

SPATIO-TEMPORAL CHANGES IN THE CROPPING PATTERN OF PADDY FIELDS IN KERALA STATE, A GEOSPATIAL ANALYSIS ON PALAKKAD DISTRICT

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ABSTRACT

Paddy field of Kerala is a typical ecosystem; this wet land ecosystem is under threat since mid seventies, as there is a study decline in the area under concentration of paddy, giving rise to several negative effects on environmental and social functions. This conversion of paddy fields are transformed into plantation crops and non agriculture uses, if necessary steps are not to taken to stop the conjversion, the coming generation will not witness any practices of paddy cultivation, this typical ecosystem, keeping this mind Palakkad district the rice bowl of Kerala is taken for investigation. The present investigation aimed to understand the changes in the cropping pattern of paddy, rice production and productivity of Palakkad district.

KEYWORDS: Paddy Cultivation, Wetland Ecosystems, Transform, Cropping pattern, Rice Bowl of Kerala

INTRODUCTION

Agriculture is the foundation of Kerala's economic growth. During the last two decades, particularly in the 1970s this vital sector witnessed a transformation in favour of commercial crops. One of the dynamic factors contributing to structural changes is due to the changes in the State Domestic Product and employment is the changes in the cropping pattern triggered by market opportunities and demand factors (Mohandas, M. 2005). The most important structural change is the relative decline in the proportion of area under food grains. Food crops like rice, tapioca and pulses have become less remunerative compared to the more patronized commercial crops, this could be justified because of the increase of agriculture income such a change, its inevitable consequences of having to compromise in the welfare angle cannot be lost sight of with ever-increasing population the pressure on land is fast mounting.

The land being a limited resource its efficient and judicious use of the same has to be made. The decision of the farmers to allocate more resources would much depend on price-expectation and productivity of substitute crops. While food grains accounted for approximately two-third of the gross cropped area (GCA) at the national level the share was as low as 10.73 per cent in Kerala during 2012-13 (George, P.S and Chattopadhyay, S 2001). Food grains crop in the state has also declined from 33.16 per cent to 8.50 per cent during this period (GOI, Agriculture statistics 2010) If the activity is allowed to go ahead, there may be irreparable damage to the environment and irreparable damage to economic interest. Thus the protections of environment will precedence over the economic interest. Precautionary principle requires anticipatory action to be taken to prevent environment and economic decline and steps are to be taken by the state government to control the use of such land. Sustainable use of land and making it available for all the use is the present need of the hour, even though unabated huge conversion still continues and that may result in a total abandonment of rice cultivation in the near future.

STUDY AREA

Palakkad is also the gate way to Kerala with a total area of 4480 sq km. It extends between 10^o 24' to 11 14' N latitude and 76^o20' E to 76 54' E longitude. Based on the physical features, the district is divided into two natural divisions - midland and highland has part of the Western Ghats. The mid lands having an altitude of 10m to 80m above sea level and highlands are 914m to 2133m above sea level. The total geographical area of the district is 4480 sq.k.m representing 11.53 per cent of the State's geographical area. Midland is thick with Paddy coconut, areca nut, cashew, pepper and rubber cultivation. The Western Ghats has an average altitude of 5000 ft.

MATERIAL AND METHODS

The study area has been delineated using the survey of India Topographic map series (No: 58A/8, 58A/12, 58B/1, 58B/2 58B/3, 58B/4, 58B/5, 58B/6, 58B/7, 58B/8, 58B/9, 58B/10, 58B/11, 58B/12, 58B/13) of scale (1: 5,0000), and the agricultural land use details of Palakkad district and cropping pattern of paddy fields were also identified from the above topographic sheets. Multi- temporal satellite data set observed by LANDSAT 5, Thematic Mapper (TM), LANDSAT 4 and Multi Spectral Scanner (MSS) were used for the analyzing present (2013) agricultural scenario. The satellite digital data was rectified using Survey of India (SOI) topographic maps; a reconnaissance survey was carried out to collect the ground information. The GIS database generated from the topographic sheets was further updated with the latest changes in the study area. Digital land use / land cover classification through supervised classification method, based on the field knowledge is employed to perform the classification. The image elements were correlated with ground truth verification and the interpretation key was developed. Arc GIS 9.2, Erdas 8.6 and Arc Map were used in the preparation of the thematic maps. The secondary data were collected from Agricultural, Economics and Statistical Department of Kerala.

