



DYNAMICS OF PADDY LAND USE PATTERN IN KERALA : THREAT TO ITS SUSTAINABILITY

Sheeba Abraham

Department of Economics, Mar Athanasius College, Kothamangalam, Kerala, India

Abstract

Land is the prime resource of the economy of any country and agriculture is the principal occupation of man from time immemorial. Economic development and structural changes led to considerable changes in the land use and cropping pattern because land plays a crucial role in the development process. Kerala has witnessed important changes in its land use pattern. The most important among them are the dwindling area devoted to cultivating food crops and an increase in the rate of deforestation. With the changing land use pattern, wetlands and paddy lands have been severely affected either by converting them for constructing buildings or for cultivation of other crops or for the construction of infrastructural facilities. Thus the rice culture of Kerala is fast vanishing. The major objectives of the study are to study the changing land use pattern in Kerala with special reference to paddy fields and to analyze the extent of paddy land conversion and how it possess a threat to its sustainability. The study is based on both primary and secondary data sources. The objectives and hypothesis of the study are analyzed by using the survey method. Three study areas are selected on the basis of their characteristics. The major findings of the study show that decadal growth in the area under paddy cultivation in the districts of Kerala showed a declining trend. The number of paddy farmers and the area under paddy cultivation were declining. The conversion of paddy lands is for cultivating food crops, for construction of buildings and for habitation and its cause severe threat to natural environment.

Keywords : Land use pattern, paddy land conversion, environmental threats, food security, sustainability.

Introduction

Land is the most important natural resource which human beings have inherited. It is the main source for the basic necessities like food, shelter and clothing. As a result of increasing population pressure requirements increased and become complex. Economic development and structural changes led to considerable changes in the land use and cropping pattern because land plays a crucial role in the development process.

Kerala has witnessed major changes in its land use pattern. The most important are the shrinking area devoted to cultivating food crops and an increase in the rate of deforestation. With the changing land use pattern wetlands and paddy lands have been severely affected either by converting them for constructing buildings or for cultivation of other crops or for the construction of infrastructural facilities.

These land use change has some positive and negative impacts. As a result of converting paddy fields there are some positive factors like developmental and construction activities. But there are certain negative impacts due to changes in the paddy land use pattern. It affects food security, environmental balance, biodiversity, quality of life etc. The sustainable management of paddy fields requires regular monitoring from the part of the authorities. Concern over the increasing impact of human activities on environmental system has received global attention. This study intends to understand the extend of paddy land conversion in Kerala.

After the formation of the state of Kerala, there has been a substantial change in the cropping pattern. The cultivation of rice, the staple crop gave way to many plantation and commercial crops. In the name of developmental activities, land use changes are occurring in Kerala day by day. The changing use pattern of paddy fields gave way to tremendous reduction in its area and it shifted to

other food crops and non food crops and mainly to non agricultural purposes. The ecological and environmental value of paddy fields cannot be regained. In Kerala wide range of laws are made to protect and promote agricultural land. The Kerala Land Reform Act of 1963 mainly aims to provide land to the tiller. The Kerala Land Utilization Order of 1967 mainly intends to bring fallow land under cultivation and prevent conversion of agricultural land to other purposes. The Kerala conservation of paddy land and Wetland Act of 2008 is an Act to conserve the paddy land and wetland, restricts the conversion or reclamation and to promote growth in the agricultural sector and to sustain the ecological system, in the State of Kerala. With all these legislations prevailed in Kerala to protect paddy land area under rice has been declining consistently over the last several years.

The changes in the paddy land use to other purposes mainly for agricultural and non agricultural purposes led to serious implications. The filling up of paddy fields by leveling the hillocks causes serious ecological implications. With the developmental activities, the most ecologically valuable paddy fields are drastically reduced. It is high time to study the causes and effects of changing paddy land use pattern in Kerala. So this study tries to bring out the extend of changes in the paddy land use in Kerala and how it possess a threat to its sustainability.

