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RESEARCH ARTICLE

SPATIO-TEMPORAL ANALYSIS OF LAND USE IN PALAKKAD DISTRICT, KERALA

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ABSTRACT

The present paper analyse the spatio-temporal variations in different type of land use in Palakkad District, Kerala. Agriculture is the main activity and 89% of the district population is rural in nature. The utilization of land for different purposes in the district indicates the relationship between the existing environmental condition and human society. The data on general land use for the period 2001 and 2011 were collected and processed by using simple statistical techniques and the results are cartographically mapped and interpreted. The analysis of the land use in the district revealed that land use is mainly controlled and determined by the topography nature of the surface and socio-economic setup of the district. The introduction of irrigation schemes, new developmental activities and expansion of the existing urban centres caused the major changes in the land use of forest, cultivable waste, fallow lands and area under cultivation in the district.

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INTRODUCTION

Land is considered to be the most important natural resource in all times. All agricultural, animal and forestry productions depend on the productivity of the land. It meets the community demand for food, energy and other needs of livelihood. The unsustainable and unplanned exploitation of this resource is of great concern today. Land use and its change has become a central component in current strategies for managing natural resources and monitoring changes in the earth system. The demand for this scarce resource is increasing with the rapid growth of population. The combination of population growth limited expansion of arable land and the growing need for non-agricultural purposes increases the pressure on the available space. Hence, the land and its inherent potential are under continuous threat due to a variety of natural degradation processes and human mismanagement. The ever increasing pressure on land calls upon the need for scientific and judicious use of every piece of land. The land use pattern of a region is an outcome of natural and socio-economic factors. The socio-temporal variation in land use and analyzing its causes and consequences are of primary concern to geographers.

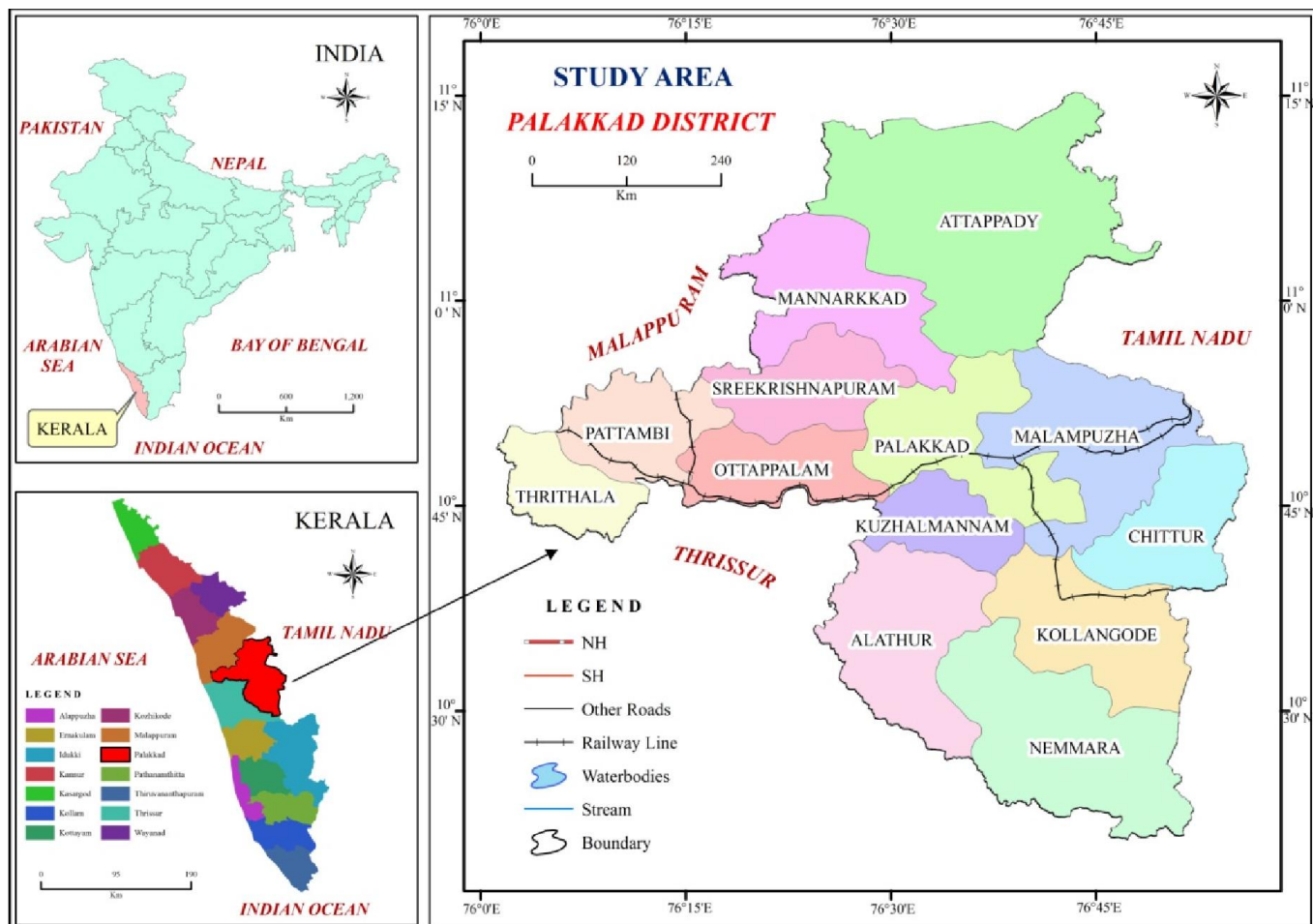
Hence the present study attempt on this aspect to bring out the spatio-temporal changes in land use in Palakkad district of Kerala state.

