Spatial pattern of agriculture productivity of crops in southern zone of tamilnadu

C. ARUL KUMAR[1] AND G. MANIMANNAN[2]

[1]*ASSISTANT PROFESSOR, VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN, TIRUCHENGODE, NAMAKKAL, TAMILNADU, INDIA.*
[2]*ASSISTANT PROFESSOR,* DEPARTMENT OF STATISTICS, DRBCCC HINDU COLLEGE, *TAMILNADU, INDIA.*

Abstract : Agriculture continues to be the most predominant sector of Tamilnadu, as sixty percent of the population is engaged in Agriculture and allied activities for their livelihood. Agriculture productivity has been an important issue as the population continues to grow. The concept of Agriculture productivity has been measured by several scholars using different methods. In this research paper an attempt is made to identify the spatial pattern of Southern Agro Climatic Zone using Agriculture Productivity Index. This Zone consists of Madurai, Ramanathapuram, Sivagangai, Thoothukudi, Tirunelveli, Virudhunagar districts. The data was collected from secondary source of Department of Economics and Statistics, Tamilnadu during the year 2002-03 to 2011-12. The main objective of this research paper is to identify agriculture productivity index in the southern zone of Tamilnadu. Many familiar techniques are available to calculate the agriculture index, but the researcher used Enyedi's method. This method achieved more accuracy. The productivity index values were calculated and discriminated the productivity regions and are labeled as Elevated Productivity Region (EPR), Standard Productivity Region (SPR) and Short Productivity Region (STPR).

Keywords: Agriculture Productivity Index, Enyedi's method, Southern Zone, Geographical Information System and Major Crops is Tamilnadu.

1.0 Introduction

Agriculture forms the backbone of the Indian economy and despite concerted industrialization in the last few decades; agriculture occupies a place of pride. Being the largest industry in the country, agriculture provides employment to around 60% the total workforce in the country. (Y.D. Pujari, 2011) Agriculture was the predominant sector of Indian economy at the time of Independence from colonial rule in 1947. The share of agriculture in total gross domestic product at that time was above 55 per cent, and about 70 per cent of workforce was engaged in agriculture sector. Indian agriculture has witnessed wide variations in growth performance during last few decades after independence. The variability is particularly pronounced due to the subsistence nature of farming in India and the sector's heavy dependence on monsoon and other climatic parameters (Ramesh Chand and Shinoj Parappurathu, 2011). Agriculture is still a vital sector and plays an important role in the overall socio-economic development of the nation.

Tamil Nadu has all along been one of the States with a Creditable Performance in Agricultural Production. Agriculture keeps on to be the most prime sector of the State economy, as 70 percent of the population is engaged in Agriculture and allied activities for their livelihood. The State has as an area of 1.3 Lakh sq.km with a gross cropped area of around 63 lakh hactare. (www.agritech.tnau.ac.in).

Now anywhere in Tamilnadu the land value is increasing day by day. This is main reason for Agriculture lands are mostly occupied by real estate business people and government in the major cities and corporation for industrialization and urbanization purpose (Arulkumar C and

Manimannan G, 2014). Due to raising the land value the current generations are not taking agriculture as job or self employment. The farmers sell their land to real estate and prefer to work on daily wages. The main reason for the troubles of the farmers due to un-compensation prices for farmers' produce, uncertainty in the monsoon, no stable prices for the produce, like cash crops, oil seeds, etc., , especially they depending on Cauvery water. Cauvery water problem stuck between the two states of Tamilnadu and Karnataka also played a crucial role in the agricultural production. In Poland Low profitability in agriculture along with high prices of land for urban uses shifts the agriculturists' interest in favour of selling of land for non-agriculture purpose (Wasillewski, Krukowski, 2002). Similar trend was observed in many parts of Tamilandu where decreasing profitability in agriculture and increasing price of lands for non-agricultural purpose have encouraged farmers to sell lands for non-agricultural uses. Now the cultivable land area has a decreasing trend.

In this background, the researcher has made an attempt to find the agriculture productivity performance of Southern Agro Climatic Zone of Tamilnadu using Agriculture Productivity Index and classify the regions based on API (Agriculture Productivity indices) for the period of 2003-2012.

