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Density of Population, Unemployment, Percentage of Workers and Per Capita Income in Kerala

Introduction

KERALA. stands foremost among the States in India in respect of density of population. In the world, the State is surpassed in density only by the predominantly urban nations of Hongkong and Singapore. Kerala is largely an agricultural rural tract with only 16% of population residing in urban areas as per 1971 census. Kerala has the peculiar problem of chronic unemployment and low income. How far these affect each other is not known. The statistical exercise attempted here is based on the information available for the dis* tricts of Kerala. It is hoped that the results are of general application to states and countries similarly placed as Kerala in respect of demographic and agro-socio-economic conditions.

Though there is a paucity of up-to-date information on some of the items like unemployment, we believe that the trends and inter-relationships here identified hold good even to-day. The conclusions should, however, be taken as tentative pending a more elaborate exercise based on more recent data to

*The opinions expressed herein are the author's own and are Dot necessarily those of the Department in which he is working.

be provided by the surveys on unemployment and agricultural census in the state.

This paper seeks to analyse the available information on density, unemployment, percentage of workers and district income by multiple correlation analysis. Relations that exist among productivity of land, productivity of workers and land have also been analysed. It may be remarked here that, for the calculation of land per worker, all the workers have been considered here.

2. Density of Population

: In 1961 the density of population per square kilometer in the state as a whole was 435. Alleppey District with 958 persons per sq. km. topped the list, followed by Trivandrum District, where the state capital is situated, with 798 persons. At the bottom of the ladder was Idukki district, the newly formed hill District with 116 persons per sq. km. and just above was Palghat District with 311 persons per sq. km. In 1971 the density increased to 549 per sq. km. in the State. Alleppey District with 1128 persons per sq. km. continued to hold the first rank and Idukki district with 150 persons per sq. km. was at the bottom.

2.1 Per Capita Cultivated Land. While analysing the density of population, it will be interesting to examine the per capita availability of land. In 1975-76 nearly 60% of the 38.85 lakh hectares of land in Kerala was cultivable including net area sown (21.89 hectares) and fallow and cultivable waste lands (1.73 lakh hectares). The per capita land (in cents) in each of the 11 districts of Kerala in *75-76 is shown in the following table, along with the density of population, estimate of mid-year population in 1975-76 and the cultivated land, compared to the state as a whole and the Indian Union.

The situation even in India as a whole is pathetic with only 125 cents of land per person of which only 72 cents could be cultivated and 57 cents was under cultivation as per provisional estimates of 1974-75. In Kerala, in 1975-76, the per capita cultivated land was 23 cents. Among the districts, Trivandrum, Alleppey, Trichur, Ernakulam and Quilon had less than 20 cents. Even the total land per person was 20 cents in Alleppey district, 22 cents in Trivandrum district and 24 in Ernakulam district. In terms of total land, only the Idukki district had an average comparable to the one for the country as a whole.

TABLE 1—PER CAPITA LAND IN CENTS IN THE DISTRICTS OF KERALA

Sl. No.	Name of District	Density per sq. km. as per '71 census	Estimated mid-year population in '75-76 (in lakhs)	Percapita land in 1975-76 (cents)		
				Geographical area	Cultivated area	Cultivable area
1.	Trivandrum	1003	24.55	22	15	15
2.	Quilon	522	26.74	44	19	20
3.	Alleppey	1128	22.93	20	16	16
4.	Kottayam	701	16.70	32	27	28
5.	Idukki	150	8.82	144	44	54
6.	Ernakulam	910	24.49	24	18	19
7.	Trichur	702	23.77	31	17	18
8.	Palghat	383	18 66	58	29	33
9.	Malappuram	510	21.09	43	25	28
10.	Kozhikode	565	24.13	38	24	25
11.	Cannanore	415	27.51	51	31	34
	Kerala State	547	239.37	40	23	24
	India	178	6027.10	125	57	72

Naturally, the death of per capita land is accounted for by the dearth of land as well as the profusion of population. The incessant increase of population causes the shrinkage of the per capitaland to still lower magnitudes. A family of 6 persons may have on an average 2 acres and 40 cents of land in Kerala of which the arable land will be 1 acre and 38 cents.