RESULTS AND DISCUSSIONS

Trends in Paddy Cultivation in Kerala

For more than half of humanity, rice is life. It is the grain that has shaped the history, culture, diet, and economy of billions of people of Asia. Many of them sleep on rice straw, drink rice liquor and offer rice to their gods (Gangadharan 1985). In Kerala also, rice is the essence of life. It permeates all aspects of the life of people from all walks of life. Rice is in music, particularly folk songs. It is in various forms of the arts – from poems to paintings to sculptures. It is also in traditional folklore, ritual and even language (George, P.S and Mukherjee Chandan 1988). For most of us, life without rice is simply unthinkable. Yet rice is almost always taken for granted. As the societies become more affluent, they are becoming less attached to rice and the rich rice cultural heritage is fast disappearing, and we need to do something before there is nothing left to preserve.

Rice cultivation is a part and parcel of our culture, and it is the major food crop of Kerala. However in recent years agriculture land has been going through tremendous transformation due to sprawls in agriculturalization, industrialization and globalization (Joseph K J 1996). Despite considerable investment and special attention given to rice, the fact remains that the area and production under the crop continues to decline. Area under paddy and rice production showed wide variation over the years from 1955 to 2013. The area under paddy increased substantially during first fifteen years after the state's formation from 760.51 '000 hectares in 1955-56 to 885.45 '000 hectares in 1975-76. It is because of the impact of ordinance of abolition of tenancy system in 1957 by the first ministry under EMS Nampoothiripad and green

revolution initiatives (Elsamma job and Nanda Mohan. V 2004). Later, there is a decline in the area under rice cultivation, from the mid seventies onwards the producing of rice declined from 885.45 '000 hectares in 1975-76 to 559.23 '000 hectares in 1990-91, 347.87 '000 hectares in 2000-01 and 213.18 '000 hectares in 2011-12 (Table.1). Today rice occupies only one third positions among Kerala's agricultural crops with respect to area under cultivation, and it is far behind coconut and rubber (Table.2 and Figure .1 & 2).

Table 1: Area Under Cultivation, Production and Productivity of Rice in Kerala - 1956 to 2012

Year	Area in '000 Hectares	Production in '000 Tonnes	Productivity Kg Per Hectares
1955-56	760.51	610.32	1350
1960-61	788.62	755.06	1371
1965-66	802.39	690.22	1243
1970-71	874.63	910.34	1483
1975-76	885.45	1331.12	1542
1980-81	801.34	902.14	1587
1985-86	678.23	810.34	1729
1990-91	559.23	760.46	1942
1995-96	471.68	645.65	2023
2000-01	347.87	505.16	2182
2005-06	230.12	405.44	2285
2010-11	228.84	389.06	2348
2011-12	213.18	371.56	2452

Source: GOK 2011 – 12 and directorate of economics and statistics govt. of Kerala

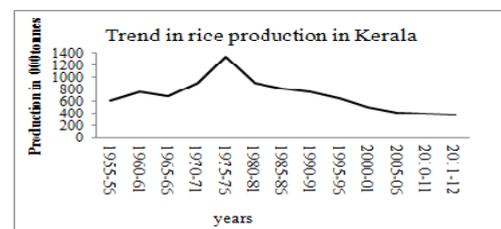
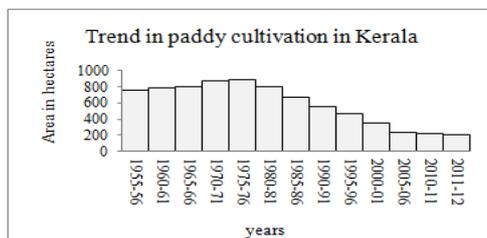


