



Areal Declination of Paddy Cultivation and Its Impact on Food Security - A Study on Karrimpuzha Watershed - Palakkad District, Kerala.

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ABSTRACT

In the name of development over the past few decades Kerala agriculture land use as undergone drastic changes, to mention a few, the hills are mined, scared grooves are damaged and paddy fields converted to nonagricultural use. Agriculture is the main stay of the economy and is the only source of food both for direct consumption and as raw material for refined foods. The accelerating rate of paddy field conversions into non-agricultural uses lead to one of the current challenging issues of water scarcity, biodiversity loss, rural unemployment and food insecurity. Food security concern is of utmost importance to food deficit state of Kerala. Where a large percentage of its population is poor and still a high share of total house hold expenditure is devoted to food, food security can become a reality only when the agricultural sector is vibrant. In this context this study is been carried out taking Karrimpuzha watershed, which is situated in the central part of Palakkad district which has recorded a great loss of paddy area. This paper attempts to examine the conversion of paddy fields to other uses and its impact on the food security.

KEYWORDS

Food Security, Paddy Cultivation, Paddy field conversions, watershed.

Introduction

Rice cultivation is the most vital agricultural process in the state of Kerala, not only in terms of food security but also in terms of livelihood. It is a key component in the diet, economy, employment, culture and history of Kerala. Paddy cultivation in kerala has witnessed a steady decline since the 1980s. Paddy fields are being converted and residential and commercial buildings are being constructed (Mohandas, M. 2005). It is been estimated that there is an eighty five per cent fall in the wetland area under paddy in the last fifty years. All the districts of Kerala mark a successive loss of paddy field and in response loss of rice production. The State of Kerala is deficit in rice production, this deficit has steadily increased from 50 to 55 percent during early fifties to mid-seventies to more than 88 per cent of its requirement at present (K. P. Kannan, 2011). Palakkad district “the rice bowl of Kerala” the situation is the same. If necessary actions are not taken immediately by the authorities concerned, there will be no paddy fields to hand over to the coming generations. This sharp fall in the area under paddy cultivation as well as in the quantity of rice produced in the state has an important implications for Kerala’s ecology, economic and social development. Unabated massive conversion still continues and that may result in a total abandonment of rice cultivation in the near future. At the national level, there is accelerating rate of paddy field conversion to non-agricultural uses which leads to food insecurity (Agus and Mulyani, 2005).

2. Study area

Karrimpuzha watershed is spread over an area of 162.82 sq. km and is located in the central part of Palakkad District. This watershed extends from latitude 10°49’59” N to 10°50’36”N and longitude 76°25’47. 98” E to 76°37’26.59” E (Fig:1). The Karrimpuzha watershed lies in the mid and high land region of Palakkad District. This watershed spread over ten Panchayaths which consist of five blocks and the entire watershed falls in Bharathapuzha river basin (KSLUB 2010), the density of population is moderate in this watershed. The major economic activity in this watershed is agriculture, livestock rearing, plantation, and small scale industries. The soil type ranges from deep fertile soil to rocky outcrops with shallow infertile soils. Paddy, vegetables, coconut, arecanut, pepper,

ginger and turmeric are the main crops cultivated in the area (panchayath level statistics 2011 Palakkad, Department of economics and statistics Kerala).

