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RAPPORTEUR'S REPORT
ON
REGIONAL VARIATIONS IN AGRICULTURAL DEVELOPMENT
AND PRODUCTIVITY

Rapporteur : PROFESSOR V. M. DANDEKAR*

There are altogether 19 papers submitted on the subject of Regional Variations in Agricultural Development and Productivity. Seven of these addressed themselves to the problem at an all-India level. The remaining twelve confined the discussion to particular States.

Though there are other ramifications of the subject, in the light of the papers submitted, we might define its scope rather narrowly as under :

- A. By agricultural productivity we shall understand yields per acre of different crops and agricultural development shall comprise, among other things, increases achieved in agricultural productivity.
- B. We shall be interested in assessing the extent of regional variation in agricultural productivity and in the rates of increases recently achieved in the same.
- C. We would like to know the reasons for such regional variation.

While assessing the regional variation in agricultural productivity and in the rates of increases achieved in the same, the following problems arise :

- (i) Which data to use ?
- (ii) Which particular year or years to use for comparing productivity in different regions ?
- (iii) Which period to use for comparing increase in agricultural productivity achieved in different regions ?

We might examine the methods adopted in the several papers in these respects. We shall first consider the first group of papers, namely, those dealing the problems at the all-India level.

Evidently, the most appropriate data to use are those from 'Area, production and average yield per acre of principal crops in India 1949-50 to 1957-58' and the 'Agricultural Situation in India 1960' both issued by the Economic and Statistical Adviser to the Government of India, Ministry of Food and Agriculture. Shri T. Maitra and Mrs. Bina Roy have used these data in their paper. Shri P. S. Sharma

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refers to "the weighted average per acre productivity (1955-58)" and "productivity indices for rice and wheat." Apparently, Shri Sharma has worked out these indices for each district. In point of fact, Shri Sharma does not attempt to assess the regional variation in agricultural productivity or agricultural development. Thus, as for the data, the most appropriate data to use seem to be those obtainable from the relevant publications of the Economic and Statistical Adviser, Ministry of Food and Agriculture. Shri Maitra and Mrs. Bina Roy have rightly made use of these data. They have examined these data at the State-level. The value of their work shall be greatly enhanced if they are able, in future, to examine the same at the district level.

The next important question is to decide which particular year or years to use for comparing agricultural productivity in different regions. Whichever year one might use, it is affected by seasonal fluctuations differently in different regions. The same problem arises while comparing the increases in productivity achieved in different regions. If the increases in productivity are estimated by a direct comparison of productivities in any two years, the comparison is affected by the choice of the two years. In the light of these difficulties, we might examine the methods adopted in the papers under consideration.

There is the method adopted by Shri Maitra and Mrs. Bina Roy. They use the data for the period 1950-51 to 1959-60 and fit a linear trend to the annual data. That gives rates of increase in the productivity over the decade. Agricultural development in different States is compared on this basis. The fitted trend also gives trend values for any years. These are computed for the two end years. Variation in productivity in different States is examined on this basis. The advantage of this method is that it makes effective use of the available data over the whole period while at the same time secures comparisons free from annual fluctuations. Though the authors do not explicitly demonstrate it, it is to be presumed that the linear trend gives a satisfactory fit to the data. Incidentally, the authors could also have indicated whether, in the light of the annual fluctuations to which the yields are liable, the increases achieved over the period were statistically significant.

Let us briefly examine the principal results. According to Shri Maitra and Mrs. Bina Roy, the all-India average yield of rice varied from an estimated 644 lbs. per acre in 1950-51 to an estimated 831 lbs. in 1959-60, both estimates being free from annual fluctuations. In 1950-51, the yield of rice varied from about 450 lbs. in Uttar Pradesh and Bihar to nearly 900 lbs. in Madras and Andhra Pradesh. The States might be broadly grouped as follows :

Andhra Pradesh (897), Madras (883), Mysore (874), Kerala (773) ;

Jammu and Kashmir (884), Punjab (723), Rajasthan (622), Bombay (598) ;

West Bengal (910), Assam (834) ;

Orissa (505), Madhya Pradesh (501), Uttar Pradesh (453), Bihar (452).