Study area

The study area Palakkad district is located in the central Kerala and its predominantly a rural district. The study area covers an area of 4480 sq.km and has a total population of 2810892 persons as per census 2011. It lies between 10°21'N and 11°14'N latitudes and 76°02'E and 76°54'E longitudes (Fig. 1) Topographically the district is divided into midland and high land. The elevation varies from 20m in the west to 2383m in the east. The district enjoys with two different types of climate. The western part of the district experiences humid climate with very hot season extending from March to June and a sub-humid climate in the eastern part. Maximum temperature is recorded in the month of May and minimum in December. The district receives an annual rainfall of 2140mm nearly 90% of the total rainfall is received during south west and north east monsoon season. Hill soils and Black cotton soils and forest soils are well distributed in most of the mid land plain area and laterite are seen in upland areas. The low land and plain in the mid land area are fully utilized for agricultural activities. Paddy, coconut, rubber, vegetables and fruits are the major crops cultivated in the district.

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Aim and Objectives of the study

1. To study the spatial and temporal variation in different types of land use between 2001 and 2011 and
2. To bring out the causes for the changes in land use.

MATERIALS AND METHODS

Data on general land use for the period 2001 and 2011 have been collected for 13 blocks including the municipal areas from the office of the department of Economics and Statistics located in Palakkad. The data were processed by using simple statistical techniques like percentages and averages and the results are cartographically brought out by using Arc GIS 9.3 version.

RESULTS AND DISCUSSION

The land use varies from place to place and determined by various natural and socio-economic and technological factors. The nine-fold land use classification of ICAR has been taken as the basis for the present study. However the current fallow, other fallow and fallow land types have been merged and considered as fallow land use. Thus, there are only seven types of land use namely, forest, non-agricultural land use, barren and uncultivable land use, tree crops and grazing lands, cultivable waste land, fallow lands and net sown area's are considered to bring out land use pattern in Palakkad district in the present study.

General land use characteristics of the district for two different periods, namely 2001 and 2011 are taken into consideration and portrayed to bring out the spatial variations in land use in Palakkad district.