Figure 1: Trend in Paddy Cultivation in Kerala

Figure 2: Trend in Rice Production in Kerala

Table 2: Share of Crop in Gross Cropped Area, Kerala State, Selected Years in Per cent

Agriculture Crops	1965-66	1985-86	2005-06	2011-12
Rice	32.1	25.2	12.01	8.51
Coconut	22.5	24.7	35.1	36.1
Tapioca	8.6	7.8	4.3	4.2
Rubber	5.9	10.8	18.4	19.3
Pepper	4.0	4.0	8.0	8.1
Cashew	3.4	5.0	3.4	3.4
Arecanut	2.4	2.1	3.6	3.7
banana	1.8	1.8	4.2	4.3
Tea	1.6	1.2	1.4	1.4
Cardamon	1.2	2.0	1.6	1.5
Coffee	0.9	2.3	3.2	3.3
Others	15.6	12.8	4.8	4.5
Gross cropped area	100.0	100.0	100	100
Gross cropped area in '000 hectares	2051	2807	2954	2661

Source: GOK 2011 – 12 and directorate of economics and statistics Govt. of Kerala

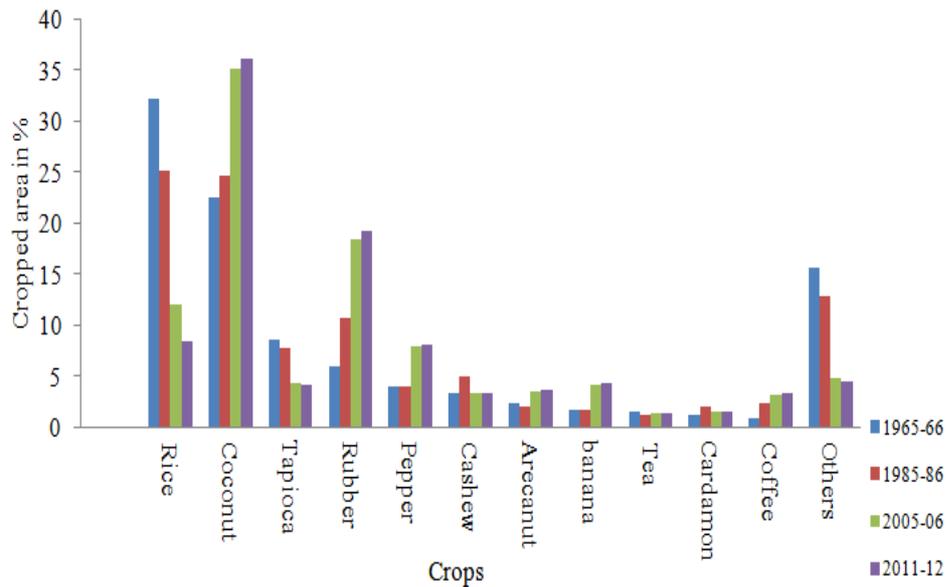


Figure 3: Share of Crops in Gross Cropped Area, Kerala State

Kerala, which is a consumer state, is facing serious challenges in the agriculture sector. Agriculture economy of Kerala has undergone structural transformation from the mid seventies by switching over from its traditional crop area which was devoted to subsistence crops like rice and tapioca and has moved to move remunerative crops like coconut and rubber. The accelerating rates of paddy fields conversions into nonagricultural uses lead to one of the current challenging issue of food insecurity (Kannan K .P. 2011). The production of rice showed an increasing trend during the period 1955-56 to 1957-76 and from the mid seventies, a decline in production was noticed, as the whole during a shorts pan of 60 years, rice production reduced from 1331.12 in '000tonnes to 371.56 '000tonnes tones in 2011 (GOK, Economic Review. 2010). The areal losses of paddy fields lead to 1/5th reduction in the state rice production, but productivity of rice gradually increased over the years. The continues increase in rice productivity can be attributed to technological factors such as the use of HYV seeds, improved use in fertilizer and tractarization and the declining trend in production can be mainly due to the decline in area.