Ten years later, in 1959-60, when the all-India average was 831 lbs. per acre, the State-averages varied from 489 in Orissa to 1,375 in Madras. But in 1959-60,

Orissa was alone so low and the next best was U.P. (604). The above groups of States then appeared as under :

Madras (1375), Mysore (1206), Kerala (1166), Andhra Pradesh (1143) ;

Jammu and Kashmir (1045), Bombay (979), Rajasthan (964), Punjab (892) ;

West Bengal (889), Assam (874) ;

Madhya Pradesh (725), Bihar (693), Uttar Pradesh (604), Orissa (489).

Thus the regional pattern broadly remained the same though within each group, the States changed places due to different increases achieved during the ten years. In terms of the actual average yield in 1950-51, the all-India average increased by nearly 35 per cent over the ten years. However, in different States, the rate of increase varied from zero, in fact a small decline in West Bengal and Orissa, to over 70 per cent in Bihar, Bombay and Madhya Pradesh. The rates of increase in different regions were as under :

Madras (61.7), Kerala (51.9), Mysore (42.0), Andhra Pradesh (30.8),

Bombay (71.3), Rajasthan (51.5), Punjab (28.9), Jammu and Kashmir (20.8),

Bihar (72.7), Madhya Pradesh (72.4), Uttar Pradesh (36.3),

Assam (5.6), West Bengal (-2.7), Orissa (-3.7).

Thus while the variations in productivity both in the initial and the final years show broad regional pattern, the rates of increases achieved during the period do not seem to conform to any regional pattern. Largest increases have been obtained in such widely placed areas as Bombay, Madhya Pradesh and Bihar and to a smaller extent in Madras. The generally high-yielding southern States show within themselves rates of increases ranging from 30.8 in Andhra Pradesh to 61.7 in the adjoining Madras. The Eastern region comprising Assam, West Bengal and Orissa show practically no progress though within themselves the productivity differs as widely as 489 in Orissa against 889 in the adjoining Bengal and while the neighbouring States of Bihar and Madhya Pradesh show some of the highest rates of increases. It seems, therefore, that while variations in agricultural productivity may be explained, in good part, as due to the regional differences in soil and climatic conditions together with the extent of irrigation facilities, the variations in the rates of development during the last decade cannot be so easily explained.

As for wheat, the striking fact is the very small progress achieved in comparison with the progress achieved in rice. Again, according to Shri Maitra and Mrs. Bina Roy, the all-India average yield of wheat increased from 620 lbs. in 1950-51 to 674 lbs. in 1959-60 thus showing barely 10 per cent increase over a decade. The State averages vary widely from 200 lbs. in Mysore to over 800 or 900 lbs. in Punjab. But the Mysore figures as given by Shri Maitra and Mrs. Bina Roy appear too low. On the other hand, the West Bengal average of 711 lbs.

in 1950-51 appears to be too high and in fact in 1959-60 it drops to 499 lbs. The remaining important wheat growing States rank as follows :

	Estimated yield in 1950-51 (lbs. per acre)	Estimated yield in 1959-60 (lbs. per acre)
Punjab	848	941
Uttar Pradesh	732	712
Rajasthan	695	834
Jammu and Kashmir	730	545
Bihar	454	501
Madhya Pradesh	408	579
Bombay	420	439

Here again, it is possible to identify a compact wheat area with comparatively high yields and outlying areas with considerably low yields. However, the rates of increases achieved during the year, do not conform to the same regional pattern though probably a somewhat different regional pattern is discernible. Any considerable increases have been achieved only in two States, namely, Madhya Pradesh (41.9), and Rajasthan (28.6), Punjab and Bihar show smaller increases of 13 or 14 per cent. Uttar Pradesh and Jammu and Kashmir indicate a decline. Bombay shows a small increase of 5.3 per cent which might not be even statistically significant.

Shri Maitra and Mrs. Bina Roy offer similar analysis for nine commodities or groups of commodities, namely, rice, wheat, other cereals, total cereals, pulses, total foodgrains, sugarcane, oilseeds, cotton and jute. It might be mentioned that in view of the fact that the all-India average yields of rice, wheat, other cereals and pulses are very different from one another, and that acreages under these crops are very different in different States, a comparison between different States on the basis of composite groups such as 'all cereals' or 'all foodgrains' is not very meaningful. Such comparisons are made by other authors also. We shall refer to this point later. The illustrative results above have been quoted from the paper by Shri Maitra and Mrs. Bina Roy because that is the only paper where the data are systematically presented.

