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Staff Paper Series

STAFF PAPER P71-8

MAY 1971

DIFFERENTIAL RATES OF GROWTH IN RURAL INCOMES  
RESULTING FROM SPECIFIC GOVERNMENT  
POLICIES LIKE THE NEW AGRICULTURAL STRATEGY

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DIFFERENTIAL RATES OF GROWTH IN RURAL INCOMES RESULTING  
FROM SPECIFIC GOVERNMENT POLICIES LIKE  
THE NEW AGRICULTURAL STRATEGY <sup>1/</sup>

by

Martin E. Abel \*

Introduction

The process of economic development, planned or otherwise, involves, among other things, the ways by which a country mobilizes available resources to generate greater total wealth and to achieve some expressed pattern of distribution of this new wealth among regions and classes of people. How the twin objectives of growth and distribution are achieved and the relative importance assigned to each will vary among nations at any point in time as well as through time for a particular nation.

The ways by which a country mobilizes its resources for development depend upon a number of factors: the quantity and quality of land and other natural resources, labor, and capital available to it; the nature of savings (including foreign

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<sup>1/</sup> Paper presented at the Seminar on Income Distribution in India, sponsored by the Planning Unit of the Indian Statistical Institute, New Delhi, February 25-26, 1971.

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sources of funds) and the ways it invests these savings; the level and composition of demands, both domestic and foreign, for final and intermediate products which can be produced from the available resources; the set of beliefs and values widely held by society which influence not only the demand and supply of commodities and services, but also determine the institutional structure governing economic and social activity -- rules by which society organizes itself to pursue accepted objectives; the distribution of income and wealth that flows from production; and finally, the extent to which technology can alter the effective resource endowment of a country. Planning of economic development, whether done formally or informally, should deal with all of the above factors acting upon a country's development process. It goes without saying, however, that this is not always the case.

How well a nation mobilizes itself for development can be inferred from its development plans and policies, or lack of them, and how well the objectives of these plans and policies are pursued and achieved through programs of action. I will argue in this paper that the merits of a particular set of policies and programs, such as those comprising the New Agricultural Strategy, should be evaluated in terms of what they were designed to accomplish; no more, no less. However, if a program has adverse effects on other national goals, this must be considered as one

of the costs of the program. Such external effects should always be considered when evaluating a program. I will argue further that it is futile to impute objectives to policies and programs that are not part of the basic policy and program design. It is not necessary for any particular set of policies and programs to deal with all the objectives a country sets for itself; rather, achievement of objectives must be viewed in terms of the collective outcome of all policies and programs.

### The New Agricultural Strategy

#### Nature and Objectives

The set of policies and programs that are conveniently called the New Agricultural Strategy have come in for a growing measure of criticism on two counts. First, there are some who feel that the present policy and program structure will not yield desired rates of growth in agricultural output. Second, there is a growing concern that the benefits of the growth in agricultural output is concentrated in the hands of certain classes of people and in certain regions, leaving large groups of people in the backwaters of development. I would like to put the New Agricultural Strategy in an historical perspective before commenting on these two sets of criticisms.

Specifically, the New Agricultural Strategy to which I refer was adopted and put into action in 1965-66. It consisted of a package of measures designed to get the quickest possible increase in food grain production and consisted of incentive prices to farmers and the concentration of the use of new, high-yielding varieties of wheat, rice and maize (and later, jowar and bajra), fertilizer, and plant protection materials on an estimated 32 million acres of land which had an "assured" supply of water. It was a strategy born out of acute food shortages with the attendant upward spiralling of food prices. <sup>2/</sup>

This was not the first time in the recent history of India when food shortages and a strong emphasis on increasing food production in the most expeditious manner was a matter of national concern. One can go back in history at least to the 1940's and the Grow-More-Food Campaign. Less remote in time, the decline in food grain production in 1957-58 raised some doubts about whether production was growing rapidly enough to meet the countries future needs. This concern was translated into a study of the nation's food situation which was published in 1959 under the title, Report on India's Food Crisis and Steps to Meet It, <sup>3/</sup>

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<sup>2/</sup> C. Subramaniam, "India's Program for Agricultural Progress", Strategy for the Conquest of Hunger Proceedings of a Symposium Convened by the Rockefeller Foundation, The Rockefeller Foundation, New York, Apr. 1968.

<sup>3/</sup> Report on India's Food Crisis and Steps to Meet It, by the Agricultural Production Team sponsored by the Ford Foundation, Ministry of Food and Agriculture and Ministry of Community Development & Cooperation, Government of India, April 1959.

This study concluded that:

- (1) The Third Plan target of 110 million tons of food grains produced by 1965-66 would not be achieved with the existing set of programs; rather a level of production of about 82 million tons was more likely.
- (2) There was need for a greatly accelerated effort in agricultural development consisting of:
  - a) Stabilization of farm prices at incentive levels;
  - b) A public works program for increasing food production and village employment;
  - c) Greatly accelerated use of chemical fertilizers;
  - d) Intensification of irrigation and drainage programs;
  - e) Security of land tenure and land consolidation;
  - f) Large scale expansion of credit through cooperatives;
  - g) Progressive reduction in cattle numbers;
  - h) Creation of a more streamlined administrative mechanism for specific and more coordinated implementation of agricultural programs;
  - i) Strengthening of the extension services down to the village level; and finally
  - j) Selection of certain crops and certain areas which have the greatest potential for increased production for intensive agricultural development efforts.



Some of the recommendations of the Food Crisis Report became the basis for the Intensive Agricultural District Program (IADP), started in 1960-61 and noted for its "package of practices" approach to agricultural development. Subsequently an expanded, but modified, version of the Intensive Agricultural District Program was extended to a much larger area under the name of the Intensive Agricultural Area Program.<sup>4/</sup>

It is abundantly clear that all the programs from the Intensive Agricultural District Program to the New Agricultural Strategy placed primary, but not exclusive, emphasis on increasing food grain production as quickly as possible. And, this was to be accomplished by concentrating efforts in those areas of the country (and indirectly on those farms) that had the potential for rapid progress.

