IMPACT: International Journal of Research in Humanities, Arts and Literature (IMPACT: IJRHAL)
ISSN (P): 2347-4564; ISSN (E): 2321-8878
Vol. 7, Issue 1, Jan 2019, 253-258

THE IMPACT OF POPULATION CHANGE ON THE AGRICULTURAL SECTOR - A CASE STUDY OF THIRUVANANTHAPURAM DISTRICT, KERALA

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Received: 09 Jan 2019 **Accepted:** 17 Jan 2019 **Published:** 24 Jan 2019

ABSTRACT

The relationship between man and environment is ever changing. Initially, man depended on agriculture for his livelihood but with the change in time, the situation changed. The advent of new technologies changed the interest of people in the agricultural sector. Same scenario is visible in Thiruvananthapuram district. The study used data pertaining for forty years ie from 1971-72 to 2011-12 revealed that the district which had about 69.33 percent area devoted for agriculture during the 1971-72 period now owns 59.76 percent (2011-12) area under cultivation. On the other side area devoted to non-agricultural use increased from 6.36 percent (1971-72) to 15.66 percent (2011-12). Various factors lead to this situation, the mostimportant being the attraction towards the tertiary sector as it is more profitable and risk-free. On this note, the present study using various statistical techniques aims to find the degree of relation between changes inpopulation and its influence on the agricultural sector. The analysis supported the fact that, the increasing population had definitely affected the agricultural sector in the district. In the area where cultivation stillpersist, a shift in the crop preference is also visible.

KEYWORDS: *Demography, Agriculture, Statistical Techniques*

INTRODUCTION

The concept of the man-environment relationship changed through time with the development of human society and the dimension of the environment. At the beginning of the process of evolution of man and his society, physical elements of the planet earth like terrain, soil, water, climate, flora, and fauna formed man's environment. As man developed socially and economically with a technological background, he broadened his surroundings by creating his own environment through his design and skill to have provision for better food, shelter, access, and comfort. These factors brought about the variations that are currently seen on the earth surface and this was intensified with the growing population which increased the pressure on land and other resources.

Thiruvananthapuram, the southernmostdistrict which is the capital of Kerala state, has a rich cultural heritage. From the early days itself, it occupies an outstanding position with its essential natural resource base and many governmental and non-governmental institutions. This has caused an increase in the population concentration of the district. The population of the district increased from 21,98,606 persons (1971 census) to 33,01,427 persons as per 2011 census. The people engaged as

cultivators and agricultural laborers also decreased in the district. Cultivators decreased from 14.05 percent (1971-72) to 2.90 percent (2011-12) whereas agricultural laborers decreased from 29.85 percent (1971-72) to 6.05 percent (2011-12) (District Census Handbook, 2011).

Study Area

Thiruvananthapuram, the southernmost district of Kerala State lies between north latitudes 8° 17' 27" and 8° 51' 41" and east longitudes 76° 40' 25" and 77° 17' 06". The district ranks eleventh in the area among the districts of Kerala with an area of 2192 km^2. The district is bounded by Kottarakkara, Kollam and Pathanapuram Taluks of Kollam district on the north, Ambasamudram Taluk of Thirunelveli district on the east and Vilavancode Taluk of Kanyakumari district of Tamil Nadu on the south and southeast and Lakshadweep Sea on the west (District Census Handbook, Thiruvananthapuram, 2001) (Fig.1).

METHODOLOGY

The data used for the study include demographic and agricultural land use data. Population details pertaining to the years 1971 to 2011 were collected from census data published by the census department, Govt. of India. Agricultural data were taken from Agricultural Statistics published by the Economics and Statistics Department. Field visits were also incorporated. The collected data were grouped and twelve variables found influencing were selected for analysis.

Table 1 shows the variables taken for the analysis:

Table 1: Variables Used for the Statistical Analysis

Demographic variables	Total population
	Population Density (persons/sq.km.)
	Urban population
	Literacy rate
	Agriculture workers
	Non – agriculture workers
Agricultural variables	Area under paddy
	Area under seasonal crops
	Area under tree crops
	Area under tree crops
	Crop diversification
	Net sown area

The selected demographic and agricultural variables of the district were studied using statistical techniques. The nature of the relationship was assessed by simple regression analysis. The goodness of fit of the regression model was assessed by calculating the Coefficient of Determination (R^2). If the R^2 value of the constructed regression model is greater than 0.50, then that regression model is considered to be good. In the cases where a linear relationship exists, Karl Pearsons Coefficient of Correlation (r) was used for finding a degree of linear relationship between the variables. The correlation of coefficient can be interpreted as follows:

Table 2: Interpretation of the Coefficient of Correlation

R	Relationship
0.00 to 0.20	Negligible
0.20 to 0.40	Low
0.40 to 0.60	Moderate
0.60 to 0.80	Substantial
0.80 to 1.00	High to very high

RESULT AND DISCUSSION

On the basis of the correlation and regression analysis, various relationships between variables could be found out.

Relationship Between Population Growth With Other Demographic and Agricultural Variables

The comparison revealed that the district shows an increase in the non-agricultural workers (r = 0.941) and this indeed may have contributed to the increase in urban population (r = 0.855. There exits a high negative correlation of population growth with an area under paddy (-0.951) and net sown area (-0.802). Another variable literacy rate has a perfect positive correlation (r = 0.958) with the increasing population. Thus it can be assumed that the present residence is mainly interested in non-agricultural activities and the district is slowly becoming urbanized.

