

# STUDY ON THE TRENDS IN YIELD OF RICE AND WHEAT IN INDIA DURING THE FIRST THREE FIVE YEAR PLANS

by

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## 1. INTRODUCTION

Panse (1959) had examined the trends in yields of rice and wheat from 1946-47 to 1955-56 with the object of making a critical comparison of average yields of these crops during the first five year plan period, 1951-52 to 1955-56 with the average for the immediate preceding period of five years, 1946-1947 to 1950-51. The study was extended by Panse (1964) to cover the second plan period 1956-57 to 1960-61.

An attempt has been made in this paper to further extend the study with a view to finding out whether and to what extent the first three five year plans have made their impact on the yield rates of rice and wheat in different states and in the country as a whole.

## 2. MATERIAL AND METHODS

In order to make valid comparisons between the yield rates in various periods, it is absolutely necessary to maintain geographical comparability. Thus the yield data for this study were confined to an identical coverage of districts, divisions and states for the period of 20 years, 1946-47 to 1965-66. In the present study the results are presented according to new political boundaries after the States Reorganisation had taken place in 1956. Table 1 gives the list of states and divisions for which yield rates of rice and wheat have been analysed under this study. The yield data required for the present study were extracted from the various reports of the Directorate of Economics and Statistics, Ministry of Agriculture. The methodology developed by Panse (1959 and 1964) has been used in the present investigation.

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TABLE 1

List of States and divisions for which yield data on rice and wheat are included in the study

<i>State</i>	<i>Rice</i>	<i>Wheat</i>
Andhra Pradesh	1. Coastal 2. Rayalseema	— —
Assam	1. Plains	—
Bihar	1. Patna 2. Tirhut 3. Bhagalpur 4. Chota Nagpur	1. Patna 2. Tirhut 3. Bhagalpur
Gujarat	1. Baroda	1. Baroda
Madhya Pradesh	1. Raipur 2. Jabalpur 3. Bilaspur	1. Jabalpur 2. Raipur 3. Bhopal 4. Indore 5. Bilaspur
Maharashtra	1. Bombay 2. Nagpur	1. Bombay 2. Poona 3. Nagpur
Tamil Nadu	1. Carnatic 2. Central 3. South	—
Mysore	1. Mysore 2. Belgaum	1. Belgaum
Punjab	—	1. Ambala 2. Jullundur
Uttar Pradesh	1. Meerut 2. Rohilkhand 3. Allahabad 4. Varanasi 5. Gorakhpur 6. Lucknow 7. Faizabad	1. Meerut 2. Rohilkhand 3. Allahabad 4. Varanasi 5. Gorakhpur 6. Lucknow 7. Faizabad 8. Agra 9. Jhansi
West Bengal	1. Burdwan 2. Presidency	—
Kerala	1. Malabar	

## 3. RESULTS AND DISCUSSION

The results of statistical analysis of yield rates of rice and wheat are discussed separately.

3.1. *Statistical Analysis of Rice Yields*

Following Panse (1964), the statistical analysis of yield data of rice was undertaken. The variation between four sets of five years as well as the variation between first and pre-plan, between second and first plans and between third and second plans were tested against (i) the variation representing interaction between individual years within periods and divisions [component (e)] and (ii) the variation between individual years within each five year period [component (b)].

The results of rice yields revealed that except in the case of West Bengal, the variation in yield between the four five year periods was significant in all the states when tested against component (e), indicating thereby that the differences in the yield rates of five year periods were real and had not arisen from random seasonal fluctuations in annual yields in different divisions of the state. The comparison in yields between first and pre-plan, between second and first plans, and between third and second plans when tested against component (e) gave significant results in all the three comparisons only for Andhra Pradesh and Tamil Nadu states. Amongst other states, Bihar, Madhya Pradesh and Uttar Pradesh revealed significant comparisons between second and first plans and between third and second plans, while in the case of Mysore the comparison between second and first plans alone was significant.

In order to find out whether the influence of plan effort on yield is significant or not after the annual variation due to weather and other uncontrolled factors in the yield level of the state as a whole had been allowed for, the variation in yields between the four five-year periods was tested against component (b) [which was generally much larger than the component (e)]. The differences were found to be significant in case of Andhra Pradesh, Tamil Nadu, Mysore, Uttar Pradesh and Kerala States. However, when comparisons in yields between first and pre-plan, between second and first plans and between third and second plans were tested against component (b), none of the states gave significant results for all the three comparisons. Tamil Nadu state revealed significant comparisons between the first plan, and pre-plan, and between second and first plans, while Andhra Pradesh and Mysore gave significant results in the comparisons between first plan and pre-plan and between second and first plans respectively. None of the states indicated significant results in the comparison between third and second plans. This indicates that the impact of plan efforts in the third five year plan was not adequate enough to raise the yield level of rice in any state to an extent where it could be detected as significant after allowing for the

annual variation due to climate and other uncontrolled factors expected in the state as a whole. Bad weather conditions for three successive years, 1961-62 to 1963-64 may partly be responsible for this. However, this point needs a further careful examination with the help of relevant data on important meteorological factors.