General Land use in 2001

The land utilization of Palakkad district during 2001 and 2011 is given in the Table 1 and about 46.5% of the total geographical area was under agriculture. Forest cover occupied 31.0 % of the total geographical area. Nearly 10.3 % of the area is under non-agricultural use, which includes building and other non-agricultural, cultural setups. About 0.8 % of the Palakkad was under barren and uncultivable land. Tree crops and grazing land shares 0.4 % area of the district. About 5.8 % area was under cultivable waste and 5.2% of the area left out as fallow lands in 2001 which include other fallow and current fallow lands .

Table 1. Palakkad District- General Land use between 2001& 2011

Sl No	Land use category	2001 (Area in %)	2011 (Area in %)
1	Forest	31.0	30.4
2	Land put in non agricultural use	10.3	9.3
3	Barren and uncultivable land use	0.8	0.6
4	Tree crops and grazing land	0.4	0.9
5	Cultivable waste	5.8	8.3
6	Fallow lands	5.2	6.6
7	Net sown area	46.5	43.9

Source: Department of Economics and Statistics – Palakkad

General Land use in 2011

In 2011 about 44% of land in Palakkad district is brought under agricultural land use. The district has 30.4% of the area under forest cover. The table reveals that the land under non-agricultural uses accounts only for 9.3% of the total geographical area. Areas under barren and uncultivable land are 0.6% and the fallow land occupies 6.6% of the total geographical area in the district. The land under cultivable waste accounts for 8.3% and grazing land and tree crops land use has 0.9% in the district.

Block Level Land use Distribution and Change

The block wise land use in 2001 and 2011 is given in Table 2.

Forest

About 31% of the area was under forest in the district in 2001. This land use type occupied maximum areas in Attappady (63.4%) and Malampuzha (58%) blocks in the north and Nemmara (64%) block in the south. Mannarkkad block had 22% area under this category followed by Alathur (14.7%) block. Forest occupied 9.2% area in Kollengode and 8.1% of the area in Kuzhalmannam blocks. There is no forest cover in Chittur block and it is minimum in Thrithala, Palakkad, Sreekrishnapuram and Pattambi blocks in 2001.

In 2011 area under forest is confined only in few blocks particularly in Attappady, Mannarkkad, Nemmara and Malampuzha. Area under forest is maximum in Attappady, where it occupies nearly 63% of its total geographical area. Forest occupies 60% of the area in Nemmara and 41.6% in Malampuzha of Palakkad district. Area under forest occupies 14.3% of the area in Mannarkkad, 4.1% area in Kollengode, 2.9% of the area of Ottapalam block.

Out of the total 13 blocks, Chittur, Pattambi, Sreekrishnapuram and Thrithala do not have forest cover during 2011. The reserved forest cover occupies larger areas in Nemmara in the south and Attappady and Malampuzha blocks in the north and shares maximum forest cover areas in the district.

Temporally, the following changes are observed between 2001 and 2011,

- Chittur block had no forest cover in both time points. Sreekrishnapuram, Pattambi, and Thrithala had minimal forest cover in 2001 but no forest cover in 2011.
- Malampuzha and Alathur blocks experienced maximum decline in this type of land use where forests are cleared for agriculture and tree crops. A remarkable decline of forest cover is noticed in Mannarkkad, Kuzhalmannam and Kollengode blocks.

Non Agricultural Land use

Nearly 11 % of the total geographical area of the district was under non-agricultural use, which includes built-up areas, cultural setups and transport facilities. Area under non-agricultural use was maximum in Chittur block, where it occupied nearly 20% of its total geographical area. It had a share between 10 and 15% in almost all the other blocks except Attappady, Mannarkkad and Nemmara. The area under non-agricultural use was very minimum in Mannarkkad (7.3%) Nemmara block (4.2%) and Attappady block with 2%. The topography of these three areas are mostly hills with reserve forest cover, which obstruct the developmental activities in these areas. In 2011, about 9.3% of the total geographical area is under non-agricultural use in Palakkad district. Area under non-agricultural use varies from a minimum of 2.8% to a maximum of 14% in the blocks.