Materials and Methods

The study is based on both primary and secondary data sources. The objectives and of the study are analyzed by using the survey method. Multi stage sampling was used. Three study areas are selected on the basis of their characteristics.

Kerala has 14 districts and rice is cultivated in all districts. The area under paddy cultivation is decreasing in all districts. On the basis of geographical, historical and cultural similarities Kerala is divided into North Kerala, Central Kerala and South Kerala. One district from each

geographical division was selected to get the representation of the whole Kerala. Accordingly Malappuram district was selected from North Kerala, Ernakulam district was selected from Central Kerala and Alappuzha district from South Kerala. The district of Malappuram has been influenced by the gulf money. Ernakulam district is the one in which large scale conversion of paddy fields occurred. The major parts of Kuttanad, the 'rice bowl of Kerala' come under the Alappuzha district.

One block was selected from each district. Accordingly Kuttipuram block from Malappuram district, Koovappady block from Ernakulam district and Veliyanad block from Alappuzha district were chosen by the researcher in order to get representation of the state.

As the next stage from each block all the Krishibhavs which come under the Grama Panchayats of each block Panchayat were covered.

The sample size was fixed based on the formula given by Krejcie and Morgan (1970).

$$s = \frac{\chi^2 NP(1-P)}{d^2(N-1) + \chi^2 P(1-P)}$$

where

s = required sample size.

χ^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.84 at 5 % level)

N = the population size (Here it is (103612))

P = the population proportion (assumed to be 0.50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (.04).

Thus sample size was calculated as 597 and it was rounded as 600.

155 households were selected from Kuttipuram block, 280 households from Koovappady block and 165 from Veliyanad block. These households were selected from the list of the Krishibhavan records using a systematic random sampling procedure.

Secondary sources consist of books, journals and articles, reports, newspapers and various published sources in this field.

Primary data was collected through a household survey by using a structured interview schedule. Participant observations and interviews were the other tools used for generating information in this context.

Table 2 : Percentage of Paddy Land Conversion to Other Purposes

Paddy land converted (%)	Kuttippuram		Koovappady		Veliyanad		Total	
	Count	Per cent	Count	Per cent	Count	Per cent	Count	Per cent
Not converted	18	11.6	59	21.1	41	24.8	118	19.7
≤ 25	19	12.3	9	3.2	20	12.1	48	8.0
26-50	49	31.6	78	27.9	83	50.3	210	35.0
50-75	11	7.1	27	9.6	13	7.9	51	8.5
More than 75	58	37.4	107	38.2	8	4.8	173	28.8
Total	155	100.0	280	100.0	165	100.0	600	100.0

Chi square = 84.601**; p-value < 0.001

Source: Primary Data.

Since p-value is less than 0.001, Chi square value was found to be significant at 0.01 level. This indicates that there is significant difference among the three blocks in the conversion of paddy land to other purposes.

Results and Discussions

Kerala, the state in the south west region of India is a small narrow strip of land, was formed on 1st November 1956 as per the States Reorganization Act has a vast area of paddy fields and wetlands. In Kerala in the earlier ages agriculture was mainly meant as paddy cultivation. The Kerala culture has been very much dependent on paddy. But during the last several decades the paddy cultivation in Kerala has got reduced significantly.

Area of Paddy Cultivation in Kerala

Analyzing the area under paddy cultivation in Kerala it can be seen that there was a drastic reduction in the area of paddy cultivation.

Table 1: Area of Paddy Cultivation in Kerala.

Year	Area in '0000 ha
1960-61	77.8926
1970-71	87.4830
1980-81	80.1699
1990-91	55.9450
2000-01	34.7455
2010-11	21.3187
2013-14	19.9611
2017-18	18.9086

Source: Economic Review (Various Issues), Kerala State Planning Board, Thiruvananthapuram.