The variation representing interaction between four five year periods and divisions were found to be significant in case of Bihar, Tamil Nadu, Uttar Pradesh and West Bengal states indicating thereby differential response of individual divisions in these states to plan efforts.

The quinquennial average yields of rice in different states and the country as a whole for the pre-plan, first plan, second plan and third plan along with the relevant differences between them and the corresponding standard errors of the differences are set out in Table 2. It may be seen from the table that at All-India level the increase in yield rates of rice in first plan as compared to pre-plan, second plan as compared to first plan and third plan as compared to second plan were 45, 90 and 20 kg/ha. These increases when expressed as percentages over the corresponding control quinquennia worked out to be 5.3, 10.2 and 2.0.

The states of Andhra Pradesh, Maharashtra, Tamil Nadu and Kerala contributed significantly to the increased yield in first plan as compared to pre-plan. The state average yields in these cases had increased by 166, 120, 161 and 255 kg/ha and these when expressed as percentage increases over the control period gave results between 12.9 and 26.3.

The states which contributed mainly to increase yields in second plan as compared to first plan were Andhra Pradesh, Madhya Pradesh and Tamil Nadu where the increases in the average yields were 116, 334 and 177 kg/ha respectively. The increase in yield rates of Bihar and Uttar Pradesh though small, being 68 & 69 kg/ha were statistically significant.

The position is not happy in case of increase in yield rates of rice in the third plan as compared to the second plan. Out of the major rice growing states of Andhra Pradesh, Tamil Nadu, Mysore and Kerala, only Tamil Nadu had shown a significant increase of 143 kg/ha which itself is not as high as the corresponding increases of 161 kg/ha and 178 kg/ha during the first plan and second plan periods. On the other hand, Andhra Pradesh, Assam, Maharashtra and Madhya Pradesh had recorded decrease in their yield rates during the third plan as compared to the second plan. However, the depressions in yield rates were statistically significant in case of Madhya Pradesh and Andhra Pradesh only. As stated earlier, this may be partly due to bad weather conditions over a continuous period of three years, 1961-62 to 1963-64. It, therefore, needs further detailed examination with the help of relevant meteorological data.

TABLE 2  
 Quinquennial average (q/ha) of rice in different States for Pre, 1st, 2nd & 3rd Five Year Plans

State	P. Plan	F. Plan	S. Plan	T. Plan	Difference between			S E. of difference
					F. Plan & P. Plan	S. Plan & F. Plan	T. Plan and S. Plan	
1. Assam	10.43	10.53	10.57	9.74	0.10	0.04	(-)0.83	0.44
2. Andhra Pradesh	11.59	13.25	14.40	13.38	1.66	1.15	(-)1.02	0.34
3. Bihar	6.77	7.02	7.70	8.57	0.25	0.68	0.87	0.21
4. Gujarat	6.91	5.72	7.71	8.33	(-)1.19	1.99	0.62	1.58
5. Maharashtra	9.26	10.46	10.91	10.52	1.20	0.45	(-)0.39	0.45
6. Madhya Pradesh	5.01	5.12	8.64	7.19	0.11	3.34	(-)1.27	0.23
7. Tamil Nadu	9.87	11.48	13.26	14.69	1.61	1.78	1.43	0.28
8. Mysore	9.56	9.50	11.72	12.10	(-)0.06	2.22	0.38	0.95
9. Uttar Pradesh	5.75	5.39	6.08	7.03	(-)0.36	0.69	0.95	0.23
10. West Bengal	9.33	10.33	10.49	10.88	1.00	0.16	0.39	0.40
11. Kerala	9.68	12.23	12.03	13.83	2.55	(-)0.20	1.80	1.13
12. Combined (All India)	8.32	8.77	9.67	9.87	0.45	0.90	0.20	0.12

Note. P. Plan stands for pre-plan period 1946-47 to 1950-51  
 F. Plan stands for first plan period 1951-52 to 1955-56

S. Plan stands for second plan period 1956-57 to 1960-61  
 T. Plan stands for third plan period 1961-62 to 1965-66

### 3.2. *Statistical Analysis of Wheat Yields*

The method of statistical analysis followed for rice yields was also adopted for wheat yields. The variation in yields amongst the four five-year periods was significant in all the states when tested against component (e). A break-up of this comparison into three components viz., between first plan and pre-plan, between second and first plans and between third and second plans revealed that Madhya Pradesh is the only state which exhibited real differences in yield rates as distinct from random seasonal fluctuations in annual yields in different divisions of the state. While Punjab and Uttar Pradesh revealed real differences in yield rates for the two comparisons, between first plan and pre-plan and between third and second plans, the difference between the yield rates of third and second plan periods for Bihar could attain the level of significance.