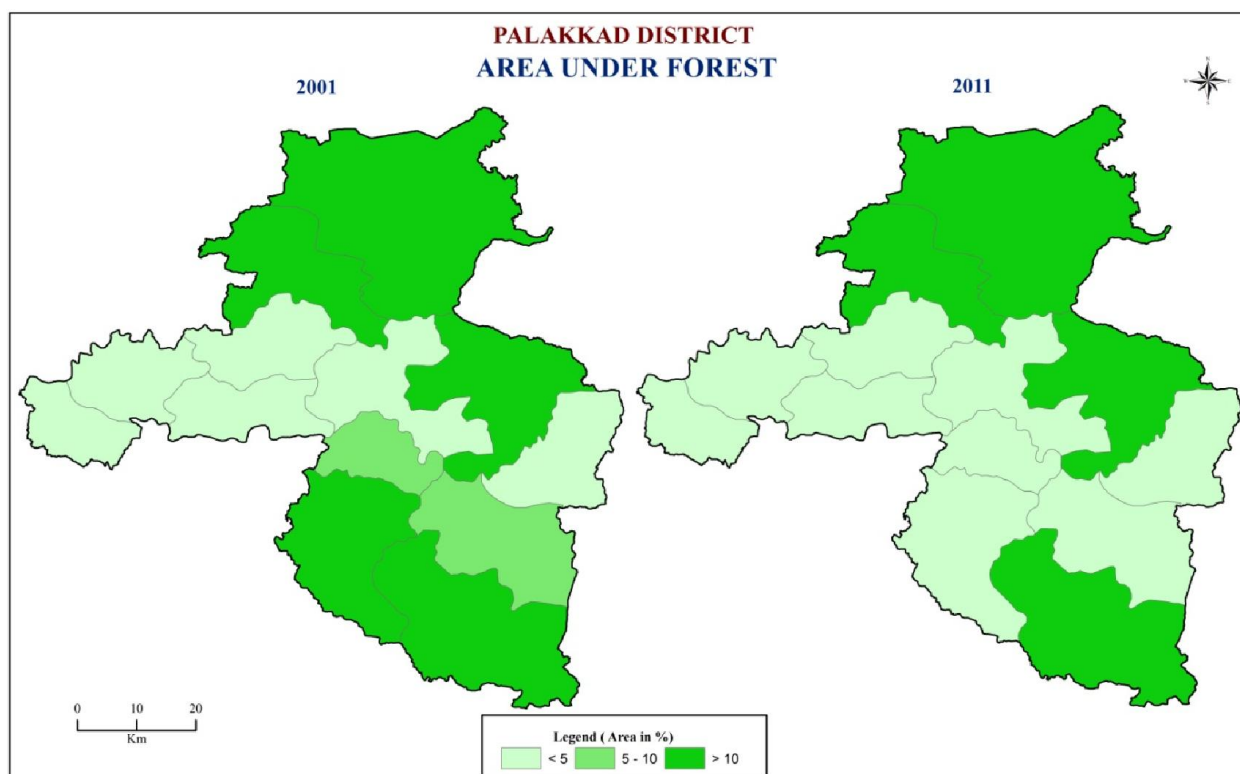


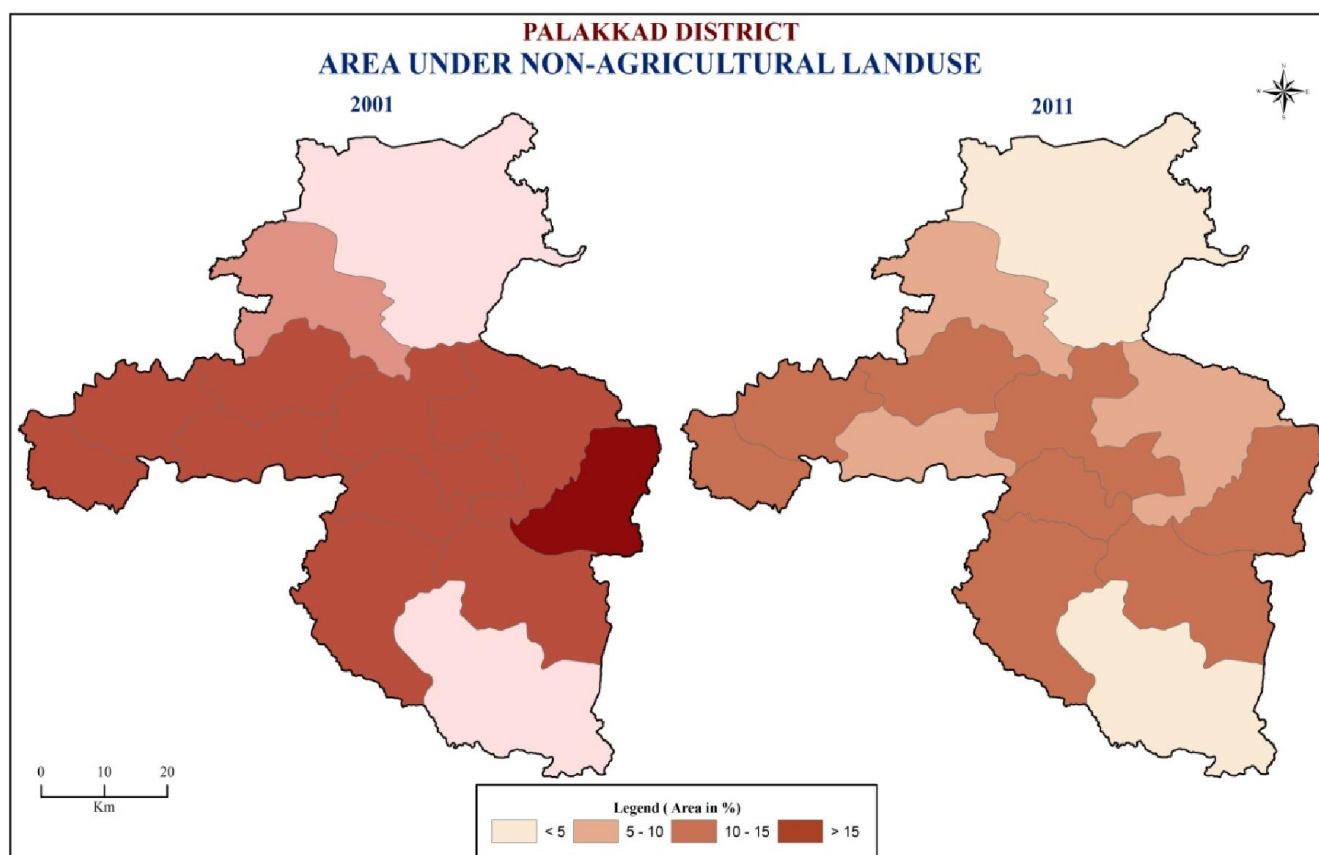
Table 2. Palakkad district – General Land use 2001 & 2011 (In percentage)