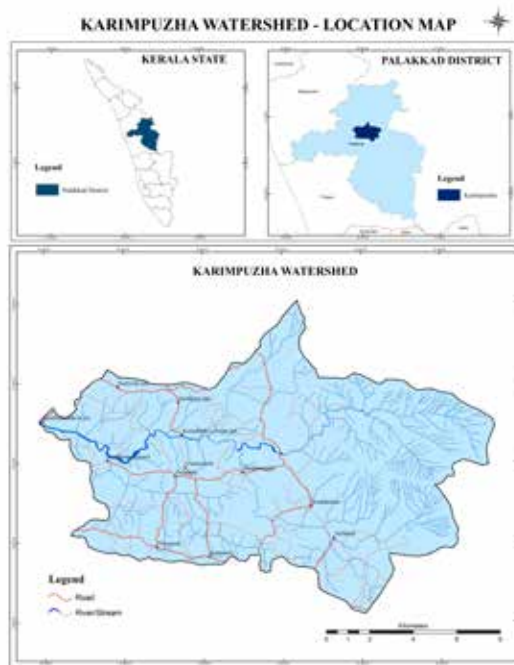


Figure.1

3. Methodology

The basin area is been delineated using the survey of India Topographic map series (No: 58B/5, 58B/9, 58B/13, 58B/8, 58E/4 and 58F/2) of scale (1: 50000), The agricultural land use of 1973 with regards to Karrimpuzha Watershed (1975)

is been 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 (2012) 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 is further updated with the latest changes in the watershed.

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. Base maps including road, railway, settlement, village location and watershed boundary was extracted from the topographic sheets. Arc GIS 9.2, Erdas 8.6 and Arc Map were used in the preparation of the thematic maps. This classification is performed based on the classification scheme of National Remote Sensing Center (NRSC), Department of Space, and Govt of India. The secondary data were collected from Agricultural, Economics and Statistical Department. These collected data have analyzed with the help of proper statistical techniques and tools Method for calculation of food security status requires food requirement and availability and for the calculation of food requirement Singh (1975), and for food availability Chakrovathy (1970) and for standard nutrition unit (SNU) for required energy in Kcal is been adopted.

Objective

- The main objective of the analysis is to estimate the conversion of paddy fields, and its impact on the food security status of Karrimpuzha watershed.

4. The concept of food security

The concept of food security is very complex, multidimensional and complicated and is debated since last three decades. It has been visualized at international, regional, household and even at individual levels. According to FAO (1984) the basic concept of food security implied that "all people at all times have both physical and economic access to the "basic food they need" but the World Bank (1986) has modified it indicating that "food security is access by all people at all times to enough food for an active and healthy life". Food security is essentially built on three pillars: *food availability, food access, and food utilization*. An individual must have access to sufficient food of the right dietary mix (quality) *at all times* to be food secure. Those who never have sufficient quality food are chronically food insecure. Those whose access to an adequate diet is conditioned by seasonality are food insecure and are generally called *seasonally* food insecure. Individuals who normally have enough to eat but become food insecure in the face of disasters triggered by economic, climatic, and civil shocks (war and conflict) are *transitorily* food insecure. The "at all times" element of the food security definition makes risk and associated vulnerability an important element of the food security concept (Radhakrishna, R. 1999). This definition emphasizes three critical dimensions of food security: (i) physical supply of desired food in sufficient quantity; (ii) an economic access indicating close link of purchasing power to food security; and (iii) stability in supply which include access to global food market (Bhattacharya, 2001).

5. Nutritional value of Rice

Nutrition may be defined as the science of food and its relationship to health. It is concerned primarily with the part played by nutrients in' body growth, development and maintenance (Table.1). The word Nutrient or food factor is used for specific dietary constituents such as proteins, vitamins and minerals (Rai, Manoj Kumar and Vailaya, Jyoti 1996). Nutrients are organic and inorganic complexes contained in food (Table.2). There are about 50 different nutrients which are normally supplied through the foods that we eat. Each nutrient has specific functions in the body. Most of the natural foods contain more than one nutrient. These may be divided into:-

i) **Macronutrients:** These are proteins, fats and carbohydrates which are often called "proximate principles" because they form the main bulk of food. ii) **Micronutrients:-** These are vitamins and minerals. They are also called micronutrients because they are required in small amounts which may vary from a fraction of a milligram to several grams.