3. Work Participation

The following table gives the district-wise distribution of workers and the population percentage as per 1971 census.

The work participation rate is 29%. Cannanore, Idukki and Palghat district* have a higher rate. The rate is lower in districts with high density of population. Pearson's coefficient of correlation between density and work participation

TABLE 2—NO. OF WORKERS AND POPULATION PERCENTAGE AS PER 1971 CENSUS IN THE DISTRICTS OF KERALA

Sl. No.	*Name of District*	*No. of workers (lakhs)*	*Population percentage*
1	*2*	*3*	*4*
1.	Trivandrum	6.28	28.58
2.	Quilon	6.90	28.61
3.	Alleppey	5.98	28.15
4.	Kottayam	4.21	27.33
5.	Idukki	2.65	34.62
6.	Ernakulam	6.21	28.71
7.	Trichur	6.04	28.35
8.	Palghat	6.05	35.89
9.	Malappuram	5.03	27.08
10.	Kozhikode	5.67	26.92
11.	Cannanore	7.15	30.21
	Kerala State	62.16	29.12

rate worked out to −0.6 which is significant, showing the high inverse correlation between the two.

It may be noted here that the census figures on workers in 1971 quoted above consist of only those whose primary occupation was work. If, however, the secondary occupation of non-workers is considered the difference in work participation will be only to the extent of 0.5%; for individual districts the difference is not significantly large.

Considering the industrial sector separately, it is seen that nearly 17½% of workers are engaged in manufacturing, household industries and construction. Ernakulam, Quilon and Trichur districts show a higher percentage.

3.1 Unemployment and Under-Employment. In the context of work participa-

tion, unemployment merits attention. If the total population is broken up into employed, unemployed and those not in the labour force, the unemployed would comprise persons in the labour force who are willing to work and are available for work, whether they are currently seeking work or not.

There is a dearth of current data on unemployment in the state. There are, however, estimates showing that nearly 10 lakh persons were unemployed in 1975. There was a survey on unemployment conducted in 1965 which yielded very reliable estimates of unemployment. At that time, nearly 5.5 lakh persons were unemployed.

Even among the employed, some are employed only for a part of the time and are willing to take up additional work. They have been termed as 'under-employed' on the basis of the time utilised for work. There are other concepts of under-employment based on qualification, wages received etc., which are more difficult to measure. Hence, the time concept is adopted in most surveys.

The estimates of unemployment and under-employment as obtained from the 1965 survey in respect of the 9 districts which existed then, are shown below.

TABLE 3—ESTIMATES OF UNEMPLOYMENT AND UNDEREMPLOYMENT

Sl. No.	*Name of District*	*Percentage of unemployed*	*Percentage of underemployed*
1	*2*	*3*	*4*
1.	Trivandrum	14.73	21.27
2.	Quilon	10.14	33.43
3.	Alleppey	10.41	41.93
4.	Kottayam	6.80	10.83
5.	Ernakulam	8.35	24.81
6.	Trichur	11.98	26.56
7.	Palghat	6.98	21.68
8.	Kozhikode	8.96	24.58
9.	Cannanore	3.17	20.54
	Kerala State	9.10	22.97

The estimated population of the state in 1965 was 180 lakhs; 5.5 lakh persons were unemployed and 13.8 lakh persons were under-employed, giving 9% and 23% of the labour force, respectively.

Unemployment is highest in the Trivandrum and lowest in the Cannanore district. The Trichur, Alleppey and Quilon districts have relatively more unemployed as compared to the state as a whole. Of underemployed persons, the percentage is highest in the Alleppey followed by the Quilon and Trichur districts. The Kottayam district has the lowest percentage of under-employed. In the Trivandrum district, where unemployment percentage is the highest, the underemployed is relatively less than the state average. This is perhaps due to the fact that a substantial part of the workers in the district are employed, in Government and Semi-Governmental institutions.