We might next consider the causes underlying the regional variations both in agricultural productivity and agricultural development. Shri Maitra and Mrs. Bina Roy make no comments on this point.

Shri P. S. Sharma makes a more systematic effort to combine several factors which might affect agricultural productivity and agricultural development and demarcate regions according to, what he calls, their 'potential level of agricultural development'. He chooses the following indicators for assessing the potential level of agricultural development : (i) Gross area irrigated as percentage of gross area sown ; (ii) Average annual rainfall ; (iii) Extent of cultivated area ; (iv) Intensity of cropping ; (v) Soil characteristics, topography, etc. ; (vi) Gross area sown per capita. He examines these indicators for the 300 and odd districts and combines them suitably to give each district a rank according to its agricultural

development potential. The manner in which he combines the several indicators to obtain a single composite index is interesting but it would be too long here either to describe or to examine it critically. On the basis of his composite index, he groups the districts into 13 regions and described their major features. Incidentally, the use of the word 'resource potential' appears to be not appropriate. For instance, if one of the indicators is 'existing' gross area irrigated as percentage of gross sown area, in what sense does it indicate irrigation 'potential'?

We might next turn to papers examining the problem at the State-level. There are two papers dealing with the situation in Uttar Pradesh. The paper by Dr. J. S. Garg compares and contrasts two districts, Gorakhpur in eastern Uttar Pradesh and Meerut in western Uttar Pradesh. The data on the following factors, for the period 1951-52 to 1960-61, are examined: total cropped area; gross irrigated area; production of all foodgrains taken together; and finally average yields per acre of rice, wheat and sugarcane. The most distinguishing factor between the two districts is the extent of irrigation—over 50 per cent of the cropped area in Meerut as against only about 25 per cent in Gorakhpur is irrigated. The effect of this is evident in the yields of both rice and wheat but not so much of sugarcane. It would have been worthwhile pursuing the point by examining the yields for rice and wheat separately for irrigated and unirrigated crops. Also, though the data for ten years are given, there is no attempt to work out and compare the rates of agricultural development in the two districts. Incidentally in Table I, the author compares the district figures as percentages of the State totals. This is not at all relevant and makes the comparison unnecessarily indirect and obscure.

The second paper by Dr. S. P. Dhondyal, attempts to study "the role of farm management in increasing the level of farm earnings and narrowing down the regional variations in farm productivity." The importance of farm management for increasing the level of farm earnings is of course admitted. That one of the purposes and objectives of good farm management is also to reduce the regional variations in farm productivity appears to be a new concept. A hypothesis is developed that 'the regional variations in agricultural development and productivity are also influenced by the variations in the level of farm management ability of cultivators' and by means of farm management data for 50 cultivators in Jhansi district, 10 cultivators in Gorakhpur district and 10 cultivators in Aligarh district, the hypothesis is claimed to have been substantiated. From this it is presumed that it follows that 'management as input factor can diminish the regional differences.' Without going into the question whether the farm management data have in fact substantiated the hypothesis that management is an important factor influencing farm income, it must be pointed out that the conclusion that therefore good farm management will lead to smaller regional differences does not follow. The object of good farm management is optimum utilisation of the available resources. Therefore, if two regions differ in their resource endowment, good farm management would inevitably bring out the difference.

There is one paper relating to Rajasthan. Shri D. C. Sancheti discusses the productivity of principal cereals in dry area of Rajasthan. He demonstrates effectively the importance of irrigation in Rajasthan. In the first instance, he points out that in comparison with other States, Rajasthan stands very high in respect of wheat and barley both of which are *rabi* crops and which in Rajasthan

can be grown by irrigation. On the other hand, Rajasthan stands very low in respect of *kharif* crops which are grown on rainfall. The same point is emphasised by comparing the dry areas of Rajasthan with the whole State where again it is evident that the dry areas of the State compare unfavourably only in respect of the *kharif* crops. Another point he makes is by comparing the ranking of Rajasthan for two years, namely, 1956-57 and 1959-60. He notes that even in respect of *kharif* cereals, Rajasthan has improved its ranking between the two years. If this is not accidental to the particular years being compared it deserves looking into more closely. Certainly, the improvement is not on account of extension of irrigation to *kharif* crops.