The reasons for this approach are equally evident. India was gravely concerned in the early and mid-1960's with food enough. Many felt, and with considerable justification, that the sharply rising prices of food and the acute food shortages of the drought years 1965-66 and 1966-67 represented a serious impediment to economic progress, let alone the social problems they created or helped to aggravate. It is all too easy to forget with the passage of time the calamitous fall in food grain production from 89 million tons in 1964-65 to 72 million tons in 1965-66, with only 74.2 million tons of food grains produced in 1966-67.

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<sup>4/</sup> Fourth Five Year Plan; 1969-74, Planning Commission, Government of India, 1970.

It is also easy to forget that the architects of the New Agricultural Strategy, while consciously aware of the disparities which would be created by concentrating increased agricultural production in selected areas and on selected types of farms, were also concerned with questions of equity. But these questions concerned the equity of survival.

Now that the nation's food situation has become more comfortable a new set of equity questions, rooted in the past but highlighted by the events of the times, has come to the forefront. Questions of "equity" and "economic and social justice" are rapidly assuming positions of pride-of-place in the hierarchy of concerns about rural development.

More about this matter later. First, we should examine the question of whether the New Agricultural Strategy has been successful in achieving its stated objective -- increasing food grain production as quickly as possible.

#### Accomplishments

An examination of the long-term trend in food grain production indicates that production increased from 54.9 million tons in 1951 to 99.5 million tons in 1970, or at an annual rate of 3.2 percent. This

same growth rate also obtained in the 1951-65 period.<sup>5/</sup> Thus, the rate of growth in food grain production during the period of the New Agricultural Strategy -- since 1965 -- enables only a continuation of the past trend. And, some observers feel that the same rate of growth will prevail through the first half of the 1970's.<sup>6/</sup>

Should one interpret the pervasiveness of the trend rate of growth in food grain production as a failure of the New Agricultural Strategy? It would appear from the aggregate food grain production figures that the New Agricultural Strategy did not contribute much to increasing production. But if one looks at the sources of growth in production quite a different picture emerges. Between 1951 and 1965 agricultural production grew at 3.1 percent per annum (3.2 percent for food grain). This rate of growth consisted of a 1.40 percent rate of growth in gross cropped area, a 1.33 percent rate of growth in per acre productivity, and a 0.37 percent rate of growth due to changes in cropping patterns.<sup>7/</sup> Thus, nearly one-half of the growth in agricultural output came from the expansion of gross area under cultivation. The major expansion in cultivated area took place

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<sup>5/</sup> B. S. Minhas, *Fourth Plan: Objectives and Policy Frame*, Commerce Pamphlet 20-21, Vora and Co., Publishers, Private Ltd., Bombay, India, Sept. 1969.

<sup>6/</sup> Report on Price Policy for Kharif Cereals for the 1970-71 Season, Agricultural Prices Commission, Government of India, August 1970

<sup>7/</sup> Minhas, op. cit.

in the 1950's. Very little new cultivated land was brought into production during the Third Plan Period (1961-66). And, net cultivated area is expected to remain about constant in the Fourth Plan period (1969-74). This means that continuance of the historical rate of growth of agricultural and food grain production through the 1960's reflects a sharply increased rate of growth in productivity per acre, since essentially all of the increased output has come from higher yields, more intensive use of land and changes in cropping patterns.<sup>8/</sup> These observations are supported by what has happened to the use of inputs, which may be just as good, if not a better measure of progress in increasing agricultural output as a direct measure of output itself.<sup>9/</sup> For example, fertilizer consumption ( $N+P_2O_5+K_2O$ ) increased from 306,000 metric tons in 1960-61 to 1,750,000 metric tons in 1968-69. During the same period the number of electric and diesel pump-sets increased from 421,000 to 1,688,000 and the area covered by plant protection measures from 6.4 million hectares to 40 million hectares.<sup>10/</sup>

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<sup>8/</sup> Martin E. Abel, "Agriculture in India in the 1970's", Economic and Political Weekly, Vol. V., No. 13, March 1970.

<sup>9/</sup> A. M. Khusro, Agricultural Transformation in India, Allied Publishers Private Limited, 1969.

<sup>10/</sup> Fourth Five Year Plan, 1969-74, The Planning Commission, Government of India, 1970.

One conclusion is clear: Without arguing about the degree of success -- targets vs. performance -- the New Agricultural Strategy has accomplished in a significant way what it was designed to do; namely, increase food grain production quickly beyond what would have been possible without the high-yielding varieties, an expanded supply of inputs, and a set of factors and product prices which make the use of these new inputs profitable to farmers.

#### Regional distribution of benefits

The question still remains as to who has benefitted from the New Agricultural Strategy and where are those farmers located. Inspection of data on food grain production at the national level (Table 1) indicates that to date wheat has been at the forefront of accomplishments of the New Agricultural Strategy. Of the 10.5 million ton increase in total food grain production between 1965 and 1970, wheat alone accounted for 7.8 million tons or about 75 percent. Rice, bajra and other cereals showed only modest increases, while pulse production declined slightly and jowar production showed virtually no change.

We next look at the geographic distribution of these changes in production. Data are available for the crop years 1966-67, 1967-68, and 1968-69 on the total acreage and acreage planted to high-yielding varieties of wheat and paddy, by States. <sup>10a/</sup> These are the

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10a/ While one might question the accuracy of certain portions of these data, the overall picture which emerges does not seem at all unreasonable.