Agricultural productivity is a topic of multi dimensional in nature. The economic development depends on the net agricultural productivity of an area. Agricultural Productivity is one of the important indicators to assess the performance of agriculture in any area (Pawan kumar salaria, 2014) Different methods have been introduced by many scholars from different disciplines like economics, geography etc. to measure the agricultural productivity. Agricultural Productivity has been defined by several researchers with reference to their own view and discipline (Lal Mervi Dharmasiri, 2010). Agriculture productivity may be defined as the ratio of index of local agricultural output to the index of total input used in farm production (Shafi M,1983). Singh and Dhillon (2002) suggested that the yield per unit should be considered to indicate agriculture productivity. Agriculture productivity has been computed worldwide by many researchers using different methods. Shymal Dutta (2012) analyzed agricultural efficiency and backwardness of agricultural production in Hugli district of west bengal, he applied agricultural efficiency index proposed by S.S Bhatia, he classified the productivity regions as very high efficiency, high efficiency, moderate and low efficiency regions. Sule, B.M. and Barakade, A.J. (2014) examined the impact of irrigation of agricultural productivity in the solapur district; kendal's ranking coefficient method was applied and observed that the spatial pattern of irrigation and agricultural productivity widely unequal from village to village in the study area. Further, a simple ranking coefficient technique of calculation of agricultural production was used first by Stamp (1960) for 20 countries of the world and later on by Shafi (1960) for the state of Utter Pradesh in India.

2.0 STUDY AREA
Tamilnadu has been classified into seven Agro Climatic Zones based on soil characteristics, rainfall distribution, irrigation pattern, cropping pattern and other social characteristics. For the present study Southern Agro Climatic zone of Tamilnadu chosen. This zone comprises the districts of Madurai, Ramanathapuram, Sivaganaga, Thooukudi, Virudhunagar andTirunelveli. This zone constitutes an area of 36,655 sq.kms. The total area under

cultivation is 16, 50,250 hectares which is 45 per cent of the total area. This zone is prone to frequent drought. The annual normal rainfall is 816.5mm. It covers the rivers of Vaigai, Sitrar, Thamraparani, Numbiar, Pachaiyar, Kludar, Arjunar, Kodumudiyaar, Manimuthar, Periyar and Vaigai.

The dams used by this zone are Periyar, Vaigai, Manjalar and Bhabanasam. The patterns of irrigation are well irrigation, canal irrigation, irrigation by dams and by lakes. *(www.*planningcommission.gov.in)

3.0 DATA BASE AND METHODOLOGY

In the present research paper an attempt is made to identify the agriculture productivity index in the regions of Southern Agro Climatic zone of Tamilnadu for the period of 2002-03 to 2011-12. . The present work is based on secondary sources of data. The required data for analysis is collected from Department of Economics and Statistics, Chennai and Statistical Hand book of Tamil Nadu. In this study, 15 major crops grown in this zone were selected carefully. These crops were grouped into four categories (a) Cereal crops to include paddy, cholam, cumbu, ragi, and maize (b) pulses include bengalgram, redgram, blackgram, greengram and horsegram (c) oil seeds include groundnut, gingelly and coconut (d) cash crops include sugarcane and tapioca. After taken a review of several methods, Enyedi's method was chosen to compute crop productivity index because of its accuracy.

$$\Pr oductivity\ Index = \frac{Y}{Y_n} \div \frac{T}{T_n} * 100$$

Where Y – Production of the selected crops in an unit area i.e., district,

Y_n – Total Production of the selected crops at the entire zone,

T – Area under selected crops in unit area,

T_n – Total cropped area in the entire zone.

Using the above formula the productivity index values were calculated for the districts of Southern zone during the study period and discriminated the productivity regions and are labeled as Elevated Productivity Region (EPR), Standard Productivity Region (SPR) and Short Productivity Region (SPR).

In order to classify the productivity regions of Southern Zone on the basis of productivity indices, the statistical method quartiles were applied. Quartiles are three points that divide a range of data set into four equal parts. The first quartile is the number below which lies the 25 percent of the bottom data. The second quartile divides the range in the middle and has 50 percent of the data below it. The third quartile has 75 percent of the data below it and the top 25 percent of the data above it. The algorithm for classification procedure is as follows

Step 1: The index value which lies below in the first quartile was named as Short Productivity Region (STPR).

Step 2: The districts which have the index value lies between first and third quartiles is marked as Standard Productivity Region (SPR)

Step 3: The districts index values which lies above the third quartile is named Elevated Productivity Region (EPR). These results of index values are shown in the Table and in the spatial pattern Map in the following section.

4.0 RESULTS AND DISCUSSIONS

In this research paper an attempt is made to identify the agriculture productivity regions of Southern Agro Climatic zone of Tamil Nadu during the year 2003 to 2012. At first Enyedi's method was applied to calculate the agriculture crop productivity index values and quartiles methods are used to classify the regions as EPR, SPR and STPR. The classification of regions based on productivity indices are discussed below.

Initially Agriculture productivity indices was calculated for various crops in the districts of Southern Agro climatic zone during the study period, but only the sample results for the year 2003 and 2012 was shown in Table 1.