4. Per Capita Income

The state income increased from Rs. 4,32,22 lakhs in 1960-61 to Rs. 7,04,89 lakhs in 1974-75 in constant 1960-61 prices and to Rs. 19,79,31 lakhs in current prices. These show respectively 63% and 358% increase over the 1960-61 figure. In per capita income, the corresponding increases have been 19% and 233%, respectively. Obviously the difference in the increases between total income and per capita income over the 14 year period is due to the increase in population during the period. Similarly the differences between the figures in constant prices and current prices are due to rise in prices.

Estimates of district income at current prices have been worked out by the Bureau of Economics and Statistics for the years 1970-71 to 1975-76. The per capita income figures for the years 1970-71 and 1975-76 are shown below.

In the districts of Kottayam, Quilon and Idukki where per capita income in 1975-76 is above Rs. 1,000/-; there has been an increase of 68-70% during the 5 years, thereby giving an annual average increase of nearly 14%. Trivandrum also shows a similar increase in per capita terms. In the Alleppey district, where the density of population is the highest, the increase is only 52% in 5 years. In the Trichur and Malabar districts, except Palghat, the increase is 43-45%. Thus, the density of population is not perhaps the crucial variable affecting per capita district income.

TABLE 4—PER CAPITA DISTRICT INCOME AT CURRENT PRICES FOR 1970-71 AND 1975-76

Sl. No.	Name of District	Per capita income (Rs.) in 1970-71	Per capita income (Rs.) in 1975-76 (provisional)	Percentage increase
1.	Trivandrum	550	926	68
2.	Quilon	634	1081	70
3.	Alleppey	564	859	52
4.	Kottayam	670	1125	68
5.	Idukki	623	1052	69
6.	Ernakulam	641	990	54
7.	Trichur	550	790	44
8.	Palghat	559	896	60
9.	Malappuram	486	695	43
10.	Kozhikode	616	890	44
11.	Cannanore	560	813	45
	Kerala State	586	909	55

5. Relations that Exist among Per Capita Cultivated land, Unemployment and Underemployment

Analysis by simple and multiple correlation has been attempted here. The coefficients of correlation between each pair of the threev ariables, namely per capita cultivated land (x_1), percentage of unemployed persons in the population (x_2), and the percentage of under-employed persons in the population (x_3) in the 9 districts of Kerala in '65 are shown below :

	x_1	x_2	x_3
x_1	1.0000	—1.8329	—0.6839
x_2	—0.8329	1.0000	0.6239
x_3	—0.6839	0.6239	1.0000

The following table gives the percentage of variation explained by the variables (R^2), the multiple correlation coefficient (R), the partial regression coefficients, the variance ratio (F) for sum of squares due to regression, and the regression equation, considering the two variables per capita cultivated land (x_1) and percentage of un-employed persons in the population (x_2) as dependent variables in turn.

DEPENDENT VARIABLES

x_1		x_2	
R^2	1.23 = 0.7379	R^2	2.13 = 0.6992
R_1	1.23 = 0.8590	R	2.13 = 0.8362
Percentage contribution		Percentage contribution	
of	x_2 = 69.4	of	x_1 = 69.4
,,	x_3 = 4.4	,,	x_3 = 0.5
Partial regression coefficients :			
b	12.3 = −1.43	b	23.1 = −.0284
b	13.2 = −16.10	b	21.3 = −33.47
F	= 8.44	F	= 6.97
Regression equation		*Regression equation*	
$x_1 = .4386 - .0143\ x_2 - .0016\ x_3$		$x_2 = 18.06 - .0284\ x_3 - 35.47\ x_1$	

The values of F are statistically significant.

It is seen that a large part of the variation is explained by the independent variables considered. 69% of the variation in per capita land is explained by the percentage of unemployed persons in the districts. Per capita land explains a similar part of the variation in unemployment. It is clear that pressure on land is a significant factor in the situation of unemployment and under-employment.