The rate of growth in area under food grains, plantation crops and garden crops are presented in Table.3, which indicate that the growth rate of area under food grains was positive during 1960-61 to 1970-71 due to an absolute increase in the cropped area. The growth rate was negative for all other periods due to the gradual decrease in the paddy field. The growth rate of area under plantations is positive during all the time periods. The growth rate of area under garden crops was positive for all the time periods except for two periods 1975-76 to 1980-81 and 1980-81 lo 1985-86. The overall growth rate of food grains for the period 1960-61 to 2011-121 is negative (-1.5003). The growth rate of area under plantation crop and garden crop are shows a positive trend which is 1.4371 and 1.3452 respectively, this is due to the gradual increase of cropped area. The growth rate of area under paddy cultivation has been negative in the state as a whole, during the four decades 1960-61 to 2010-11.

Table 3: The Growth Rate in Area Under Food Grains, Plantation Crops and Garden Crops – Kerala State

Year	Growth Rate of Food Crops	Growth Rate of Plantation Crops	Growth Rate of Garden Crops
1960-61 to 1965-66	0.0275	0.1723	0.1079
1965-66 to 1970-71	0.0788	0.2259	0.1196
1970-71 to 1975-76	-0.0446	0.1497	0.613
1975-76 to 1980- 81	-0.0542	0.1402	-0.0679
1980-81 to 1985-86	-0.1896	0.2666	-0.0003
1985-86 to 1990-91	-0.1301	0.1411	0.1328
1990-91 to 1995-96	-0.1412	0.0934	0.0219
1995-96 to 2000-01	-0.2861	0.0406	0.0196
2000-01 to 2005-06	-0.3705	0.0562	0.0198
2005-06 to 2010-11	-0.3903	0.0592	0.0129
Overall Growth Rate	-1.5003	1.3452	1.4371

Source: GOK 2011 - 12, Directorate of economics and statistics Govt. of Kerala

Paddy fields are distributed unevenly across the state. Mid land and lowland areas of Palakkad and Alappuzha are the districts occupies major share of state's paddy fields. These districts occupy 69.20 percent of the total paddy (Table: 4). Idukki district occupies only 0.74% of the total paddy area of the state. Kasargode, Wayanad, Kollam, Pathanamthitta and Thiruvananthapuram are the district which occupies 1 to 2 % of state share respectively. Quantity of Rice production is directly proportionally to the share of paddy area of the each district. Palakkad and Alappuzha are the leading producer of rice, these two districts contribute more than 50% of state's total rice production (figure: 4). Idukki, Kozhikode and Kollam are least producer of rice. Productivity of rice crop per hectare shows a steady increase and the state of Kerala and maintain could maintain a level of productivity higher than the national average during nineties (Thomas P.M 1999). This is because of the reason that the usage of HYV seeds, chemical fertilizer and mechanization in the agriculture practice among rice farmers of rural Kerala.

Table 4: District Wise Distribution of Paddy Area, Production and Productivity (2013 – 2014)

District Name	Area (1000 Ha)	Production (1000 tons)	Productivity (per Ha)
Trivandrum	2395	6139	2563
Kollam	2097	4768	2274
Pathanamthitta	2802	8989	3208
Alapuzha	36251	111980	3089
Kottayam	21410	63579	2970
Idukki	1264	3135	2480
Ernakulam	7731	16572	2144
Trissur	21172	62316	2943
Palakkad	83998	224413	2672
Malappuram	7528	18577	2468
Kozhikode	2920	4274	1464
Wayanad	8995	23526	2615
Kannur	5740	12170	2120
Kasargode	3857	8555	2218
Total	208160	568993	35228