There is one paper relating to West Bengal, and another comparing West Bengal with Orissa. In their paper, Sarvashri A. Chatterji and P. Maitreya compare two northern districts of West Dinajpur and Maldha with two southern districts of 24-Parganas and Burdwan in West Bengal. They compare for these districts areas under different crops, yields per acre of rice and jute, areas under irrigation, use of modern implements, etc. Most of the data are presented for a period of years from 1950-51 to 1957-58. The analysis by these authors suffers from their pre-conception that the difference between the northern and the southern districts is on account of the fact that while the southern districts are close to the area of industrial development, the northern districts are far away from the same. Nevertheless, the authors have done well to emphasise differences in agricultural productivity and development between the northern and southern regions of West Bengal. A closer analysis of the same and a more systematic search for the underlying causes would be worthwhile.

Sarvashri Madan Gopal Ghosh and N. Bandyopadhyay attempt a comparative study of agricultural development in West Bengal and Orissa. They have examined for a period of 8 years from 1951-52 to 1958-59, the development expenditure on agriculture in both the States, both in absolute terms and as per acre of cropped area and apparently attempt to relate the same to growth in irrigated area, net sown area and cropped area as per cent of net sown area. In spite of it all, on the crucial question of yield per acre, both the States fail to show any progress over the period and the series reveal nothing but annual fluctuations of good and bad seasons. On this point, the two States seem to go together and there is little to distinguish between the two. In the latter part of their paper, the authors have appended a great deal of district-wise data for only West Bengal.*

Finally, there is one paper relating to Madras, two papers relating to Andhra Pradesh and one paper relating to Maharashtra. Sarvashri Rupchand and Ravi Varma have examined the agricultural progress in the different districts of Madras State between 1949-50 and 1959-60 by means of a direct comparison of the two terminal years. The basic data are derived from the Annual Season and Crop Reports. The year 1959-60 was chosen because that was the latest year for which such data were available. Also, in that year, "the condition of the crops was generally satisfactory in all districts of the State excepting parts of Chingleput, South Arcot, North Arcot, Salem, Coimbatore and Tiruchirapalli districts." Thus in 6 out of the 11 districts in the State, the conditions were not satisfactory.

* These data are not published in this Number.

Nevertheless, the authors suppose that “ the year 1959-60 may be considered to be a normal year.” Even this was not true of the base year 1949-50. This was chosen “ as the base year since many of the targets of agricultural production in the plans are in fact set forth with reference to 1949-50 ” though admittedly “ the year 1949-50 was below the normal.” Besides, in between these two years, there occurred considerable improvements in the statistical basis of the data —the reporting areas increased and the estimates of production came to be increasingly based on crop-cutting experiments. Results such as the following inevitably follow : Chingleput district shows an exceptionally high rate of increase, over 16 per cent per annum, mainly because the yields in the base year 1949-50, in this district, were exceptionally low. Ramanathapuram also shows a rather high rate of increase, nearly 9 per cent per annum, because the district was formerly under *Zamindari* and *Inamdari* tenure and the reporting of data was formerly far from complete.

The authors have sought to correct this shortcoming of their analysis by instituting comparisons between trienniums ending in 1959-60 and in 1956-57. The purpose of these comparisons is not clear and their interpolation in the main two-point comparison is confusing. In any case, it does not remedy the main defect of non-comparability of data over the period. The only way to remedy this situation is to link each year with the previous year on the basis of comparable part between the two years and later to chain such links to give an index of production over the period. Such an index is now available on the all-India basis. The authors should have attempted to prepare similar production indices for the districts and examined the relative progress in different districts on that basis.

There are a few points of analysis on which the authors are not clear. In Table III, the gross value of product per acre and in Table IV, the gross value of product per capita are given. It is to be hoped that in both the cases,—the area and population figures are used appropriate to each year.

The authors have tried to examine the factors associated with progress in agricultural production. But they have not been able more than to list them, and indicate changes in them in different districts between the two years.