Table 1

Production of Food Grains, India, 1951-1970

Crop year ending June 30	Total Food Grains	Rice	Wheat	Jowar	Bajra	Other Cereals	Pulses
-----million metric tons-----							
1951	54.9	22.1	6.8	6.2	2.7	7.9	9.2
1952	52.0	21.3	6.2	6.1	2.4	7.7	8.3
1953	58.1	22.9	7.5	7.4	3.2	9.1	8.0
1954	67.1	28.2	8.0	8.1	4.6	8.7	9.5
1955	67.8	25.2	9.0	9.2	3.5	10.1	10.8
1956	69.3	28.7	8.9	6.7	3.5	9.8	11.7
1957	69.9	29.0	9.4	7.3	2.9	9.7	11.6
1958	63.5	25.3	7.9	8.4	3.6	8.6	9.6
1959	74.3	30.2	9.9	8.8	3.6	9.6	12.2
1960	77.7	31.7	10.3	8.6	3.5	10.8	12.8
1961	82.0	34.6	11.0	9.8	3.3	10.6	12.7
1962	82.7	35.7	12.1	8.0	3.6	11.5	11.8
1963	80.2	33.2	10.8	9.8	4.0	10.9	11.5
1964	80.6	37.0	9.9	9.2	3.8	10.6	10.1
1965	89.0	39.0	12.3	9.8	4.4	11.0	12.4
1966	72.0	30.7	10.4	7.5	3.7	10.0	9.8
1967	74.2	30.4	11.4	9.2	4.5	10.4	8.4
1968	95.6	37.9	16.6	10.1	5.1	13.7	12.2
1969	94.0	39.8	18.7	9.8	3.8	11.6	10.4
1970	99.5	40.4	20.1	9.7	5.3	12.3	11.7

Source: Directorate of Economics and Statistics, Ministry of Food, Agriculture, Community Development, and Cooperation.

two major food grain crops; wheat showing a high rate of adoption of high-yielding varieties and paddy showing only a modest rate of adoption.

In the case of wheat there has been a very rapid expansion in the area planted to high-yielding varieties (Tables 2a and 2b). For all of India, area of wheat planted to high yielding varieties was 539.3 thousand hectares or only 4.3 percent of the total area of wheat in 1966-67. By the 1968-69 crop year the area under high-yielding varieties had expanded to 4,742.6 thousand hectares or 30.5 percent of the total wheat area. Two States -- Punjab and Uttar Pradesh -- accounted for 75 percent of the total area under high yielding varieties of wheat, and in each of these States nearly 50 percent of wheat area was planted to high yielding varieties. This is a very rapid rate of adoption. There are other States in which the substitution of high yielding varieties for local varieties was rapid, but wheat area in these States is small; e.g. Assam, Orissa, etc. There are a few States which have a modest area in wheat production and where about 30 percent of the wheat area was planted to high yielding varieties in 1968-69; e.g. Haryana and Gujarat. Finally, there are States with rather sizeable area planted to wheat where the area under high-yielding varieties has increased very slowly or only at a moderate rate; e.g. Madhya Pradesh, Maharashtra, Rajasthan.

Table 2a

Wheat: Total Area And High-Yielding Variety (HYV) Area  
by States and by Years, 1966-67 to 1968-69

State	1966-67		1967-68		1968-69	
	Total	HYV	Total	HYV	Total	HYV
-----1000 hectares-----						
Andhra Pradesh	13.9	-	13.8	-	12.7	-
Assam	5.7	.2	6.7	.8	7.5	4.5
Bihar	809.4	25.1	1054.4	199.5	1095.3	301.1
Gujarat	460.8	.4	552.6	160.9	502.5	167.4
Haryana	738.0	13.4	845.5	101.2	895.0	259.0
Jammu & Kashmir	161.3	.8	186.7	28.4	200.0	36.4
Kerala	-	-	-	-	-	-
Madhya Pradesh	2129.7	16.2	2661.1	45.4	3005.6	80.9
Maharashtra	876.1	42.5	891.4	13.8	873.1	63.5
Mysore	298.0	.8	304.7	10.4	309.5	26.3
Orissa	15.9	.8	14.5	3.7	14.1	4.2
Punjab	1615.0	58.7	1804.0	639.0	2086.0	1011.7
Rajasthan	961.3	9.3	1264.5	125.4	1162.3	190.6
Tamil Nadu	1.4	-	1.0	-	1.1	-
Uttar Pradesh	4394.3	363.0	4969.7	1586.8	5239.1	2514.8
West Bengal	55.4	8.1	79.0	27.5	150.0	82.2
<b>TOTAL</b>	<b>12536.2</b>	<b>539.3</b>	<b>14649.6</b>	<b>2942.8</b>	<b>15553.8</b>	<b>4742.6</b>

Source: Ministry of Food, Agriculture, Community Development and  
Cooperation.



Table 2b

Percent of Wheat Area Planted to High-Yielding Varieties, by States,  
1966-67 to 1968-69

State	1966-67	1967-68	1968-69
	-----percent-----		
Andhra Pradesh	-	-	-
Assam	3.5	11.9	60.0
Bihar	3.1	18.9	27.5
Gujarat	0.1	29.1	33.3
Haryana	1.8	12.0	28.9
Jammu & Kashmir	0.5	15.2	18.2
Kerala	-	-	-
Madhya Pradesh	0.8	1.7	2.7
Maharashtra	4.9	1.5	7.3
Mysore	0.2	3.4	8.5
Orissa	5.0	25.5	29.8
Punjab	3.6	35.4	48.5
Rajasthan	1.0	9.9	16.4
Tamil Nadu	-	-	-
Uttar Pradesh	8.3	31.9	48.0
West Bengal	14.6	34.8	54.8
TOTAL	4.3	20.1	30.5

Table 2c

Production of Wheat by States, 1964-65 to 1968-69

State	1964-65	1965-66	1966-67	1967-68	1968-69
-----1000 metric tons-----					
Andhra Pradesh	4.4	2.1	2.8	2.7	3.0
Assam	3.3	3.4	3.5	4.3	4.7
Bihar	417.8	477.3	365.0	913.5	1259.0
Gujarat	415.9	579.3	456.9	700.4	620.5
Haryana	920.2	669.0	1054.0	1466.4	1522.0
J & K	81.7	111.2	112.2	142.2	210.0
Kerala	-	-	-	-	-
Madhya Pradesh	1980.9	1327.3	1031.4	1881.6	2007.5
Maharashtra	407.7	304.5	366.6	360.4	428.1
Mysore	107.7	50.0	47.0	133.4	160.0
Orissa	7.2	10.3	14.2	15.3	17.4
Punjab	2360.0	1916.0	2493.9	3352.0	4520.0
Rajasthan	1103.1	7784.7	872.2	1319.1	1178.1
Tamil Nadu	0.5	0.5	0.5	0.4	0.4
Uttar Pradesh	4117.9	3754.7	4230.3	5840.7	6086.8
West Bengal	28.0	34.0	45.5	71.7	300.1
All India	12257.0	10424.4	11392.8	16540.1	18651.6

Source: Ministry of Food, Agriculture, Community Development, and Cooperation.