The State Agriculture Statistics 2012 reveals that after 2008, Kerala lost more than 25,000 hectares of rice fields. Paddy, which was the first choice among the crops in 1970s, has been pushed to the third position after coconut and rubber. In 1970, the rice production in Kerala was 1,365,000 tonnes and it fell to 569,000 tonnes in 2011-12. It is reported that in 39 years Kerala lost 7 lakhs hectares of paddy fields. (Mathrubhumi Newspaper daily dated February 14, 2015).

Percentage of Paddy Land Conversion

During the field survey detailed investigation was conducted among the paddy land owners regarding the area of paddy land converted for different purposes. Only 19.7 percent of the households did not convert their paddy lands. 8 percent converted less than or equal to 25 percent of their paddy lands. 35 percent converted 26-50 percent of their paddy lands. 8.5 percent converted 50- 75 percent and 28.8 percent converted more than 75 percent of their paddy lands.

Chi- square test was conducted to test whether there was any significant difference in the percentage of paddy land conversion in Kuttippuram, Koovappady and Veliyanad blocks. The result is presented in the Table.

The Conversion of Paddy Land under Reversible and Irreversible Form

The changes in the paddy land area were mainly by converting these to reversible form or irreversible form. The area under irreversible form poses a serious threat to both the society and the environment. The area of paddy field in the three study areas of Kuttippuram, Koovappady and Veliyanad are 226.2, 289.3 and 175.0 hectares respectively. Out of the total paddy field in the study area of Kuttippuram (226.2 ha) 170.4 ha were converted. Of this, 34.5 percent were reversible and 65.5 percent were irreversible. In Koovappady among the total paddy fields of 289.3 hectares, 254 hectares were converted and out of this only 31.5 percent

were reversible and 68.5 percent were irreversible land. In Veliyanad out of the 175 hectares of the paddy fields 69.25 percent were converted, 14.1 percent were reversible and 85.9 percent were irreversible. Thus among the total paddy land area of 690.4 hectares of paddy fields in the three regions a total of 493.65 hectares were converted and among this only 30.1 percent were reversible and 69.9 percent were irreversible. This brings out the seriousness of the paddy land conversion and if this trend is not brought under control the paddy fields in Kerala will be endangered. The following table gives the data regarding the area under reversible and irreversible paddy land area which changes its original use pattern.

Table 3: Area of Converted Paddy Fields under Reversible and Irreversible Form

Block	Reversible form		Irreversible form		Total land area converted
	Area	Percentage	Area	Percentage	
Kuttippuram	58.75	34.5	111.65	65.5	170.4
Koovappady	80	31.5	174	68.5	254
Veliyanad	9.75	14.1	59.5	85.9	69.25
Overall	148.5	30.1	345.15	69.9	493.65

Source: Primary Data.

Action from the Part of Authorities on the Paddy Land Conversion

The researcher enquired about whether the authorities take any action for the paddy land conversion. The field discussion clearly reveals that the laws to conserve the paddy lands and wetlands are confined only in paper. The sample households reveal the conversion process is done mainly on holidays and during nights. Even the machine used conversion is going on in the areas.

68.5 percent households reported that no action was taken from the part of the authorities. 31.5 percent reported in a positive way only in the sense that the authorities visit the concerned sites, but no further action was taken for preserving paddy fields.

Percentage of Paddy Land Converted for Other Purposes

Out of the 690.40 hectares of the paddy fields of the sample households 368.40 hectares was converted to other purposes. Out of this, 131.63 hectares were for the non food crops, 110.70 hectares for food crops, 97.33 hectares percent for buildings, 20.14 hectares for habitation purposes and for the construction of roads 7.61 percent was converted.

The respondents in Kuttippuram block revealed that the conversion of paddy fields for the fast food centres and automobile workshops creates severe problems to the quality of the water. In Koovappady block large scale conversion was done for the construction of ply wood industries which affects the existing paddy cultivation because of the discharge of the waste from it.

One important factor revealed by the respondents in Veliyanad block was that after getting the consent of converting paddy fields from the authorities for building houses for residential purposes, later it was used for the commercial purposes like construction of hotels and restaurants including home stays, petrol pumps, workshops etc since it was part of a tourist destination. A portion of paddy fields in Veliyanad block is near by the AC road where large number of tourists are travelling.