Sarvashri M. D. Gopalakrishnan and T. Ramakrishna Rao have examined the regional variations in agricultural productivity in Andhra Pradesh. On the basis of the data from Season and Crop Report for the year 1959-60 they have compared the districts for (i) gross value of agricultural product per acre and (ii) gross value of agricultural output per head of agricultural population. The value of output per acre for the whole State is Rs. 203.6 and it varies between different districts from under Rs. 100 in Mehboobnagar and Adilabad to over Rs. 400 in East and West Godavari and Srikakulam. In fact, on the basis of value of gross output per acre, the districts group themselves very neatly into the three well-defined regions of the State, namely, Coastal districts, Ceded districts and Telangana. The average values of gross output per acre in the three regions are Rs. 360.8, Rs. 187.6 and Rs. 135.4. Thus even in their average, the coastal districts have value of per acre output twice as much as for the rest of the State. Later when the authors examine the yields per acre of different districts, they observe that the low productivity regions, as judged by the value of gross output per acre are not necessarily districts which show low yields. The reason is obvious.

When districts which are predominantly jowar growing are compared with districts which are predominantly rice growing, districts with even comparatively high yields of jowar do not compare favourably with districts with even relatively low rice yields for the simple reason that rice as compared to jowar is both high yielding and high valued. The authors, of course, understand this point. However, their formulation of the same is a little confusing. They observe "Variations in yields between crops alone do not account for large variation noticed in per acre output values between low and high productivity districts. Cropping pattern is found to be more significant for explanation of this variation." The simple point is that cropping patterns are different in different districts and different crops differ in their average yields and values. These two circumstances put together lead to the kind of results obtained when productivity is defined in terms of average value of agricultural output per acre for all crops put together.

The other comparison which the authors make, namely, on the basis of average value of output per head of agricultural population also gives interesting results. The most important result is that though the districts still remain grouped broadly into the three regions, the Coastal districts come much closer to the Ceded districts and the Telangana districts also improve their position. The average value of output per head in the three regions are : Rs. 254.2, Rs. 240.9 and Rs. 192.1. In fact, the whole range of variations between the districts appears very much smaller on the basis of value of output per head rather than on the basis of value of output per acre.

While discussing these results, the authors observe : "There can be two sets of definitions of low income regions : (1) Regions with low per capita income despite high productivity resources and (2) Regions with low per capita income due to low resource productivity." This may be so. However, this is carrying the discussion beyond the purview of the subject under discussion, namely, variations in agricultural productivity. From this point of view, the importance of the results achieved by comparing the districts on the basis of their value of output per head lies in a possible interpretation that one might put on them, namely, that part of the variations in productivity might be due to varying inputs of human labour. Probably this is only another way of saying that rice requires greater inputs of human labour and is a relatively high yielding crop. Therefore in the absence of differential labour inputs in the cultivation of the same crop, it would be difficult to attribute any independent effect to the labour inputs.

All these considerations indeed emphasise the difficulties of comparing productivities in different regions on the basis of composite comparisons taking all crops together. When different regions show basically different cropping patterns and when different crops utilise widely varying inputs of several factors and give widely varying yields, there is probably no other way except to compare the agricultural productivities of different regions on the basis of single crop comparisons.

The authors have also attempted to examine a number of factors as possibly affecting the productivity as measured by value of output per acre. The factors included are : rainfall, current and old fallow, irrigation, literacy, proportion of population depending on non-agricultural occupations, intensity of cropping, proportion of the value of output derived from crops other than food crops,

proportion of area under crops other than foodgrains and fodder and finally density of agricultural population per acre. The choice of these factors appears to be both peculiar and ambitious. However, in the nature of things, the factors chosen are such that not more than sundry comments could be made. Finally, they attempt a multiple regression of the value of output per acre on the two most promising independent variables, namely, percentage of irrigated area and percentage of area under foodgrains and fodder. The multiple correlation coefficient (0.723) is found to be not statistically significant. At the same time, the authors point out that the individual correlations, presumably of the output with the two independent variables, were 0.95 and 0.70. These results appear rather contradictory. In any case, with a correlation as high as 0.95, irrigation ought to be judged an important factor affecting value of output per acre.