Table1. Productivity index of various crops for the year 2003 and 2012

S.No	Districts	2003				2012			
		Cereal Crops	Pulses	Oil seeds	Cash crops	Cereal Crops	Pulses	Oil seeds	Cash crops
1	Madurai	107.35	114.87	113.82	134.81	100.39	109.50	91.35	138.38
2	Ramanathapuram	60.18	88.59	118.28	21.83	80.82	61.13	77.53	19.97
3	Sivagangai	83.66	96.24	176.87	163.85	88.90	104.64	219.14	162.05
4	Thoothukudi	104.06	82.49	76.16	4.66	109.22	95.82	58.18	23.63
5	Tirunelveli	173.12	97.06	80.01	112.75	128.89	124.83	48.45	89.48
6	Virudhunagar	107.3	114.87	113.82	134.81	101.66	98.48	105.42	135.55

4.1 Productivity regions based on Cereal Crops

From Table 2 and Figure 1 it is observed that cereals were given high productivity in Tirunelveli district in both 2003 and 2012. The same tendency was observed in the remaining years also. This is due to the perennial river Tamirabarani flows in this district. Standard productivity was observed in Madurai, Virudhunagar and Thoothukodi districts. Ramanathapuram district was shown low productivity in cereals in both 2003 and 2012 years. Since this district always has deficient in rainfall. There are no major rivers providing perennial water supply for cultivation.

Table 2. Classification of Productivity Indices based on cereal crops

Index Range	Category	Name of the Districts	Index Range	Category	Name of the Districts	
Below 71.82	Short Productivity Region	Ramanathapuram	Below 86.88	Short Productivity Region	Ramanathapuram, Sivaganga	
71.82 – 140.24	Standard Productivity Region	Sivaganga Madurai, Thoothukodi Virudhunagar	86.88 – 114.14	Standard Productivity Region	Madurai, Thoothukodi Virudhunagar	
Above 140.24	Elevated Productivity Region	Tirunelveli	Above 114.44	Elevated Productivity Region	Tirunelveli	

4.2 Productivity regions based on Pulses Crops

Pulses are one of the important food crops globally due to higher protein content. India is the world's largest producer and consumer of pulses Pulses are an important group of crops in India, which is also responsible for yielding large financial gains by amounting for a large part of the exports. (http://agriexchange.apeda.gov.in). . In this study, the researcher covered the following pulses Bengalgram, Redgram, Blackgram, Greengram and Horsegram. These are the major pulses grown in the region. Again Tirunelveli district observed with elevated productivity in cereal crop during the study period. Madurai, Virudhunagar and Thoothukodi districts shown Standard productivity and in 2003 sivaganga district observed with standard productivity and 2012 marked with short productivity. This variation may due scarcity of rainfall. Short productivity experienced in Ramanathapuram district in both the study period which is shown in Table 3 and Figure 2

Table 3 Classification of Productivity Indices based on pulses crops

Pulses Crops - 2003			. Pulses Crops - 2012			Figure 2. Spatial pattern of pulses
Index Range	Category	Name of the Districts	Index Range	Category	Name of the Districts	

Belo w 85.54	Short Productivit y Region	-	Belo w 86.88	Short Productivit y Regiuon	Ramanathapura m	

| 85.54 – 105.97 | Standard Productivity Region | Ramanathapuram Sivaganga, Thoothukodi Tirunelveli | 86.88 – 114.14 | Moderate Productivity Region | Sivaganga Madurai, Thoothukodi Virudhunagar | |
| Above 105.97 | Elevated Productivity Region | Madurai Virudhunagar | Above 114.34 | High Productivity Region | Tirunelveli | |

4.3 Productivity regions based on Oil seeds.

Groundnut, Gingelly and Coconut are the main oil seeds grown in this zone in Rabi (winter) season with limited irrigation. Oil seeds had shown very good productivity in Sivaganga district during both the study period. Madurai, Ramanathapurm and virdhunagar marked with standard productivity. In 2003 thoothukodi and in 2012 Tirunelveli observed short productivity in oil seeds. This is shown in Table 4

Table 4 Classification of Productivity Indices based on oil seeds

Oil seeds 2003			. Oil Seeds Crops 2012			Figure 3. Spatial pattern of oil seeds
Index Range	Category	Name of the Districts	Index Range	Category	Name of the Districts	
Below 78.09	Short Productivity Region	Thoothukodi	Below 55.74	Short Productivity Regiuon	Tirunelveli	
78.09 – 147.58	Standard Productivity Region	Madurai Ramanathapuram Tirunelveli Virudhunagar	55.74 – 133.85	Moderate Productivity Region	Madurai, Ramanathapuram, Thoothukodi Virudhunagar	
Above 147.58	Elevated Productivity Region	Sivagangai	Above 133.85	High Productivity Region	Sivagangai	

4.4Productivity regions based on Cash Crops:

In agriculture there are few crops which are grown for profit are called as „Cash Crops or Commercial crops'. Cash crop is a backbone of agriculture economy of India. It sets a strong base for Indian economy where country's trade and commerce flourish domestically and internationally. Cash crops are generally grown for money. Sivaganga district observed with high productivity in cash crops in both the study period. Madurai, Tirunelveli and

Virudhunagar districts marked with standard productivity while thoothukodi and Ramanathapuram districts recorded short productivity during 2003 and 2012 which was shown in table 5 and Figure 4.