Carbohydrate is the main source of energy and it is also essential for the oxidation of the fats and for the synthesizing. Per capita daily intake should contain 60 to 70 % of carbohydrates and major sources of carbohydrate are starches, sugar and cellulose. Starch is basic to the human diet and it is found in abundance in cereals, roots and tubers and fibers (Table.1). They also contribute significant quantities of proteins (6 to 12 per cent), minerals and B-group vitamins. In terms of energy, cereals provide about 350 kcal per 100 grams (Table.2). A balanced diet is defined as one which contains correct proportion of all nutrients in the proportion suggested by the experts of nutritional science. The above table shows a clear picture about the per day recommended daily intake of energy for each category. Mal-nutrition is one of the most important health problems of the world in general and of India particular. According to (Stamp, 1962) 450 grams/ day of Cereals per head require of a man for maintaining subsistence life and 2460kcal/day which is equivalent to 900,000 kcal/year and it is termed as standard nutritional unit (SNU). Rice is the staple food of Indians and it has been estimated that in Indian conditions per capita daily intake of 1200 kcal to 1300 kcal is alone from cereals like rice and wheat. Considering the large amounts in which they are consumed, cereals contribute 70 to 80 per cent of the total energy intake in typical Indian diets. Balanced diet may ensure healthy growth of men and women. i.e. 350 to 400 gms of cereals requires for maintaining a nutritional status that enables us to grow well and enjoy good health (International Food Composition Tables directory, 2006).

Table .1. Required level of macro Nutrients in per day intake

Proteins	7 to 15 per cent
Fats	10 to 30 per cent
Carbohydrates	65 to 80 per cent

Source:(2006 b. International Food Composition Tables directory.

The International Network of Food Data systems (INFOODS). Rome. <http://>

Table.2. Nutritive value of cereals (values per 100g.)

Nutrients	Rice	Wheat	Maize	Jowar	Bajra	Ragi
Protein (g)	6.8	11.81	11.1	10.4	11.6	7.3
Fat (g)	0.5	1.5	3.6	1.9	5	1.3
Carbohydrate (g)	78.2	71.2	66.2	72.6	67.5	72
Energy (kcal)	345	346	342	349	361	328

Source: 2006b. International Food Composition Tables directory.

The International Network of Food Data Systems (INFOODS). Rome. <http://>

Table.3. Energy Requirement

Group	Body weight Kg.	Energy Required per day/ Kcals
Infancy 0-6 months 7-12 months		118 108
Children 1-3 years 4-6 years 7-9 years	12.03 18.87 26.37	1240 1690 1950

Adolescents 10-12 years (males)	35.4	2190	Kcl/kg/day
(females)	31.5	1970	
16-18 years (males)	57.1	2640	Kcl/kg/day
(females)	49.9	2060	
Adults Males (light work)	60	2425	Kcl/kg/day
(moderate work)		2875	
(heavy work)		3800	
Adults Females (light work)	50	1875	Kcl/kg/day
(moderate work)		2225	
(heavy work)		2925	

Source: 2006b. International Food Composition Tables directory. The

International Network of Food Data Systems (INFOODS). Rome. <http://>

6. Declining trend of paddy fields in Karrimpuzha watershed

Agricultural crops in Karrimpuzha watershed are of two types food and non food crops. During 1973-74 the ratio of food crop area to non food crop area was 70:30. In 2012-13 it has changed into 25:75. Declination of food crops has occurred during these few years. Within the short time span of 40years and the area under paddy cultivation has been reduced drastically. In most of the Panchayath in Karrimpuzha watershed the area under paddy fields has declined. In 1973-14, the principle crop of these panchayath was paddy which occupied 41.1%of total cropped area of this watershed. Out of 15815.66 ha, occupied by paddy has now reduced to only 6459 ha. (Fig: 2 &3), Recently the area under paddy field declined to 9.2% of total cropped area of this panchayath (Figure: 3), Within 40 years of time period the panchayath alone lost 4973.88 hectares of paddy fields (Table: 4 and fig: 4). This shifts in land use have profound implications for the food security, where Kerala depends on other state to supplies and meet more food grain requirements. Owing to the socio economic and or technological commercial crops, population growth and urbanization conversion to upland crops led to a market increase in clay mining and other non agricultural uses of land. (Kannan, K.P. and Pushpangadan, K. 1988), '.