Shri D. Radhakrishna has studied the regional productivities of agricultural inputs in two distinctly different regions of West Godavari district in Andhra Pradesh. One region is a canal irrigated area mainly growing paddy in two seasons. The other is a dry region growing important commercial crops such as Virginia tobacco and chillies, besides a certain amount of irrigated and unirrigated paddy and jowar. The study is based on the farm management data for 70 farms in the first region and 37 farms in the second region for the three-year period 1957-60. The method is to fit Cobb-Douglas production function to these data and compare the marginal productivities of the several factors. The results are as follows :

	Marginal Value Product (Rs.)	
	Region I	Region II
Land (in acres)	108.90	62.49
Human labour (man days)	0.62	1.22
Bullock labour (pair days)	1.82	
Bullock unit labour (pair and man days) ..		6.05
Fixed investment (Rs.)	0.13	0.05
Working expenses (Rs.)	2.91	1.55

Thus, land, fixed investment and working expenses show better marginal returns in the first region (irrigated) while human and bullock labour show higher marginal returns in the second region (dry-tobacco). The conclusion therefore is that 'the crop pattern will have its effect on productivities.'

The author has not been able to pursue his mathematical statistical analysis by means of a more meaningful analysis in real terms. Instead, he is content with giving the general excuses for not pursuing it further. For instance, after comparing the labour productivities in the two regions, he observes : "Another point which is to be borne in mind is that in peasant farming the earnings of labour alone cannot be studied as its opportunity cost is very low but the combined earnings of land, labour and management should be taken into account." Why then use production functions ?

The fact is that the author like many of his colleagues in the field has refused to take pains to find meaning for his statistical results. The author has not been also very careful in the definitions of his variables though he himself emphasises

that 'a careful classification of various input factors is an important point to be borne in mind when production function analysis is attempted.' Thus 'fixed investment' is defined to include "investment on major implements and machinery, irrigation wells, digging of field channels, improvements in bunding, tobacco curing barns and their machinery, storage sheds, etc." It seems that the author is making a confusion between 'fixed assets' and 'investment in fixed assets during a year.' As a factor of production, evidently the former and not the latter is relevant. However if, in fact, the author means by 'fixed investment' 'fixed assets' one wonders how existing irrigation wells, field channels, bunds, etc., were evaluated. Secondly, evidently, 'fixed investment' does not 'include plough cattle.' Nevertheless, later the author makes the following remark : "Similarly fixed capital in the form of machinery, plough cattle and tobacco curing barns, etc." One wonders, therefore, whether plough cattle were in fact included in 'fixed investment.' If they were, and if the value of land has not been included in 'fixed investment,' plough cattle would certainly form a large part of the 'fixed investment' and in that case the rather divergent marginal returns to bullock labour and fixed investment would require closer examination. Incidentally, the average size of the farms in the two regions is also not clear. In the opening remarks on the first page, they are given to be 5.70 acres in Region I and 10.30 acres in Region II. On the other hand, the geometric means of factor 'land in acres' are given to be 3.02 acres in Region I and 3.47 acres in Region II.

The author obviously knows the statistical techniques and meaning of the production function analysis. Nevertheless a couple of remarks throw certain doubts. On the basis that the regression coefficient for the several factors add up close to unity, he concludes that the farm business operates under constant returns to scale and then adds : "It may however be noted that the factor which ultimately determines the nature of the returns to scale and the size of the enterprise, viz., management labour, is not taken into account in this study." Of course it was not. But because it was not taken into account in the study, it does not mean that the management did not function. Therefore, if in fact the management had obtained increasing returns to scale, the same could be seen in the returns to all the factors included in the analysis.

Again, the author observes as follows : "It may be hoped that the regression analysis followed here gives in a certain sense the best estimate of dependent variable if the independent variables are known. It is not designed to give the best estimates of the regression coefficients but they are very useful for broad policy purposes." And this is followed by the following : "It may also be noted here that production functions estimated on the basis of cross-section data restricts the use of the results as a guide to policy. To derive any useful conclusions, time series should be utilised particularly because agriculture is highly seasonal in character." All this is very confusing. The technical limitations of the Cobb-Douglas production functions applied to the kind of data under discussion are now fairly well understood. There is no reason to cause confusion by passing loose remarks of this kind. It would be better to concentrate attention on a closer examination of the raw data in the light of the results obtained and seek for them meaning in real terms.