While a large number of the wheat producing States have experienced some progress in the use of high-yielding varieties, the bulk of the progress has been concentrated in a relatively few States. In many ways, this should not be an unexpected phenomenon. The new varieties of wheat require, among other inputs, an adequate and timely supply of water and under rabi seasons this means irrigation. Thus, the new varieties have been grown where the irrigation facilities are located and also where irrigation could be expanded rapidly; namely through tubewell development. This situation is basically consistent with one of the objectives of the new agricultural strategy; namely, concentrate the production of high-yielding varieties on land with an assured water supply. We should keep in mind, however, that it was economic forces rather than administrative pressures that led to this pattern of production; farmers produced the new varieties of wheat where it was profitable and they had the resources to do so.

The growth in production of high-yielding varieties of rice in many ways stands in sharp contrast to that of wheat (Tables 3a, 3b). As of 1963-69 only 7.8 percent of the total rice area was planted to high-yielding varieties of rice. While some progress has been made with growing high-yielding varieties of rice in almost all States, none, with the exception of Jammu and Kashmir, has reached the intensity of use of the new seeds that characterizes U. P. and Punjab in the case of wheat. Only Tamil Nadu and Kerala seem to be making reasonably good progress

Table 3a

Paddy: Total Area And High-Yielding Variety (HYV) Area  
By States and by Years 1966-67 to 1968-69

State	1966-67		1967-68		1968-69	
	Total	HYV	Total	HYV	Total	HYV
-----1000 hectares-----						
Andhra Pradesh	3322.9	275.2	3399.4	350.8	3053.4	506.4
Assam	1972.7	2.0	2082.7	20.6	2199.2	60.7
Bihar	4495.9	66.8	5255.4	255.8	5427.8	269.5
Gujarat	497.3	.4	513.8	54.1	489.4	27.0
Haryana	192.0	-	217.0	4.2	223.0	10.4
Jammu & Kashmir	223.6	8.1	226.5	50.6	239.2	118.9
Kerala	799.4	70.4	809.5	20.9	925.5	220.5
Madhya Pradesh	4209.3	52.6	4169.9	32.0	4391.2	131.5
Maharashtra	1346.4	76.1	1367.4	68.2	1372.0	129.1
Mysore	1123.8	29.6	1134.8	45.2	1192.6	74.7
Orissa	4253.1	45.8	4336.5	121.1	4299.0	146.0
Punjab	285.0	7.2	314.0	16.9	338.0	26.5
Rajasthan	78.4	.4	95.0	0.8	129.4	4.9
Tamil Nadu	2628.1	152.6	2669.0	441.5	2571.9	638.8
Uttar Pradesh	4445.8	69.2	4398.3	149.9	4521.1	330.6
West Bengal	4648.7	26.3	4714.4	131.5	4838.8	195.5
<b>TOTAL</b>	<b>34522.4</b>	<b>882.7</b>	<b>35703.6</b>	<b>1764.1</b>	<b>36211.5</b>	<b>2866.7</b>

Source: Ministry of Food, Agriculture, Community Development, and Cooperation.

Table 3b

Percent of Paddy Area Planted to High-Yielding Varieties, by States,  
1966-67 to 1968-1969

State	1966-67	1967-68	1968-69
	-----percent-----		
Andhra Pradesh	8.3	10.3	16.6
Assam	0.1	1.0	2.8
Bihar	1.5	4.9	5.0
Gujarat	0.1	10.5	5.5
Haryana	-	1.9	4.7
Jammu & Kashmir	3.6	22.3	49.7
Kerala	8.7	2.6	23.8
Madhya Pradesh	1.2	0.8	3.0
Maharashtra	5.7	5.0	9.4
Mysore	2.6	4.0	6.3
Orissa	1.1	2.8	3.4
Punjab	2.5	5.4	7.8
Rajasthan	0.5	0.8	3.8
Tamil Nadu	5.8	16.5	24.8
Uttar Pradesh	1.6	3.4	7.3
West Bengal	0.6	3.4	4.0
Other territories	0.8	-	-
TOTAL	2.6	4.9	7.9

Table 3c

Production of Rice by States, 1964-65 to 1968-69 by Year  
(In thousands)

State	1964-65	1965-66	1966-67	1967-68	1968-69
-----1000 metric tons-----					
Andhra Pradesh	5006.9	3961.4	4852.8	4673.8	4340.5
Assam	1920.0	1847.4	1756.3	1979.8	2250.8
Bihar	4913.7	4262.0	1645.2	4731.6	5197.4
Gujarat	471.0	247.4	294.3	463.5	230.0
Haryana	264.6	204.0	223.0	287.0	265.0
Jammu & Kashmir	207.9	160.5	256.7	279.6	487.3
Kerala	1121.4	997.5	1084.1	1123.9	1400.0
Madhya Pradesh	3505.7	1700.6	1910.3	3192.8	3004.3
Maharashtra	1454.6	893.4	1065.0	1437.3	1368.8
Mysore	1750.8	1159.7	1636.2	1796.9	2001.1
Nagaland	42.8	43.2	50.0	51.0	52.9
Orissa	4420.2	3285.4	3691.6	3755.5	4698.6
Punjab	351.0	296.0	338.0	415.0	460.0
Rajasthan	98.4	23.5	21.6	95.3	57.0
Tamil Nadu	4036.1	3709.4	4076.4	4115.6	3940.0
Uttar Pradesh	3323.4	2342.0	2013.1	3262.1	2922.1
West Bengal	5760.6	4893.1	4824.3	5208.2	6250.0
All-India	39307.8	30655.1	30437.9	37612.2	39761.2