Source: GOK 2013, Directorate of Economics and Statistics

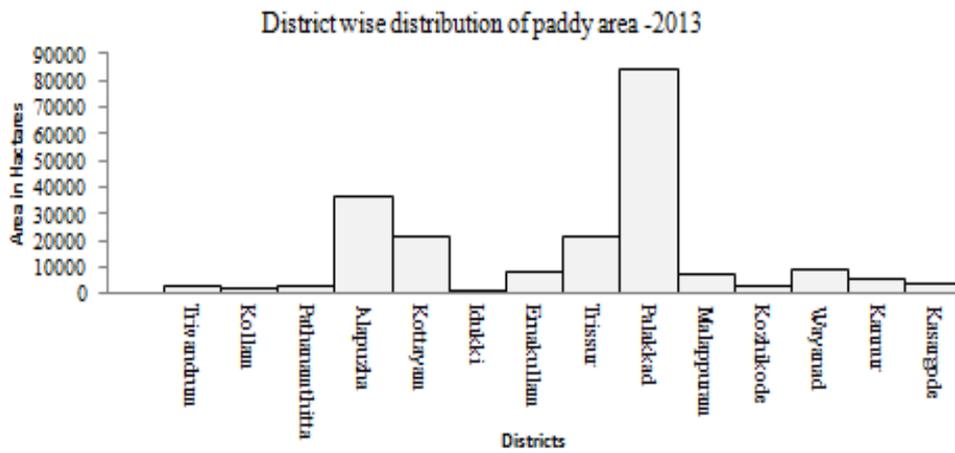


Figure 4: District Wise Distribution of Paddy Area -2013

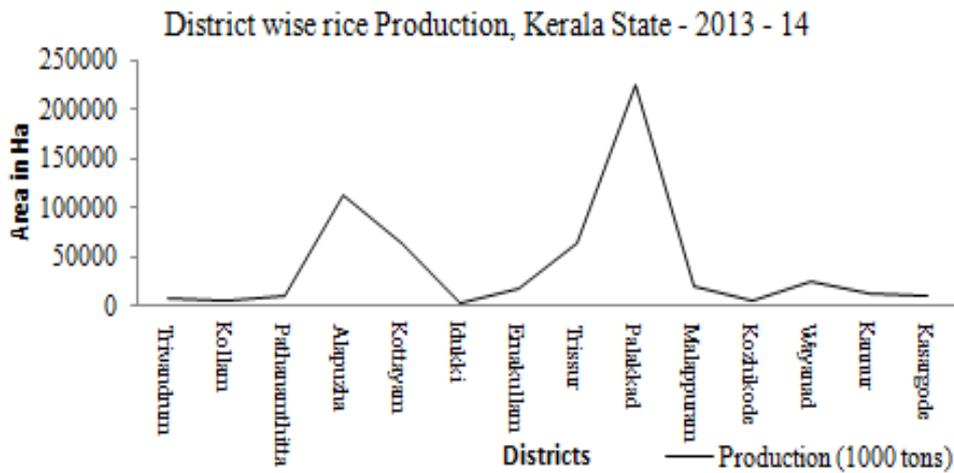


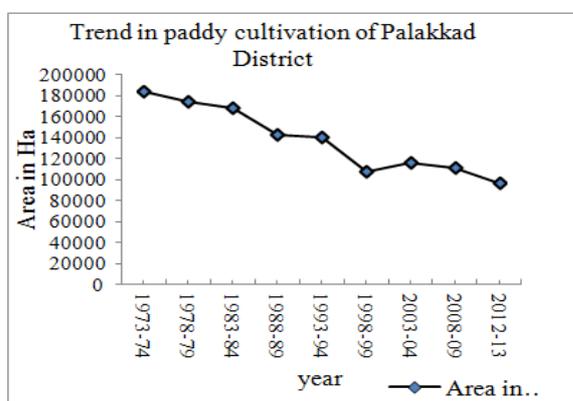
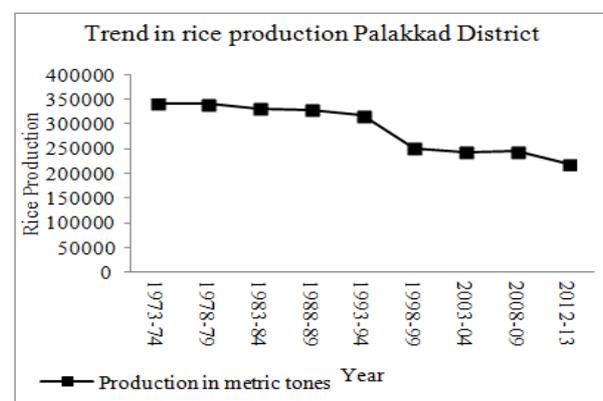
Figure 5: District Wise Rice Production, Kerala State -2013 -14