Finally, we have the paper by Sarvashri S. G. Sapre and V. D. Deshpande. They have examined the inter-district variations in agricultural efficiency in Maha-

rastra State. The focus of their paper is, however, on the method they have employed in order to construct a composite productivity index taking all crops together. Their method is to rank the districts according to per acre yield of each crop and then average the several ranks of each district to obtain what they call an Average Ranking Coefficient. While doing this, rather than taking a simple average of the several ranks for each district, they take a weighted average, the weights for the several ranks being in proportion to the areas under the respective crops in the district. Thus by reducing the yields data for each crop to ranks, the differences in the average yields of different crops are eliminated. The ranks are then weighted in proportion to the area under the respective crops and averaged. A more sensitive index, following the same procedure, would be to express the district yields of each crop as percentage of the State average and then obtain a weighted average of the same with weights proportional to the crop acreages. Conversion to ranks is quite unnecessary and makes the index unreasonably insensitive. Incidentally, the authors mention that the ranks for each crop are based on quinquennial averages. They do not, however, mention the specific period covered.

It is noteworthy that in spite of the attempt to construct an average ranking coefficient, the authors have not been able to get over the advantage which rice growing areas enjoy over other areas in any composite comparison. Here, the two districts Thana and Kolaba ranking first and second in their rice yields, are exclusively rice growing. Therefore they do not appear in comparisons on the basis of other crops. The result is that their ranks on the basis of rice, also become their average ranking coefficients and they appear to be the most productive districts in the State. It is not, therefore, surprising that when later the authors try to relate, by means of a multiple regression, their average ranking coefficient to three factors, namely, normal average rainfall, proportion of irrigated land and soil fertility, they find that rainfall alone is an important factor causing variations in productivity and that, in particular, neither irrigation nor soil fertility are of any great significance.

The several papers have highlighted the importance of undertaking a thorough examination of the available data on yields of different crops on a district basis. This should be done to assess the existing variation in yields and also in the increases achieved in them over the past decade. It is also clear that the analysis must be done for each crop separately. In order to discuss the underlying causes, extent of irrigation in each district for each crop will have to be ascertained and at the same time agronomic data such as seed varieties used, use of fertilizers and possible differences in other cultivation practices will have to be collected and closely examined.

SUMMARY OF GROUP DISCUSSION

Chairman : PROFESSOR V. M. DANDEKAR

The Rapporteur in his report on the papers submitted on this subject had observed that in the light of papers submitted, the scope of the subject might be defined as under :

- A. By agricultural productivity, we should understand 'yields per acre of different crops' and agricultural development should mean, among other things, increases in yields per acre achieved over a period.
- B. We should be interested in assessing the extent of regional variations in yields per acre of different crops and in the rates of increases recently achieved in the same.
- C. We would like to know the reasons for such regional variation.

It was pointed out that in order that we might define the scope of the subject in this or any other manner, we should first be clear about the purpose of a study of regional variations in agricultural productivity. After a certain amount of exchange of ideas and views, it was generally agreed that the purpose of such a study was to ascertain the causes of variation and to examine whether they are such that low-productivity regions might profit from the experience of the high-productivity regions.

With this purpose in view, there was a fairly full discussion on how we might define the term 'agricultural productivity.' One definition was of course, 'yields per acre of different crops.' Apropos such a definition, some of the members pointed out that land was only one factor in agricultural productivity and that there were other factors like human labour and other inputs which were equally responsible for agricultural productivity, and that therefore it was arbitrary to attribute productivity entirely to land and express it per acre of land. It was suggested, for instance, that productivity could also be measured in terms of per unit of labour and different regions compared on that basis. After a full discussion of this point, it was generally agreed that though there are several factors responsible for agricultural product, for purposes of comparing productivity in different regions, it would be convenient and operationally meaningful if the comparison is based on a per acre productivity while variations in respect of other factor inputs might be viewed as possible causes of variations in productivity and might be examined as such.