in spreading the use of high-yielding rice varieties with 24.8 and 23.8 percent of the total rice area in each respective State being covered in 1968-69; <sup>11/</sup> Andhra Pradesh ranks next with 16.6 percent of its rice area under-yielding varieties. While there appears to be less State-wise concentration in the production of high-yielding varieties of rice compared with wheat, this does not mean that there may not be considerable concentration of production within particular States.

Some of the basic reasons for the slower rate of adoption of high-yielding varieties of rice than wheat are well understood. In most of the rice producing areas dependent only upon monsoon rains or receiving water under unregulated canal or tank irrigation systems, there is a lack of control -- either too much or too little -- in water use, a critical requirement if the full yield potential of the new rice varieties is to be realized. Furthermore, insect and disease problems are more prevalent under conditions of heavy cloud cover and relatively low intensity of sunlight that prevail during the monsoon season. In addition, the reduced availability of solar energy due to heavy cloud cover reduces yields. Economic factors may also be important, such as the lower price received for the high yielding varieties of rice.

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<sup>11/</sup> We should keep in mind that two important varieties in these States are not truly high-yielding varieties, but improved local varieties -- ADT 27 and C-28.

The high-yielding varieties of rice do much better during the non-monsoon seasons under irrigation. But, the amount of land with such irrigation is as yet very small.

There has been a range of experience with other cereal grains. High-yielding varieties of bajra are being planted on an increased area and there is a modest upward trend in total production (Table 1). In the case of high-yielding varieties of jowar, disease and insect problems as well as problems of consumer acceptability have retarded their adoption and there has been no apparent growth in total jowar production during the decade of the 1960's. Among the different cereals, high-yielding varieties of maize were among the first to be developed and adopted in India. There has been continued growth in the use of these varieties. However, they are not without their serious problems and, for example, area planted to high-yielding varieties of maize has declined in recent years in the Punjab.<sup>12/</sup> Some of the reasons for this decline are higher costs of production, lower prices, variations in seed quality, etc.

To summarize: The New Agricultural Strategy was designed to get rapid increases in food grain production. New high-yielding varieties together with fertilizers and plant protection materials were to be concentrated on areas with assured water supply. Within the

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<sup>12/</sup> H. S. Sandhu and S. S. Johl, Performance of Maize Crop in Punjab (1967-68 through 1969-70), Department of Economics and Sociology, Punjab Agricultural University, Ludhiana.



limits of available technology, this is what more or less has happened. It has happened more so in the case of wheat than that of rice for reasons already discussed; the experience with other food grains has been mixed with bajra showing probably the most promising results to date. Continued research in plant breeding will bring forth still better varieties of food grains adapted to local ecological conditions. Continued improvement in water management will also occur, but with many large-scale problems yet to be solved. There will undoubtedly be continued tubewell development in the Gangetic Plain, constrained, however, by the availability of power, pumpsets, credit, etc., and very likely by insufficient knowledge about the quantitative and qualitative adequacy of ground water supplied. Improvement of irrigation systems to bring better control of water use to individual farmer's fields and to make the systems more responsive to agricultural requirements in the rice areas will be a long-term effort. But as this effort is made as well as further improvements in rice varieties, we will see the continued spread of high-yielding rice varieties.

Distribution of benefits by size of farm

So far we have discussed the differential impact of the New Agricultural Strategy on different areas of the country. We turn now to the question of how different groups of farmers have been able to benefit

from the new high-yielding varieties- specifically, namely, how it has benefited farms of different sizes.

In a recent article,<sup>13/</sup> P. K. Mukherjee presents some data from the Plan Evaluation Organization's study of the High-Yielding Variety Program in 1968-69. The data are for three States (Tamil Nadu, Maharashtra, and Punjab) and for three food grains (paddy, jowar, and wheat). The percentage distribution of cultivators in each size-of-farm category in the sample growing high-yielding varieties of the three food grains is presented in Table 4.

The data for wheat in the sample of villages in the Punjab again confirms how successful these new varieties have been. Not only did 98.28 percent of the cultivators in the sample grow high-yielding varieties of wheat, but the distribution of the proportion of cultivators growing the new varieties ranged from 96.77 to 100.00 percent. In this sample, both small and large cultivators alike have benefited. For paddy in Tamil Nadu, 58 and 72 percent of the cultivators in the sample grew high-yielding varieties in the rabi and kharif seasons, respectively. During the kharif season, 70 percent of the smallest cultivators grew the new varieties compared with 100 percent of the

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<sup>13/</sup> P. K. Mukherjee, "The HYV Programme; Variables that Matter", Economic and Political Weekly, Review of Agriculture, Vol. V, No. 3, March 28, 1970.

Table 4

Proportion of Cultivators Growing High-Yielding Varieties by Size of Operational Holdings

Size of holding	<u>Paddy</u> (Tamil Nadu)		<u>Jowar</u> (Maharashtra)		<u>Wheat</u> (Punjab)
	Kharif 1968	Rabi 1968- 1969	Kharif 1968	Rabi 1968- 1969	Rabi 1968- 1969
(acres)	-----percent-----				
Below 2.5	70.33	52.36	9.43	7.20	96.77
2.5 - 4.9	68.48	60.82	26.36	8.06	98.67
5.0 - 9.9	74.69	69.40	23.08	8.08	97.74
10 - 19.9	82.35	69.70	19.15	11.91	98.65
20 - 49.9	95.23	100.00	29.37	17.70	98.45
50 & above	100.00	100.00	53.33	19.12	100.00
All sizes	72.09	57.70	23.17	10.65	98.28

Source: P. K. Mukherjee, "The HYV Programme; Variables That Matter", Economic and Political Weekly, Review of Agriculture, Vol. V, No. 3, March 28, 1970.

largest cultivators; the comparable figures for rabi paddy are 52 and 100 percent. In the case of jowar in Maharashtra, 23 percent of the cultivators grew the high-yielding varieties in the kharif season, but only 11 percent did so in the rabi season. The range from smallest to largest cultivators was from 9 to 53 percent in the kharif season and from 7 to 19 percent during the rabi season.