PALAKKAD DISTRICT – CHANGING SCENARIO OF PADDY CULTIVATION

This section analyses the trends of paddy cultivation in terms area, production and productivity in the Palakkad district. The area under paddy cultivation shows wide variations in the area over the years from 1973-74 to 2013-14. There was a steady decline in the area under cultivation from 183181 hectares in 1973-74 to 96030 hectares in 2013-14, and that of today, paddy area of Palakkad district occupies 38.51 percentage of state share in paddy fields. The total rice production of Palakkad district during the year 2013-14 was estimated at 2.18 lakh tones as against 3.41 lakh tones during 1973-74. This shows a decreasing trend in the production of rice over the years. Thus within a span of 40 years, there is a decrease of nearly 1.2 lakh tones rice, but productivity of rice gradually increased over the years from 1495 kg/hectares in 1970s to 2493 kg/hectares in 2011. The continues increase in rice productivity can be attributed to technological factors such as the use of HYV seeds, improvement in fertilizer consumption and agricultural implements used (Mahesh, R. 1999).

Table 5: Area Under Cultivation, Production and Productivity of Rice Palakkad District 1973 to 2013

Year	Area in Hectares	Production in metric tones	Productivity in kg per hectare	District share to state
1973-74	183181	341348	1495	20.94
1978-79	174413	341035	1542	21.82
1983-84	168034	331816	1587	22.70
1988-89	142293	328812	1875	24.64
1993-94	139769	316947	2290	27.52
1998-99	107460	250911	2213	25.60
2003-04	115910	243926	2104	37.33
2008-09	111561	244244	2316	37.83
2012-13	96030	218155	2493	38.51

**Figure 6: Trend in Paddy Cultivation of Palakkad District****Figure 7: Trend in Rice Production Palakkad District**

The table: 6 shows block wise spatial variation of paddy fields in the Palakkad district between 1973 - 74 and 2013 - 14, which is over a span of 40 years, the agriculture data of Palakkad district reveals that about 55% (70265 hectares) of loss in paddy area. All blocks of Palakkad district have showed decline trend in paddy cultivation. Rice was the first ranking crop of all blocks in Palakkad district during 1973 -74 and It covered more 50% of total agriculture area (Panikar P G K, 1980). In the case of areal distribution of paddy, Alathur block occupied first position which contained 16200 hectares of land followed by Kuzhalmannam block (15256 hectares) and Chittur block (14486 hectares) in 1973 - 74. Attapady block and Kollengode block had the lowest concentration of paddy cultivation in seventies.

But by the year 2013 – 14, the distribution of paddy cultivation of Palakkad district has totally changed. All the blocks in this district marks noticeable change in the concentration of paddy area. Presently Kuzhalmannam block occupies high share of paddy area which is about 8861 hectares and followed by Alathur block (7739 hectares). While Attapady Mannarkad and Sreekrishanpuram are blocks have the lowest positions. The further reveals that the maximum loss of paddy area is recorded in Alathur Block (8461 hectares) followed by Chittur block (7826 hectares). Lowest loss of paddy area is noticed in Kollengode block which is only about 2674 hectares.