Table 5 Classification of Productivity Indices based on cash crops

Cash Crops - 2003			Cash Crops - 2012			Figure 4. Spatial pattern of cash crops
Index Range	Category	Name of the Districts	Index Range	Category	Name of the Districts	
Below 13.25	Short Productivity Region	Thoothukodi	Below 22.72	Short Productivity Regiuon	Ramanathapuram,	
13.25 – 149.33	Standard Productivity Region	Madurai Ramanathapuram Virudhunagar Tirunelveli	22.72- 144.30	Moderate Productivity Region	Madurai, Thoothukodi Tirunelveli Virudhunagar	
Above 149.33	Elevated Productivity Region	Sivagangai	Above 144.30	High Productivity Region	Sivagangai	

5.0 Conclusion:

The study focuses on estimation of Agriculture Productivity Index and classifies the agriculture productivity performance using statistical method quartiles. The agriculture productivity performance based on the Principal groups was classified into Elevated Productivity Region (EPR), Standard Productivity Region (SPR) and Short Productivity Region (STPR) of various districts of Southern Agro Climatic Zone of Tamilnadu during the study period of 2003 to 2012. But the results are shown only for the year 2003 and 2012. Among all the districts Tirunelveli has given Elevated Productivity based on Cereals and Pulse crops. Sivaganga district observed high productivity in Oil seeds and Cash crops during the study period. Madural, Thoothukodi and Virudhunagar districts observed with standard productivity. A slight variation observed in Ramanathapuram district with short and standard productivity in pulses and cash crops. The reasons for the short productivity are due to

deficient rainfall, delayed monsoons, real estate business and government policies of industrialization.

Different districts possess various types of soils, which may be a factor that affects productivity. To increase the agriculture productivity in the districts of southern zone the emphasis should be laid on restructuring measures, technological changes, infrastructure development, application of new agricultural technology brought with high yielding varieties which may suit to the agro climatic zone will be of great help.

References:

1) Arulkumar C and Manimannan G (2014) Spatial Pattern of Agriculture Productivity of Crops in Cauvery Delta Zone of Tamilnadu, *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 7, Issue 11 Ver. I (Nov. 2014).*
2) Jasbir Singh, Dhillon S S (2002) Agricultural Geography, Tata McGraw Hill Publishing Company Limited, New Delhi.
3) Lal Mervin Dharmasiri (2010), Measuring Agricultural Productivity using the Average Productivity Index, Srilanka Journal of Adanced Social Studies vol.1 – No.2
4) Pawan kumar salaria (2014), Status of Agricultural Producitivity in Himachal Pradesh, Research Expo International Multidisciplinary Research Journal, Volume – IV, Issue – II ,June 2014
5) Pujari Y.D (2011) Socio-Economic impact of Globalisation on Indian Agriculture, Goldern Research Thoughts, ISSN: 2231-5063, Vol I, Issue IV, Oct 2011
6) Ramesh Chand and Shinoj Parappurathu (2011) Historical and Spatial Trends in Agriculture: Growth Analysis at National and State Level in India Workshop on Policy options and investment priorities for accelerating agricultural productivity and development in india.
7) Season and Crop Report, Department of Economics and Statistics, Chennai. (Various issues)
8) Shafi, M. (1960): Measurement of Agricultural Efficiency in Uttar Pradesh, *Economic Geography*, Vol.36, pp.305.
9) Shafi M (1983) Agricultural Productivity and Regional Imbalances – A study of Uttar Pradesh. Concept Publishing Company, New Delhi.
10) Shyamal Dutta (2012) Assessment of Agricultural Efficiency and Productivity: A study of Hugli district, West Bengal. *International Journal of Current Research* Vol **4**, Issue 11, pp 190-195.
11) Sule B.M, Barakade AJ (2014), an Impact of Irrigation on Agricultural Productivity in Solapur District with References to Case Studies in Selected Villages: A Geographical Analysis. *European Academic Research*, Vol. **II**, Issue 3, pp 3328-3339.
12) Wasilewski A, Krukowski K (2002) Land conversion for suburban Housing: A study of urbanization aground Warsaw and Olsztyn, Poland. Sustainable Agriculture in Central and western European Countries (CEESA). Discussion Paper No.8 ISSN 1616-9166.
13) http://griexchange.apeda.gov.in/product_profile/prodintro/Pulses.aspx
14) www.agritech.tnau.ac.in
15) *http://www.planningcommission.gov.in/reports/sereport/ser/7vgtn/v3_ch3.pdf*

.