Table 3: Relationship between Population and Selected Variables in Thiruvananthapuram District 1971-2011

	Dependent Variable	z	Intercept	R^2	r
Total Population	Urban population	0.8822	$-2\ 10^6$	0.731	0.855
	Non – agricultural workers	0.8822	8320	0.887	0.941
	Literacy rate	$2\ 10^{-5}$	15.728	0.979	0.958
	Area under paddy	-0.0001	524.5	0.906	-0.951
	Net sown area	-0.0001	1800.4	0.643	-0.802

Source: Compiled by the Researcher

Relationship Between Net Sown Area and Selected Variables

Except for agricultural workers (R^2 = 0.420), all other variables showed a linear relationship with the net sown area.

Table 4: Relationship between Net Sown Areas with Selected Variables in Thiruvananthapuram District 1971-2011

	Dependent variable	Slope	Intercept	R^2	r
Net sown area	Area under paddy field	0.8431	-1056.3	0.759	0.899
	Area under tree crops	-264.7	505227	0.813	-0.901
	Area under seasonal crops	499.69	-630853	0.733	0.856
	Agriculture workers	-	-	0.42	-
	Crop Diversification	-0.0429	87.107	0.7	-0.836
	Urban popula-tion	-5871.2	910^6	0.861	-0.928

Source: Compiled by the Researcher

The table 4 reveals that high positive correlation exists with paddy (r = 0.899) and can be related with the changing agricultural scenario in which the area under paddy cultivation is considerably reduced due to the change in preference of paddy to other commercial crops. High to the very high negative correlation of net sown area is seen with an area under tree crops (r = -0.901). Thus it can be assumed that the majority of the available net sown area is now mainly under tree crops. Similar to the paddy cultivation, due to the increasing interest in plantation crops, an area devoted for other seasonal crops is also decreasing due to which high positive correlation (r = 0.856) exists between net sown area and area under seasonal crops. There also exists a high negative correlation between net sown area and crop diversification (r = -0.836). This is because, along with the reduction in the area under agricultural land, there is a reduction in the varieties of crops cultivated in the district. So with the increase in population (r = -0.802) (Table 3) and the increasing urban population (r = -0.928) (Table 4), the net sown area is continuously decreasing in the district.

Relationship between Area under Paddy and Selected Variables

The previous discussion showed that the varying interest of people has definitely affected the agricultural sector and in that the area devoted to paddy was seriously affected. The analysis revealed the deteriorating situation of this category of land use in the district.

Table 5: Relationship between area under Paddy and Selected Variables in Thiruvananthapuram District 1971-2011

	Dependent Variable	Slope	Intercept	R^2	r
Area under paddy	Population density	-2.7535	1706.4	0.906	-0.952
	Literacy rate	-0.1651	105.13	0.788	-0.887
	Agricultural workers	0.0005	42.762	0.666	0.816
	Area under operational holdings	73.633	83776	0.459	0.677
	Area under tree crops	-291.48	170316	0.923	-0.961

Source: Compiled by the Researcher

The area under paddy is negatively correlated with total population (r = -0.951) (Table 3) and also with population density (r = -0.952) (Table 5). This is due to the increased conversion of paddy field for other uses, because of change in preference and needs of the population. An area under paddy fields showed a high negative correlation (r = -0.887) with literacy rates which indicates that the increase in literacy is driving people away from agriculture. According to Gopinathan and Sundaresan (1990), between 1979 and 1989, 50 percent of farmers in Thiruvananthapuram discontinued rice cultivation; rice was primarily replaced by coconut followed by rubber. This finding can be supported by the high positive correlation of paddy area of the district with agriculture workers (r = 0.816) and with that of the area under operational holding (r = 0.677), which produces substantial correlation. The relation of paddy fields with an area under tree crops also shows a high negative correlation (r = -0.961). This can be due to the fact that, plantation crops can be cultivated in small land holdings with less number of laborers and yields better output and these merits make them preferable to the seasonal crops.

Thus the correlation and regression analysis were helpful in highlighting the major factors responsible for the variations in land use and the various socio-economic and demographic variables paving way for this change. The analysis revealed the following:

· Demographic factor influence the agricultural land use of the district.

· Urban population shows a notable increase in the district. The growth of this population group is very much related to the reduction in net sown area.

· The major causes identified for the reduction in area under paddy cultivation include increasing population and increasing literacy rate.

· The increase in population influences other aspects of cultivation whereby the seasonal crops are replaced by tree crops which can be concluded from the positive correlation of net sown area with seasonal crops and high negative correlation ofnet sown area with tree crops.

The analysis was useful in identifying the relation existing between selected land use and demographic variables in the district, which provided an idea about the situation existing in the district. The growing population, thereby increasing population density, increasing profit from commercial crops etc are the major causes identified for the overall changes in agriculture in the district.

CONCLUSIONS

The various socio-economic aspects of the population which seem to play an important role in the current makeup and future makeover of the district was given importance in the investigation. Analyzing the relation of these variables in spatial scenario provides an in-depth understanding of the real situation. The knowledge of these actions and forces are crucial in understanding, modeling and predicting environmental changes and also for managing and responding to such changes.

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