In the same context, another point was raised. The productivity in different regions has of course to be examined for each crop separately. However, after having done that would it be possible to prepare certain composite index of productivity so that productivity of agriculture in different regions might be compared for agriculture as a whole? It was agreed that for purposes of examining whether the experience of one region could be profitably transferred to another region, the comparison on a single crop basis alone was useful. Nevertheless, it was felt that if certain composite indices of productivity and development could be prepared, they might be useful for purposes of a general classification of ranking of different regions. It was agreed that such indices to be useful must reveal something more than the fact that certain crops are high yielding and that certain regions have proportionately larger areas under high yield crops. The proposed composite indices for productivity and development have to be examined from this point of view.

Another point in the same context was whether agricultural development should include increased production due to extension of cultivated area. It was

agreed that because possibility of extension of area under cultivation was not the same in different regions, a comparison between different regions would not be very useful. Nevertheless, it was felt that to the extent increase of cultivated area has been achieved by increased double cropping, it should be included as an important aspect of agricultural development.

The discussion then turned to the quality and nature of available data. It was emphasised that all data used in the studies of regional variation must as far as possible be uniform in its method of collection and estimation, and that to the extent that because of the continuous improvement being done in the quality of data, the data in different regions and in different years, are not uniform, they will have to be appropriately adjusted and corrected for such elements of non-comparability. It was also agreed that to ensure comparability over time and space, such adjustments should be made by or under the direction of one central authority. The Group took notice, with great satisfaction, of the steps taken in this direction by the Directorate of Economics and Statistics, Ministry of Food and Agriculture, and the co-operation extended to it by the State Statistical Bureaus or other relevant statistical agencies of State Governments.

In the afternoon session, the discussion returned to the possibility of constructing composite indices of productivity by means of which overall productivity in different regions could be compared. It was obvious that two different indices were needed—one to compare productivity in a given year and other to compare overall agricultural development. It was agreed that in order to construct the first index, the regional average yields per acre of a crop should first be expressed as percentages of national average and then such percentage positions in respect of different crops for each region should be combined into a weighted average, the weights being the area under different crops in that region. The Group took notice of a study earlier made on this basis and published in *Agricultural Situation in India*.¹ In order to construct a composite index for purposes of comparing agricultural development, we should first obtain for each region the value of agricultural product per acre for each year and after deflating the series for change in the level of prices over this period, compute a rate of agricultural development for that region. This rate has the advantage that it will also take into account any shifts from one crop to another crop. Also, if the value of product is expressed per acre of net area sown, it will also take into account development due to extension of double cropping. It was generally agreed that a comparison on the basis of such an index of agricultural development would be very useful.

There was a brief discussion regarding the statistical methods used for computing rates of growth. It was agreed that in the present state of our data, simple statistical formulae implying either a constant absolute growth or constant proportionate growth might be employed.

Finally the Group discussed possible causes of the existing regional variations. It was agreed that extent of irrigation and use of fertilizers might explain a good part of the existing variations. It was also thought that it should be possible to systematically assemble and examine data on these two points. Regarding other factors which might be responsible for such variations such as dif-

1. P. S. Sharma, "A Zonal Study of Soils, Crop Productivity and Pressure of Agricultural Workers," *Agricultural Situation in India*, Annual Number, Vol. XVII, No. 5, pp. 491-503.

ferences in variations, cultural practices and such other qualitative factors, it was felt that there was urgent need to collect and systematically record such data. It was reported that such data are presently being recorded in the crop-cultivation experiments conducted for crop-estimation as ancillary information but that probably these data are at present not being tabulated, analysed or made much use of. The value of such data and the need to undertake systematic analysis of the same, and publication of the result regularly was emphasised.

Besides these technological factors, the institutional factors such as land tenure, and agricultural credit were pointed out as relevant considerations. For instance, it was observed that tenancy conditions in West Bengal might be mainly responsible for the lack of progress there. Pressure of population in land leading to lack of surplus which could be ploughed back for purposes of development was another important factor mentioned. While these factors might be partly responsible for the existing variations, it was strongly felt that the existing variations in agricultural productivity and development are so large and its pattern so conflicting, that it would need a close and thorough examination. It was hoped that Society would be able to organize a systematic and concerted investigation into this problem.