioneered a program which if expanded could benefit all farm operators. The entire village program underway in Raipur district can serve as a prototype for adaptation to other areas. In many areas, however, improved tenure arrangements are needed to permit more equitable sharing by tenants. New measures will have to be developed to permit equitable sharing by landless workers, even in IADP districts. There are now over 30 million landless workers in India. They have had little opportunity to share in the recent benefits of agricultural improvement. And how many of the 53 million additional rural people by 1974 will have to join the ranks of landless workers in the absence of other opportunities? The disadvantaged masses in rural India are an important threat to political stability. People who have nothing to lose are beholden to none, and any promise of betterment seems attractive.

Living conditions for the rural masses can be made more tolerable by providing productive employment. (The original IADP included provision for rural works programs). Helping small operators adopt production-increasing technology will result in more work and more food production, much of which will be consumed in better living by farm families. Government intervention will be needed to assist the weakest bargainers (landless laborers and share tenants) in obtaining their shares of benefits from agricultural improvement.

Enforcement of improved tenure arrangements and wage agreements will require courageous government action. Rural works programs can be undertaken in slack seasons to provide additional income. To the extent that irrigation, drainage, road building, and conservation measures benefit private landowners, improvement levies can be assessed to help pay the costs. Part of such employment might be organized as "food for work" programs, although not necessarily "payment in kind." People will eat more and thus be able to do more work.

A people-oriented program eventually will result in greater total output than a program oriented solely toward increased production, and the benefits of improvement will be shared more equitably.

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