The implication of this analysis in the context of the increasing population in the state and absence of industrial pursuits of a substantial nature is obvious. There is an urgent need to stabilise the population, while steps should be taken to find employment for the people in industrial enterprises in the state and for population re-distribution by suitable policies of migration and the like so as to reduce the pressure on land.

6. Relations that Exist among Per Capita Income and the Other Variables

Increase in per capita income is often considered as an index of the economic development of a country or a region, though it ignores the distributional aspect. It is clear that per capita income can be higher if there are some people with very high incomes in the population, even without any economic growth for the population as a whole. In states, like Kerala, where there are few persons with very high incomes, and where income disparities are comparatively smaller, the per capita income may show the actual state of affairs and can therefore be considered as an index of economic growth.

It is hypothesised that the following four variables are related : *(1)* Per capita income : x_1, (2) Per capita cultivated land : (x_2), (3) Percentage of industrial workers among all workers : x_3, and (4) The percentage of workers in the population : x_4. A correlation analysis for the four variables yields the following results :

	x_1	x_2	x_3	x_4
x_1	1.0000	0.2008	0.0252	0.1639
x_2	0.2008	1.0000	−0.7904	0.6481
x_3	0.0251	−0.7904	1.0000	−0.4360
x_4	0.1639	0.6481	−0.4360	1.0000

The correlation table shows very low values when x_1 is considered. Perhaps the variables which are correlated with the per capita income are not occurring in the group considered. We may, therefore, consider the variable x_2 taken as a dependent variable in the earlier analysis with unemployment and under-employment. A reference to the relations of other variables, including per capita income, with this variable is in order.

Considering the per capita cultivated land (x_2) as the dependent variable, the percentage variation explained by the other variables is 76.34; of this, percentage of industrial workers (x_3) accounts for 62.47%, percentage of workers in the population (x_4) for 11.37% and the per capita income for 2.50%. The *F*-ratio for the sum of squares due to regression is 7.53 which is statistically significant.

The partial regression coefficients of x_2 are : $b\ 23 = -1.04$, $b\ 24 = 0.97$,

b 21 = .0105 respectively on the variables x_3, x_4 and x_1 excluding the effects of other variables.

The regression equation is : $x_2 = 3.82 - 1.04\ x_3 + 0.97\ x_4 = .0105\ x_1$.

It is seen that per capita income has very little effect on per capita land, while the other two variables make appreciable contributions. Thus increasing the percentage of industrial workers and total work participation rates are beneficial to the economy. They may ward off the evil effects of the pressure of land.

The variables x_3 and x_4 are also not considered as dependent variables here as they do not have significant correlations with the other variables except with x_2, which has been considered as a dependent variable in the above analysis. However, x_3 and x_4 are inter-related by their very structure.

7. Relations among Productivity of Land, Productivity of Workers and Land Per Worker*

We may now focus attention on inter-relations among the transformed variables like the productivity of land, productivity of workers and land per worker. Productivity of land (y_1) has been worked out as the ratio of the per capita income (x_1) to per capita land (x_2). Productivity of worker (y_2) is shown by the ratio of per capita income (x_1) to percentage of workers in the population (x_4). Land per worker (y_3) has been obtained as the ratio of per capita land to percentage of workers. These roundabout definitions are specified here in order to derive the variables y_1, y_2 and y_3 from x_1, x_2, x_3 and x_4. The variables in question can very well be explained directly and the values can be obtained for each District from the original data. A point which is worth mentioning here is that y_1 is the total income of the District divided by the total land. The total income is derived from sources other than that of cultivating the land. This may seem to introduce some bias in the data. The main purpose in the present orientation arises from the dependence of the four variables x_1, x_2, x_3 and x_4 with each other which introduces some constraints in regression analysis. It may be noted here that stepwise regression removes the dependence of the independent variables by stages and has therefore been adopted in the analysis made in this paper.

*This analysis has been attempted at the instance of Professor Ayyangar, Professor of Economics, Osmania University, Hyderabad who presided over the session in which this paper was presented. The author expresses his deep sense of gratitude to Professor Ayyangar for his valuable suggestion.