Table: 4. Changes in the cropping pattern of paddy (1973 - 74 to 2013 - 14)

Name of the panchayath	Area 1973-74 in ha	% of paddy 1973-74	Paddy Area 2013 -14 in ha	% paddy Area, 2013 -14	Changes in ha	Changes in %
Agali	0.725	0.11	0	0	0.725	0.014
Kad-ampazhipuram	1616.1	25.01	454.48	31	1162.1	23.1
Karakurissi	494.2	7.65	74.399	5.1	420	8.3
Karimpa	996	15	73.93	5	923.1	18.3
Karrimpuzha	644	9.97	123.76	8.5	541.45	10.5
Kongad	1395	21	407.77	27.8	988.22	19.6
Malampuzha	280	4.3	76.42	5.3	203.22	4.4
Mundur	876	13.56	227.44	15.55	649.66	12.9
Sreekrishnapuram	106	1.6	20.848	1.32	82.22	1.63
Thachampara	51.26	0.007	0	0	51.26	1.01
Total	6459.2	100	1460.29	100	4973.88	100

Source: Primary

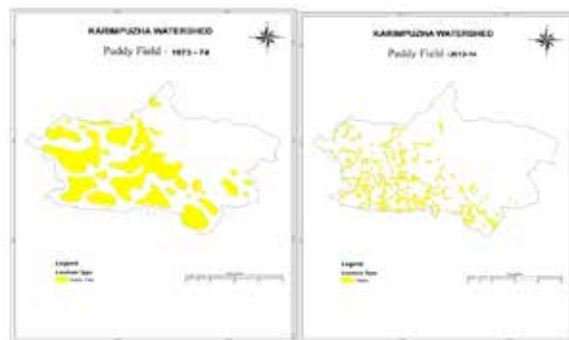


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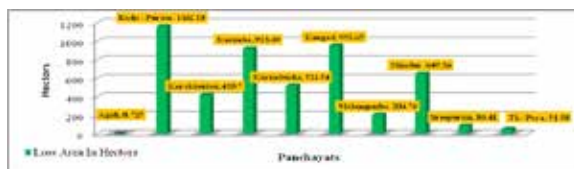


Figure 4: KARRIMPUZHA Watershed, panchayath wise Loss of paddy area in hectares

7. Food Security status of Panchayaths in KARRIMPUZHA watershed

Food production is one of the most important elements in the food security. It is commonly believed that agricultural production directly affects food security (Suryanarayana, M.H. 1996). However, there is more to it than a mere direct link. Rising agricultural productivity increases rural incomes and lowers food prices, making food more accessible to the poor. If any region have the capacity to produce enough food to meet the needs of people, it is very easy to achieving food security status. i.e distribution food products, controlling food price, etc only comes behind the food grain production component.

The requirement of food either in weight or calories varies according to age, sex, occupation, body size, income, culture and climate. According to Singh's -scale (1970) each unit of the population is equal to 0.773 consumption unit or 1000 persons are equal to 773 consumption unit. These are the triennium average of the total projected population of each that ward has been calculated and is multiplied with the co-efficient of consumption (773) in order to get the consumption unit of the total population.

Food availability of has been worked out at ward level by taking triennium average data of agricultural produce of the year. There are many sources of leakages, e.g. Losses in transport and storage, destruction by insects and pets, kitchen waste, use of seeds etc. between the production and consumption of agricultural produce, but the precise data for there all these aspects are not available. Therefore Chakravarthy (1970), after examine various estimates of losses and accounts given by different scholars and institutions has suggested the standard deduction of 10 percent exclusive of read requirement. Similarly after evaluating various estimates of seed requirements ranging from 3.5 percent to 14.0 percent, Chakravarthy has recommended 6.8 percent of the total production for seed requirement. Hence the total deduction of or wastage, cattle feed and seed ought to be 16.8 percent of the total gross production. The co-efficient of production is there for 0.832 (100-16.8= 83.2), Chakravarthy, (1970). this formula is been used for calculating total amount energy available from total rice production of particular area. For the present analysis 350 grams/ day of rice is considered as ideal amount for getting sufficient energy for leading healthy life in Kerala conditions which is equivalent to 4581250kcal/year. (Kannan, K.P. 1995), in his paper 'Public Intervention and Poverty Alleviation: he reveals that there is successive decrease in the areal extension of paddy field as well as rice production. According to (Stamp, 1963) 450 grams/ day of Cereals per head require