Table 6: Block Wise Declination of Paddy Area – Palakkad District

Blocks	1973-74 in Hectares	1993- 94 in Hectares	2013 - 14 in Hectares	Loss in Hectares (1973 – 2013)	Loss in %
Nemmara	9229	7134	4750	4479	6.1
Trithala	8335	6356	4447	3888	5.1
Alathur	16200	11278	7739	8461	11.3
Chittur	14486	10981	6660	7826	10.3
Kollengode	7846	6786	5172	2674	4.1
Ottapalam	10766	7681	4198	6568	9.3
Kuzhalmannam	15256	9768	8861	6395	9.1
Pattambi	11888	7423	5399	6489	9.2
Mannarkad	10051	7956	3190	6861	9.3
Palakkad	13164	9125	6102	7062	10.0
Sreekrishnapuram	9456	5890	3690	5766	8.1
Malampuzha	10503	8165	6707	3796	5.9
Attappady	1840	901	281	1536	2.2
Total	183181	139769	66915	70265	100

Source: Primary source and KSLUB – 2013

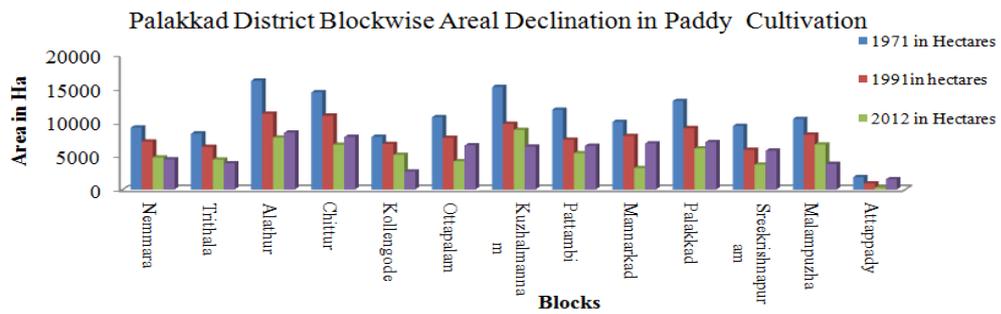
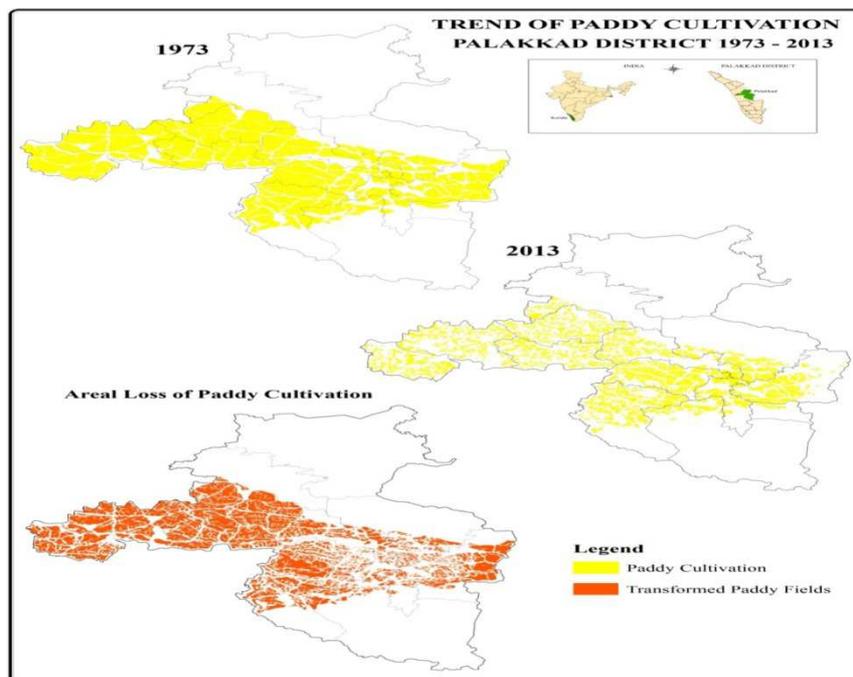