The correlation table for the 3 variables y_1, y_2, and y_3 is given below :

	y_1	y_2	y_3
y_1	1.0000	0.5208	—0.8673
y_2	0.5208	1.0000	—0.0882
y_3	—0.8673	—0.0882	1.0000

All the correlation coefficients except that of y_2 on y_3 are large in the above table.

(*a*) y_1 AS DEPENDENT VARIABLE. Adopting step-wise regression analysis with y_1 as the dependent variable, it is seen that 95% of the variations in y_1 (income per unit of land) has been explained by the other variables. The multiple correlation coefficient is 0.975 which is very high. y_3 (land per worker) explains 75% of the variation in income per unit of land while productivity per worker explains 20%. It is natural to expect in agricultural economics that variation in land per worker explains a very large part of the variation in productivity per unit of land.

The regression line that is obtained on this basis is

$$y_1 = 43.21 + 1.20\, y_2 - 43.25\, y_3.$$

The *F*-ratio for sum of squares due to regression is 77.88, which is significant. It is noteworthy that the standard errors of the partial regression coefficients in the above equation are very low (4.57 and 0.21).

(*b*) y_2 AS DEPENDENT VARIABLE. Considering y_2 (Productivity per worker) as the dependent variable, it is seen that 80% of the variations in y_2 are explained by y_1 and y_3; of this, y_1 explains 27% and y_3, 53%. The land per worker has more say than income per unit of land in explaining productivity per worker. The multiple correlation coefficient is 0.897.

The regression line is $y_2 = -22.36 + 0.67y_1 + 31.84y_3$.

The *F*-ratio is 16.45 which is significant and the standard errors of the partial regression coefficients are .117 and 6.819 respectively.

(*c*) y_3 AS DEPENDENT VARIABLE. Here y_1 and y_2 together account for 93% of

the variations in y_3 of which y_1 accounts for 75%. This means that in the variations in land per worker, income per unit of land contributes to a very large extent. The multiple correlation coefficient is 0.966.

The regression line is $y_c = 0.898 - .019\ y_1 - .023\ y_t$.

The standard errors of the partial regression coefficients are .0013 and .0049 respectively.

The analysis has shown that the three variables are highly correlated with each other. It follows that, in order to increase the income per unit of land it is necessary to concentrate on the land per worker more than on the income per worker. This means that there is already high intensity of workers on land and the best way for economic growth is to reduce the pressure on land. The conclusion is also borne by the fact that more than half of the variation in the productivity per worker is explained by land per worker. Thus increasing land per worker would achieve both the improvement in his productivity as well as in the total income per unit of land. Land per worker is determined largely by the income accruing therefrom.

Pooling all these together, the necessity to reduce the pressure on land is obvious. As industrialisation is more productive than agriculture, this is perhaps one way of accelerating economic growth. As availability of land cannot be expanded in the state except to a small extent, the possibilities of out-migration and emigration will have to be explored. Increase of population in the future will actually go against productivity and economic growth and has to be contained at any cost.

8. **Limitations** of the Analysis

The usual limitations of multiple correlation analysis in explaining the relations among the variables can be pointed out here also. The relation can be non-linear and there need not be normality in the distribution of the variables. The analysis cannot be said to be complete as part of the variation is still unexplained. Perhaps, the distribution of land holdings may be a crucial variable and if this is introduced, all the other contributions may change. If the per capita land, employment and income by sectors are analysed together, a different type of relationship may emerge. It is hoped that a thorough analysis would be

undertaken when more information is available on unemployment and under-employment and when the report on the current agricultural census is finalised.

SOURCES OF DATA

1. Bureau of Economics and Statistics : *Statistics for Planning,* printed and published by the Superintendent of Government Presses, Trivandrum 1977.
2. Bureau of Economics and Statistics : *District Income of Kerala,* printed and published by the Superintendent of Government Presses, Trivandrum 1978.