While the small farmers seemed to benefit nearly as much as the large farmers from the new varieties of wheat, this was not so in the case of paddy and especially not in the case for jowar. Even for wheat, the data for the Punjab may show overly optimistic results for wheat as a whole. As we saw in Tables 2a and 2b, Punjab had the highest rate of adoption of the high-yielding varieties of wheat. The data indicate that the pre-conditions for the profitable use of the new wheat varieties, namely adequate irrigation, were present on a large scale and widely distributed. This may not be the case in other States. And, if irrigation, for example, is not as uniformly distributed among farms of different sizes, one would expect a less even distribution of the use of the new wheat varieties among farm-size groups. The Plan Evaluation Organization is presently engaged in a comprehensive study of three years of experience with the high-yielding varieties of wheat, paddy, jowar, bajra, and maize and it will be interesting to see what this study shows for States and food grains other than ones discussed above.

At this point, it is worth discussing an important economic aspect of New Agricultural Strategy; namely, that the main components of the new approach form a biological-chemical element of new technology which is neutral with respect to economics of scale or farm size. The chemical-biological element consists of the new seeds and chemical fertilizers. Since these inputs are perfectly divisible, there is no reason why significant scale factors should exist. Therefore, small as well as large farmers should get proportionately the same benefits from the new technology. The experience of Japan and Taiwan are cited to support this proposition.

While this analysis of the impact of the new technology on farms of different sizes is correct, it is at best a partial evaluation. For the neutrality-of-scale argument to be generally true, there would have to be an absence of scale economies with respect to all the other supporting inputs required for farmers to realize the full economic potential of the new high yielding varieties. This may or may not be the case. There are several important supporting inputs which are available to farmers either mainly in terms of lumpy or discrete investments or through institutional structures which favor large over small farmers, both of which give rise to scale economies with respect to the use of these inputs. Privately owned tubewells

represent one form of lumpy investment giving rise to scale economies in the use of high-yielding varieties where irrigation is important. Of course, there are forms of economic organization such as joint investments in tubewell development by several small farmers which can reduce the lumpiness of this type of investment to the individual farmer, the same result can also be achieved through the sale of water to smaller farmers by larger ones at reasonable rates. However, this form of economic organization is still the exception, rather than the rule. With respect to institutional structures which favor larger over smaller farmers, the credit system represents one example among many. It is no secret that generally larger farmers have access to proportionately more borrowed capital on easier terms than do small ones, both because of their economic as well as social position within the community.<sup>14/</sup> Here again, there are alternative institutional arrangements which are less biased with respect to size of farm, but they too are probably in the minority at the present time.

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<sup>14/</sup> C.H. Hanumantha Rao, "Farm Size and Credit Policy", Economic and Political Weekly, Review of Agriculture, Vol.5, No.52., December 26, 1970.

In subsequent sections of this paper we discuss measures required to more fully take advantage of the neutrality-of-scale characteristic of the new chemical-biological technology. As will be discussed, these measures lie mostly beyond the pale of the New Agricultural Strategy.

Potential of the New Agricultural Strategy for Dealing with Problems of Income Distribution and Employment

Now that the problems of income distribution and employment in rural India have become much more important relative to the problems of self-sufficiency in food and fiber production, it is worth examining to what extent the New Agricultural Strategy as defined in this paper can contribute to the solutions of these problems.

One obvious extension of the New Agricultural Strategy is to achieve further varietal improvements in food grains which will make them economically superior to local varieties and spread their adoption within the present physical and economic environment. This means, for example, further research work to develop varieties of paddy and jowar which are more resistant to prevailing insects and diseases and can yield higher rates of return to farmers under existing conditions of production. It also means that no single variety will be best for all of India; numerous varieties will have to be developed and adapted to

the variations in production conditions, area by area. Success in these endeavors will result in a wider geographic coverage of the new technologies represented by the high-yielding varieties. It may also have some impact on the distribution of benefits of the new technology among farms of different size. This would occur to the extent the physical and economic risk associated with some of the less adapted high-yielding varieties was significantly reduced and, as a consequence, made them more attractive to small farmers. This assertion assumes that small farmers are less able and less willing to adopt high-risk technology relative to larger farmers. While there is no conclusive evidence to fully support this assumption, there is a significant amount of evidence to indicate the larger farmers do have more management skills, access to information, and financial resources to adopt risky, yet profitable new practices than is true for small ones.

Beyond varietal improvement of food grains the things that need to be done fall outside of the framework of the New Agricultural Strategy, as defined. They involve three basic sets of program and policy decisions: The first is to strengthen programs of varietal improvement for commodities other than food grains -- other food and non-food crops. Second, more emphasis should be put on



agricultural pursuits other than crop production -- animal husbandry and forestry. And third, more effort will have to be devoted to improving the physical, economic and institutional "environment" for crop production to more fully exploit the yield potential of improved crop varieties over wider geographic areas and among farms of various sizes by providing required inputs in adequate quantities to all sizes of farms.