Implications of Paddy Land Conversion in Kerala

Paddy land and wetland resources are regarded as the most productive ecosystems in the world. There should be a concerted effort to restore or re-create these wetlands and paddy lands in order to compensate for those lost. Wetlands are valued highly for their high nutrient preservation and potential and their unique biodiversity. They are known for their distinctive flora and fauna. Rapid land use changes create positive and negative effects to the society and environment. Social, economical and political factors are responsible for this. This land use changing process threatens the sustainable development and its impact is unable to be measured.

Modes of Conversion of Paddy Fields

The major modes mentioned by the respondents for converting the paddy fields are putting sand from hillocks, putting sand as part of construction of infrastructural activities in the nearby areas, digging canals by manual work, digging canals by using machines, putting large stones and certain others factors. Putting sands from hillocks as a mode of conversion of paddy fields affects the environment mainly in two ways. Hills have the capacity of storing water and by razing down the hillocks the water flows to the low lying areas. Paddy fields serve as water-conserving tanks and it replenishes the ground water. By filling it the specific characteristics of paddy fields are lost. As the paddy fields are flooded parcel of land it helps to maintain the ground water level and much helpful for the recharging capacity of the nearby wells. The enchanted beauty of the paddy fields creates nostalgic feeling for many people in Kerala. Destruction of the paddy fields creates severe environmental issues.

Disappearance of Some Medicinal Plants and Some Creatures from the Paddy Fields during the Last Several Years

In Kerala Ayurvedic treatment especially 'Nattuvaidhyam' is very popular. Precious medicinal plants were seen in the bunds of paddy fields. The medicinal value

of such plants was known to these 'Nattuvaidhyans'. The respondents reported that such medicinal plants in the bunds of the paddy fields and small creatures are disappearing because of the conversion of the paddy fields. Almost all of the respondents (99.3 percent) are agree to this opinion.

Concerns for the Paddy Fields and Wetlands

Wetlands in their original form provide extensive benefits to the society. They provide main functions like biological productivity, water filtration, water storage and habitat for many species. The conversion of wetlands and its irreversibility involves many uncertainties and threat in the ecological and environmental processes. Fresh water availability is one of the important serious limitations in the state. Large scale conversion of wetlands, breaking the hillocks followed by the acute degradation of land and the consequent urbanization and industrialization results in the pollution resulted in the scarcity of safe drinking water. If proper and timely precautionary steps are not taken from the part of the authorities, this will become a very acute problem in the future.

The data from the Central Ground Water Department shows a reduction in the ground water level in the study regions. Kerala's abundant availability of rainfall, availability of water even in the summer season and food security is protected by the existence of vast paddy fields and their cultivation. Studies show that climatic changes and water shortage in Kerala was mainly due to the disappearance of vast area of paddy fields. Paddy fields which have minute soils and 1 Hectare of paddy field has the capacity of storing 5 lakh litres of water. 1 ha of paddy field conversion will result in the loss of 470000 litres of water for the summer season (Mathrubhumi Newspaper daily dated February 14, 2015).

Water Shortage during Summer Season in the Study Area

During the summer season major parts of Kerala are facing acute water shortage. 92.8 percent households responded that they have water shortage during summer season.

The discussion with the households reveals that the water shortage was not so acute in the past 20-30 years. They are of the opinion that changes in the use pattern of paddy fields play a key role in the water shortage because paddy fields act as the water reservoirs.

Responses made by the Households that Water Shortage was because of the Changes in the Paddy Land

The researcher enquired whether the shortage was due to the changes in the use pattern of paddy fields. Out of the respondents 87.0 percent are of the opinion that water shortage was due to the changes in the use pattern of the paddy fields.

Perception about whether Water Shortage was Due to the Changes in the Use Pattern of Paddy Land

91.2 percent of the total respondents agreed to this opinion. 7.7 strongly agreed to this opinion. 1.2 percent had no opinion regarding this.