For almost all the states, the component (b) was found to be very high as compared to component (e). Thus for a more rigorous comparison the variation amongst the yield rates of plans was tested against component (b). In none of the states, the impact of plan efforts in the second five-year plan was found to be adequate enough to raise the yield rate of wheat to an extent where it could be detected as significant after allowing for the annual variation due to weather and other uncontrolled factors expected in the state as a whole. However, the increase in yield rate was significant in case of Mysore for the first plan (as compared to pre-plan) and for Punjab and Gujarat during the third plan (as compared to second plan).

The quinquennial averages of wheat yields in different states for the pre-plan, first plan, second plan and third plan along with the differences between them and the corresponding standard errors for the differences are presented in Table 3.

At All-India level the increase in the yield rates of wheat were 80 and 72 kg/ha for the first plan over the pre-plan and third plan over the second plan respectively, whereas practically no increase was recorded in the comparison between second and first plans. The increase in yield rates during the first and third plans when expressed as percentages over corresponding control periods were of the order of 11.7 and 9.5 respectively.

All the states except Bihar and Gujarat contributed towards the increase in yield rate of wheat in first plan over the pre-plan. The increase in yield rates of these states varied between 54 kg/ha and 126 kg/ha.

The comparison of yield rates of wheat in the third plan with those in the second plan revealed significant increases in the yield in the states of Gujarat, Punjab, Uttar Pradesh and Bihar. The increase in yield rates of these states varied between 83 kg/ha and 203 kg/ha.

TABLE 3

Quinquennial averages q/ha of wheat in different States for Pre, 1st, 2nd and 3rd Five Year Plans

State	P. plan	F. plan	S. plan	T. plan	Difference between			S.E. of difference
					F. plan and P. plan	S. plan and F. plan	T. plan and S. plan	
1. Bihar	5.49	5.96	5.52	6.74	0.47	(- )0.44	1.22	0.31
2. Gujarat	3.49	3.92	3.28	5.31	0.43	(- )0.64	2.03	0.62
3. Madhya Pradesh	4.52	5.78	5.49	5.67	1.26	(- )0.29	0.18	0.20
4. Maharashtra	2.67	3.70	3.89	4.32	1.03	0.19	0.43	0.23
5. Mysore	1.42	2.45	2.47	2.95	1.03	0.02	0.48	0.41
6. Punjab	9.83	10.37	10.29	12.08	0.54	(- )0.08	1.79	0.27
7. Uttar Pradesh	7.42	8.63	8.34	9.17	1.21	(- )0.29	0.83	0.19
8. Combined (All India)	6.76	7.56	7.57	8.29	0.80	0.01	0.72	0.11

Note. P. Plan stands for pre-plan period, 1946-47 to 1950-51

F. Plan ,, ,, first ,, 1951-52 to 1955-56

S. Plan ,, ,, second ,, 1956-57 to 1960-61

T. Plan ,, ,, third ,, 1961-62 to 1965-66

In contrast to first and third plans, there was no increase in the yield of wheat in any state during the second plan. The depressions in the yield rates in all the states as given in Table 3 were not statistically significant. The situation is somewhat unhappy in the sense that after an all round increase in the yield rates of wheat during the first plan there had been no increase at all during the second plan in any state. Panse (1964) had explained that widespread rust epidemic on the wheat crop in India during 1946-47 which continued to show some effect during the next two years was mainly responsible for this situation. The apparent increase in yield rates in the first plan in almost all the states was merely the result of recovery from rust epidemic that occurred during the pre-plan period.

#### SUMMARY

In the present study, the trends in yield rates of rice and wheat have been studied over a period of twenty years, 1946-47 to 1965-66 with the objective of finding out the impact of the first three Five Year Plans on yield rates of these crops in important states growing these crops and in the country as a whole.

The results of statistical analysis showed that at All-India level the yields per hectare of rice in first, second and third plans were higher by 5.3, 10.2 and 2.0 per cent than the yields in the corresponding control quinquennia. Tamil Nadu, was the only state which showed a steady increase in yield per hectare of rice during all the three plans. Next to Tamil Nadu, Andhra Pradesh recorded significant increase in yield rates during the first and second plan periods. In contrast to these, some of the states like Assam, Maharashtra, Madhya Pradesh and Andhra Pradesh had recorded some decrease in the yield rates during the third plan, though these decreases were found to be statistically significant in case of Madhya Pradesh and Andhra Pradesh.

Unlike rice, plan efforts had very little impact on the yield per hectare of wheat. At all-India level the increase in yield rates of wheat in the first and third plans were 80 and 72 kg/ha respectively, while practically no increase in yield was recorded in the second plan. The apparent increase in yield rates of wheat in the first plan in most of the states appeared to be the result of recovery from the rust epidemic of 1946-47, the effect of which continued during the next two years. The states of Gujarat, Punjab and Uttar Pradesh had contributed significantly to increase in the yield rates during the third plan.



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