#### Broader Program of Varietal Improvement and Production

The main thrust of the New Agricultural Strategy has been to increase the yield performance and production of food grains. While some new varieties contain some serious weaknesses which have prevented more rapid adoption, research efforts are underway to correct these deficiencies. When we turn from food grains to other food crops and to non-food crops, the prospects are less promising. A "Green Revolution" is not in sight for such crops as cotton, (although varietal improvement is taking place) oil seeds, pulses, and some horticultural and vegetable items. Yet some of these commodities represent major sources of incomes for large agricultural areas of India. Intensified efforts to improve yields and expand production of these commodities will bring added income and employment to many areas that have not yet benefited much from the New Agricultural Strategy.

### Livestock and Forestry

Insufficient attention has also been paid to such rural pursuits as livestock and forestry. Not only are research and technological considerations involved, but also investment decisions in production, processing and marketing commensurate with the growing demands. The future development of the livestock and forest product industries have important implications for bringing new employment and income opportunities to areas that have not and are not likely to benefit much from the New Agricultural Strategy. In addition, these industries offer opportunities for increasing employment and incomes of small farmers and landless labor. The impact of livestock development on the economic well-being of small farmers can be illustrated by the way in which an organized system of milk marketing in Kaira district, Gujarat, has made possible a significant source of non-crop income for small farmers in that area. However, to reproduce this experience in other areas may require some new innovations in institution building.

### Improving the Production Environment

One of the signal characteristics of the new high-yielding varieties of food grains, which form the basis of the New Agricultural Strategy, is that their performance is sensitive to the physical (and economic) environment in which they are grown. The new varieties of wheat and rice were bred to achieve a high response to heavy application of

fertilizer. A concomitant factor in the realization of the high yield potential of these varieties is the availability of water in correct amounts and on a timely basis. This means a high degree of water control involving both controlled application of water and drainage systems capable of removing excess water. In addition, disease and insect problems will have to be made manageable whether through control of these problems in ways that are external to the varieties or by developing better inherent resistance in the plant.

In a study of the performance of the high-yielding varieties of rice and wheat in Asia, Barker <sup>15/</sup> concludes that:

"Data have been presented to support the hypothesis that differences in environmental conditions and not farmer's ability or knowledge have been responsible for the outstanding performance of the new wheat as compared with the new rice varieties. The typical environmental conditions under which the two crops are grown differ markedly. The production functions suggested that the potential response of the high yielding rice varieties is equal to that for the new wheat varieties under the same environmental condition. However, given the difference in growing conditions for dry climate wheat and rice as compared with rice in the monsoon, not only the degree of response but the year-to-year variability in response must influence the farmer's willingness to apply inputs. The wide differences that can be observed in production gains to date give support to the importance of the environment.

"Acceptance of the above hypothesis has important policy implications for Asian Countries. Sustained gains in rice

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15/ Randolph Barker, Environmental Factors Influencing the Performance of New High Yielding Varieties of Wheat and Rice in Asia, International Rice Research Institute, Los Banos, Philippines (mimeo.)

production can be achieved principally by reducing the risk and uncertainty facing farmers. Continued effort will be required to improve and expand irrigation and drainage facilities. At the same time, more attention will need to be given to improvement of production potential under rainfed and upland conditions. It will be necessary to invest adequate research funds in the development of insect and disease resistant varieties. Resistant varieties for the long run appear to offer a more fruitful approach than emphasis on insecticides which for the individual farmers are expensive and offer uncertain benefits."

Barker's conclusions call for two lines of action. On the question of disease and insect problems, researchers should try to build as much resistance into high yielding varieties as is practicable. This is clearly within the purview of the New Agricultural Strategy. So too would be the further development of food grain varieties suitable to rainfed areas. On the other hand, development of water resources through irrigation and drainage programs which would yield a high degree of water control on farmers' fields represents an extremely large area of program activity that falls outside the framework of the New Agricultural Strategy. Yet the water factor represents one of the major restraints not only on total agricultural production, but also on spreading the benefits of the New Agricultural Strategy over larger areas and among different size-groups of farmers. For example, a recent study by U. P. Agricultural University of recent changes in the agriculture of two areas in Western U. P. States that "Irrigation deficiencies remained substantial ... and certainly critical for the

small, medium and very small cultivators." <sup>16/</sup> This conclusion has also been substantiated in a study of small farmers in Gujarat. <sup>17/</sup>

In addition to the physical environment one has also to consider the social and economic environment within which farmers operate, particularly the small farmers and those with tenuous relations to the land they farm. The New Agricultural Strategy has dramatized many inherent inequities in the rural institutional structure which have been present for a very long period.

"It is not... the new technology which is the primary cause of the accentuated imbalances in the countryside. It is not the fault of the new technology that the credit service does not serve those for whom it was originally intended; that the extension services are not living up to expectations, that the panchayats are political rather than developmental bodies; that security of tenure is a luxury of the few; that rents are exorbitant; that ceilings on agricultural land are national; that for the greater part tenurial legislation is deliberately miscarried; or that wage scales are hardly sufficient to keep soul and body together." <sup>18/</sup>

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16/ Changing Agriculture in Two Regions of Uttar Pradesh -- 1969-70, Preliminary Report, Agro-Economic Regional Survey No. 2, U. P. Agricultural University, Pantnagar, U.P., November 1970.

17/ V. S. Vyas, D. S. Tyagi, and V. N. Misra, Significance of the New Strategy of Agricultural Development for Small Farmers; A Cross Sectional Study of Two Areas of Gujarat, Agro-Economic Research Centre, Sardar Patel University, Vallabh Vidyanagar, 1969.

18/ Wolf Ladejinsky, "Green Revolution in Bihar -- The Kosi Area; A Field Trip", Economic and Political Weekly, Vol. IV, No. 3, September 27, 1969.

Again, it is clear that the New Agricultural Strategy was not designed to reduce or eliminate the inherent inequities in the rural institutional structure, nor is it capable of doing so. Something much more in the way of development programs will be needed.

### Something More is Needed

That the New Agricultural Strategy did not have as its main goal the achievement of a more equitable distribution in rural India is clear. It is also clear that the New Agricultural Strategy, as defined, has only limited potentials for dealing with the major problem of inequable distribution of income. Therefore, something much more is needed.