Environmental Awareness regarding the Changes in Paddy Land Use

To analyze the impact of changes in the paddy land use on the environment, study was conducted among the sample households to assess whether they were aware about it. Regarding the environmental awareness of the sample households, reported that 97.2 percent were aware about the changes in the paddy land use pattern while 2.8 percent were not aware about it.

The respondents in the area are aware about the impact of the changes in the paddy land use and they fear that repercussions in the land filling will seriously affect their region. The interesting factor is that even with the awareness regarding the impact of the paddy land conversion this conversion is continuing in our society.

Challenges of Food Security

The drastic reduction in the paddy land area under cultivation in Kerala has grave implications in State's deficit in the matter of food grains. Degradation of the base for the agriculture especially natural resources like soil and water quality is one of the challenges for attaining food security. Many studies confirm that access to land is an important factor to access rural non agricultural activities. Micro food security ensured through access to land plays a crucial role in the rural employment. Agricultural land conversion seriously affects the micro food security.

The problem of food is the crux of the economic problems. In Kerala, rice being the staple food, the problem is its availability in sufficient quantity to meet the requirements. Kerala does not produce even one fourth of the rice requirements. Majority of the food grain requirements are met from the neighboring states especially Andhra Pradesh and Tamilnadu. The gap between production in Kerala and its requirement is widening every year.

Conclusions and Recommendations

The economy of Kerala changed its path from the traditional backward agrarian economy to a modern growing economy. There occurred a tremendous change in the agrarian structure of Kerala. With the introduction of the plantation crops farmers are in favour of these crops because of the high profitability. The result is the neglect of the cultivation of the traditional crop of Kerala especially paddy. Changes in the paddy land use in Kerala create several threats to the environment as well as the food security of the people. The conversion of the wetlands and paddy lands which are the ecological hotspots affects the water storing capacity of the soil. The remaining paddy fields of Kerala are to be preserved for the better future of the coming generations. The existing laws for protecting the wetlands and paddy fields give legal support for the preservation of the paddy fields. But in its enactment side there is much failure. The local self governments have to play an important role in conserving paddy fields and reviving paddy cultivation. The protection of these ecological spots is very important for the sustainable development of Kerala.

References

Alsterberg, C.; Roger, F.; Sundback, K.; Juhanson, J.; Hulth, S.; Hallin, S.; Gamfeldt, L. (2017). Habitat diversity and ecosystem multifunctionality—The importance of direct and indirect effects. *Science Advance*.

- Anthony Young "Land resources now and for future" Cambridge University Press. 2000
- Briassoulis, H. (1994). Pollution Prevention for Sustainable Development: The Land Use Question. *International Journal of Sustainable Development and World Ecology*, 2(1): 110-120.
- Davidson Davidson, N.C. (2014). How much wetland has the world lost? Long-term and recent trends in global wetland area. *Marine and Freshwater Research*.
- George, P.S. and Chandan, M. (1986). Rice Economy of Kerala-A disaggregate analysis of performance, Working Paper No. 2 13, CDS, TVM.
- Girma, H.M. and Hassan, R.M. (2015). Drivers of land-use change in the Southern Nations, Nationalities and People's Region of Ethiopia *African Journal of Agriculture and Resource Economics*.
- Jayan Jose Thomas (2011). Paddy Cultivation in Kerala, *Review of Agrarian Studies*, Vol. No.2 July- December. (2011).
- Lee Cho, Y.C.; Lee, S.M. and Lee, C.S. (2018). Floristic composition and species richness of soil seed bank in three abandoned rice paddies along a seral gradient in Gwangneung Forest Biosphere Reserve, South Korea. *Journal of Ecology and Environment*.
- Nair, G.K. (2004). Sharp fall in area under Paddy, *The Hindu Business Line Kochi*, February 3. 2004
- Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.
- Venkiteswaran, S. (1984). Changing cropping pattern and food economy of Kerala. *Agricultural Situation in India*, 39(1): 9.