of a man for maintaining subsistence life and 2460kcal/day which is equivalent to 900,000 kcal/year and it is termed as standard nutritional unit (SNU). Which is the required energy for the man per day from the carbohydrate is 1250 to 1300 Kcal i.e.300 to 400 grams of rice is need for leads sustain life per day (Table. 3).

Table: 5, Food security status of Karrimpuzha watershed 1973-74

Name Of The Panchayat	Co-Efficient Of Population	Annual Co-Efficient Of Production	Total Food Availability In Kg/Year	Annual Food Required	Surplus In Kg	Status
Agali	1351	3619.2	4350	172590		Insecure
Kdampazhipuram	6869	8067072	9696000	877514	718955	Secure
Karakurissi	2075	2467046	2965200	265081	220196	Secure
Karimpa	9834	4972032	5976000	1256293	371573	Secure
Karrimpuzha	3687	3214848	3864000	471014	274383	Secure
Kongad	6893	6963840	8370000	880580	608326	Secure
Malampuzha	2033.7	139776	1680000	259715	119939	Secure
Mundur	4522.05	4372992	5256000	577685	379530	Secure
Sreekrishnapuram	969	529152	636000	123789	40536	Secure
Thachampara	360.2	254592	306000	45990	208602	Secure
Total	39229.1	322433280	38754000	5011517	317421763	Secure

Require Energy/ Day From Carbohydrates 1250-1300kcal. Required Amount Of Rice In Grams 300-400.

Table: 6, Food security status of Karrimpuzha watershed 2013-14

Name of the panchayat	Available production in Kgs.	Required production in kilograms	Total food availability in kcal / year	Required in kcal	Status
Agali	0	419658	-	1498781250	Insecure
Kadampazhipuram	2266368	1423773	7932288000	5084906250	Secure
Karakurissi	369408	576408	1292928000	2058600000	Insecure
Karimpa	364414	2043233	1275449000	7297262500	Insecure
Karrimpuzha	612540	742994	2143890000	2653550000	Insecure
Kongad	2031744	1424029	7111104000	5085818750	Secure
Malampuzha	379392	525308	1327522000	1876100000	Insecure
Mundur	1133184	1259359	3966144000	4497712500	Insecure
Sreekrishnapuram	103833.3	123789	363416000	442106250	Insecure
Thachampara	0	76650	0	273750000	Insecure
Total	7260883	8615201	24412741000	25682768750	Insecure

Required Energy/ Day From Carbohydrates 1250 To 1300kcal. Required Amount Of Rice 300 To 400 Gm