Undoubtedly, the New Agricultural Strategy, in the areas in which it has had an impact, has contributed something to increasing employment and incomes of the small farmer and landless laborers. And, with further improvements in certain elements of the strategy, such as improving the adaptability of some high-yielding varieties of food grains, more can be accomplished. However, we have also seen that there are major restraints operating on the spread of the new technology. Among the more important of these are the improvement of water management -- achieving a higher degree of water control on farmers' fields through extension and improvement of irrigation facilities as well as making better use of surface water in rainfed areas

with limited potential for irrigation. These are complex, long-term, and costly activities involving programs outside the present scope of the New Agricultural Strategy.

When we talk about a more equitable level of income distribution we are really talking about reducing or eliminating the grinding poverty in rural India. How big and how widespread is this problem? A recent study by Bardhan<sup>19/</sup> estimates the number of people living in poverty in rural India in the late 1960's (1967-68) to be about 225 million. Poverty is defined as a monthly income of Rs. 15 per month per person in terms of 1960-61 prices. An even more disconcerting aspect of the results of the study is that the percentage of the total rural population living in poverty increased from 38 percent in 1960-61 to 53 percent in 1967-68. The magnitude of this change in the 1960's varied among States from virtually no change in percent of the rural population living in poverty in Orissa, Jammu and Kashmir, Andhra Pradesh and Kerala to a near tripling of the proportion in West Bengal -- from 22 percent in 1960-61 to 61 percent in 1967-68. The evidence strongly suggests that an already bad situation has been getting steadily worse. A recent study by

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<sup>19/</sup> Pranab Bardhan, "Green Revolution and Agricultural Labourers", Political and Economic Weekly, Vol V, Nos 29-31, Special No. July 1970; and Pranab Bardhan, "Green Revolution & Agricultural Labourers; A Correction", Political & Economic Weekly, Vol. V, No. 46, November 14, 1970.

Dandekar and Rath <sup>20/</sup> has quantified the magnitude of rural poverty (using the same income criteria as Bardhan) in India likely to prevail in the 1970's. They estimate that it will take resources valued at nearly Rs. 1,000 crores annually to eliminate poverty from rural India.

Several measures to deal with rural poverty and reducing the imbalances in rural income have been formulated as programs or proposed as possible program activities. Each of these directs its focus specifically to the problem of poverty and what can be done about it. Each also has other objectives related to increasing agricultural output and rural employment generally. However, the output objective is not given major weight in terms of national objectives; it is considered very important as a means of improving the economic well-being of certain segments of the rural poor who have opportunities to farm and expand their production.

Government has initiated a program to assist in developing the production and income potential of small farmers and to provide additional employment to landless laborers. This program will operate through the Small Farmers Development Agency with programs in some 46 districts

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<sup>20/</sup> V. M. Dandekar and Nilkantha Rath, Poverty in India, the Ford Foundation New Delhi, January 1970, and printed in The Economic and Political Weekly, Vol. VI, Nos. 1 & 2, January 1971



during the Fourth Plan, and similar administrative agencies will be in charge of programs for marginal farmers and landless laborers. <sup>21/</sup>

Assistance to increase production will be provided to potentially viable farmers (those who could earn a minimally acceptable level of income from farming). For those operating marginal farms and landless labor, assistance will be provided through fostering supplemental occupations and non-farm employment opportunities.

The estimated resources available during the Fourth Plan for the program of the Small Farmer Development Agency to help potentially viable farmers are as follows: Rs. 115 crores of direct financial support from the Plan; and Rs. 90 crores of short-term credit per annum and Rs. 170 crores of medium- and long-term credit during the Plan period from various financial institutions. The estimated resources available for generating supplemental occupations and non-farm employment for the very small farmers and landless labor is estimated to be Rs. 10 crores of short-term credit per annum and Rs. 30 crores of medium and long-term credit per annum.

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<sup>21/</sup> For a description of the program see B. Venkatappiah, Small Farmers Development Agency: Outline of a Programme of Action, paper presented at the 29th Annual Conference of the Indian Society of Agricultural Economics, Waltair, December 30, 1969; and Fourth Five Year Plan 1969-74, Planning Commission, Government of India, 1970.

While these programs are steps in the right direction, it must be recognized that they are modest efforts, indeed, compared with the magnitude of the employment and poverty problems in rural India as estimated by Dandekar and Rath.<sup>22/</sup> And, while increased agricultural production resulting from the New Agricultural Strategy and some measures of land reforms will help to increase employment opportunities for the rural poor, these efforts will not be nearly enough to deal with the poverty problem. Therefore, a major program of rural employment designed to permanently withdraw labor from agriculture is required. This labor could be used to generate capital required for more rapid development of agriculture and rural areas -- improvement and extension of a variety of irrigation measures, soil conservation, rural roads, marketing and storage facilities, etc.<sup>23/</sup> In this way, the issues of employment and production are directly joined.

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<sup>22/</sup> V. M. Dandekar and Nilkantha Rath, op. cit.

<sup>23/</sup> This approach is by no means new. See Martin E. Abel, "Agriculture in India in the 1970's", Political and Economic Weekly, Review of Agriculture, Vol. V, No.13, March 1970, for references to earlier writings on the subject.

### Conclusions

The New Agricultural Strategy has been quite successful in achieving what it was designed to do; namely, achieve a rapid increase in total food grain production. It now seems somewhat unjust to criticise this approach for not bringing the benefits of the "Green Revolution" to certain areas of the country and classes of rural people when, in fact, it was not a major objective of the programs. Rather, attention should be focused directly on the problems of income distribution and poverty in rural India and what is required to bring about significant improvement in these problem areas. Care should be taken not to undermine the technological basis for increasing agricultural production in the push to achieve a better distribution of income. As it may turn out, programs for alleviating rural poverty also can be highly supportive of spreading the benefits of the New Agricultural Strategy and increasing agricultural production.