Figure 8: Palakkad District Blockwise Areal Declination in Paddy Cultivation



Map 1: Trend of Paddy Cultivation Palakkad District 1973 – 2013

CONCLUSIONS

Rice cultivation is the most important agricultural operation in the country, not only in terms of food security but also in terms of livelihood. It plays a major part in the diet, economy, employment, culture and history of India (Thampi C J, 1995). In Kerala also the situation is the same. Majority of people in Kerala depend on agriculture and related activities for their living. Paddy cultivation was part of the culture of Kerala state. But now Paddy farms are fast disappearing from Kerala. Diminishing rice fields from Kerala creates threat to food security of the state (Deshpande R.S et.al. (2004). Paddy fields are being converted and residential and commercial buildings. If necessary actions are not taken immediately by the authorities concerned, there will be nothing to hand over to the coming generations. Though no rules exist for the conservation of Wet lands, these illegal conversions are done by misinterpreting the rules or by overcoming the clauses with artificial means Under this condition everybody must be aware of the impact and refrain from converting paddy fields for other purposes. Unabated massive conversion still continues and that may result in a total abandonment of rice cultivation in the near future in Kerala state.

REFERENCES

1. Deshpande, R.S et.al. (2004). “Crops and Cultivation”, State of the Indian Farmer: A Millennium Study, Ministry of Agriculture, Government of India and Academic Foundation, New Delhi.
2. Elsamra Job and Nanda Mohan, V. (2004). “Rice Production in Kerala- Trends and Instability Analysis”, Agriculture Situation in India, June, Vol. LXI, No.3, Gangadharan, (1985): “Rice Research in India” , Breeding, in Jaiswal, P L (ed) New
3. Delhi ICAR and Chandler, R.F Jr (1979): Rice in the Tropics: A guide to the developmen of Natural programs, Colorado: West View.
4. George, P.S. and Mukherjee, Chandan (1988): “Rice Economy of Kerala- A Disaggregated Analysis of Performance”, Working Paper No.213. CDS, Thiruvananthapuram.
5. George, P.S., & Chattopadhyay, S. 2001. Population and Land Use in Kerala. In: Growing Populations, Changing Landscapes: Studies from India, China and the United States. National Academy of Sciences, Washington DC.
6. Government of India (2010), Agricultural Statistics at a Glance 2010, Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, available at <http://dacnet.nic.in/eands/>, viewed on June 21, 2011.
7. Government of India (2010). Agricultural Statistics at a Glance 2010, Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, available at <http://dacnet.nic.in/eands/>, viewed on June 21, 2011.
8. Government of Kerala (2010). Economic Review 2010, State Planning Board, Thiruvananthapuram.
9. Joseph, K. J. (1996). “Kerala’s Agriculture: Its evolving Structure with respect to Cropping Pattern Changes- A Markov Chain Analysis”. Ph.D thesis submitted to University of Agricultural Sciences, Bangalore.

10. Kannan, K. P. (2011). "Agricultural Development in an Emerging Non-Agrarian Regional Economy: Kerala's Challenges," *Economic and Political Weekly*, vol. 46, no. 9.
11. Mahesh, R. (1999). Causes and consequences of change in cropping pattern: A location-specific study. Discussion Paper No. 1. Kerala Research Programme on Local Level Development Centre for Development Studies, Thiruvananthapuram.
12. Mohandas, M., (2005). "Agriculture Development in Kerala", in *Kerala Economy- Trajectories, Challenges and Implications*. (ed) Rajasenan, D and Gerald Groot.
13. Panikar, P. G. K. (1980). Recent Trends in Area Under Production of Rice in Kerala. Working Paper No. 116, Centre for Development Studies, Trivandrum.
14. Thampi, C. J. (1995). Sustainable landuse; farming systems and land policy. In: P P Pillai and R P Nair (eds.), *Understanding Ecologically Sustainable Economic Development*. Institute of Planning and Applied economic Research, Thrissur, Kerala.
15. Thomas, P. M. (1999), "Agricultural Performance in Kerala", in *Kerala's Economic Development- Issues and Problems*,(ed) by B.A.Prakash.