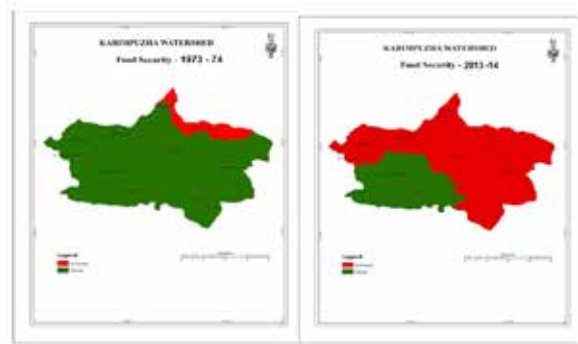


Figure: 4 & 5

This study analyzes the impact of paddy fields loss on food security among the rural people of Karrimpuzha watershed. The study reveals that the panchayath which had sustained food security in 1971 have lost its secured status presently through paddy land conversion. In 1973 - 74 all Panchayaths in this watershed had the total annual co- efficient of consumption unit of 39229.1 and during this period Karrimpuzha watershed had about 6459.2 hectares of paddy fields and its annual co-efficient of production was 32244.35 ton of rice. In 1973- 74 the required amount of rice for getting sufficient level carbohydrate for the total consumption units of this watershed in one year was around 5011.52 tons i.e., and the required amount of energy for the population was about 178982.30 lakhs kcal per year. The available energy in 1973 - 74 was about 11285164.90 kcal per year (Table.5 and Figure. 5). So this amount of rice production was more than enough to feed the mouths of population in this watershed during seventies. But in 2013 - 14 this panchayat having only 1460.23 hectares of paddy fields and it's co-efficient of production is only about 7260.89 tons of rice in one year and this amount of rice can only produce 244127.15 lakhs kcal of energy per year. Currently the co-efficient of consumption unit of population of this Panchayath increased is 64850 tones of rice and requires 256827.6 kcal amount of energy per year for satisfying the dietary needs of the population of this watershed (Table.6 and Figure. 6). Presently available production can feed only 20 to 25% of the population. All panchayths in this watershed deficit in rice, which is the staple food, has increased steadily from 20 to 30 percent during early eighties to more than 70 to 80 per cent of its requirement at present. In the year 1973, it is observed that seven Panchayath were secured food security status and that rice production were sufficient to fulfill the food requirement of all. But in the year 2013 - 14, there is only two panchayaths namely Kadampazhipuram and Kongad having secured food security status (Table.6 & Figure. 6). i.e. Within the 40 years of time period this watershed lost almost 4998.77 hectors of paddy fields and marked about 24953.51 tons of decrease in rice production (Table.7). Hence we can concluded that the continues deficit in paddy areas and rice production isthe reasons of food insecurity in rural areas of Kerala.

Conclusion

In Kerala agriculture, land has been going through a tremendous transformations due to sprawls in agriculturalisation, industrialization and globalization. Since the mid seventies both the area under the crop and production of paddy had been declining in the state at alarming rates. The issue of conversion at present is viewed as a choice decision of landowners. Although the state is against the land use change, farmers resort to conversion for maximizing their economic returns. In their effort to maximize current economic returns, 'farmers' ignore the possible ecological and environmental impacts of conversion and for the economic rationale, private owners of paddy suggest them to convert paddy fields for non-agricultural purposes. Changes in the cropping pattern in favour of perennial crops and urbanization have an immediate and direct impact on the employment of rural area and in the staple food security in the State. The regional perspectives on food

security, from the point of view of a 'food deficit' state like Kerala, remain vulnerable even when national self-reliance is achieved in terms of availability. Kerala's case, the increasing specialization from agriculture towards non-food grain crops has meant a sharp decline in the regional availability of food grains. While the better-off sections in the state are able to take care of their food grain requirements through the open market, a large section of the population, both absolutely poor and nearly-poor, have come to depend on the PDS for a major part of their food grains requirement.

Land-use planning is the term used for a branch of [public policy](#) encompassing various disciplines which seek to order and regulate land in an efficient and ethical way, thus preventing [land-use conflicts](#). Government implements sustainable land-use planning technique to manage the development of land within their jurisdictions. In doing so, the government can plan for the needs of the community and safeguarding natural resources. It is the systematic assessment of land and water potential, alternatives for land use, and economic and social conditions in order to select and adopt the best land-use options. A [comprehensive](#) land-use plan can provide a vision for the future possibilities of development in neighborhoods, districts, cities, or any defined planning area. Current agriculture land is not sufficient for satisfying the existing dietary needs, so Agriculture land use planning is necessary in Karrimpuzha watershed for satisfying the existing dietary needs. Nearly 2800 tons of rice is deficit per year in the Karrimpuzha watershed, hence people in this area are depending on other sources and neighboring states or region for receiving rice for their dietary needs. To overcome this issue, additionally 2000 hectares for agriculture land are required. Land use planning analysis point out that total 3463 hectares of paddy fields are mandatory for achieving the status of self-sufficient watershed in rice.

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