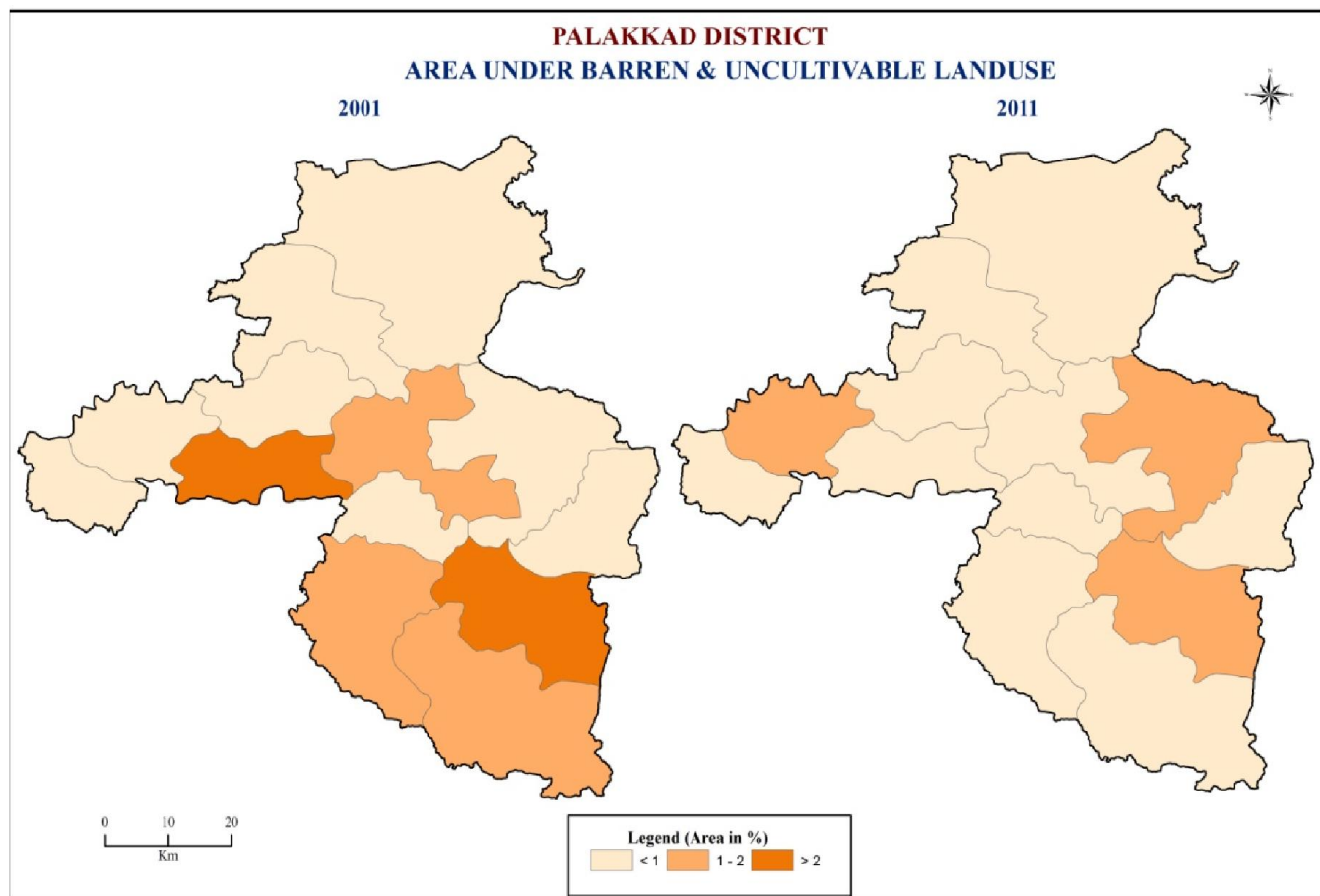
Sl. No	Block Names	Forest			Non Agricultural Land use			Barren and Un cultivable Land use			Tree crops and Grazing Land use		
		2001	2011	Change	2001	2011	Change	2001	2011	Change	2001	2011	Change
1	Alattur	14.7	1	-13.7	11.8	10.6	-1.2	1.8	0.8	-1	4.8	0.3	4.5
2	Attappady	63.4	63.1	-0.3	3	4.8	1.8	0.8	0.1	-1	0.6	0.4	0.2
3	Chittur	0	0	0	19.4	11.5	-7.9	0.8	0.7	0	0.2	0.1	-0.1
4	Kollangode	9.2	4.1	-5.1	11.5	11.5	-0.1	2.8	1.4	-1	0.4	0.1	-0.3
5	Kuzhalmannam	8.1	1.7	-6.4	14	11.1	-2.9	0.6	0.7	0.1	1.2	0.2	-1
6	Malampuzha	57.8	41.6	-16.2	13.7	9.8	-3.9	0.9	1.7	0.8	0.5	0.1	-0.4
7	Mannarkkad	21.9	14.3	-7.6	7.3	7.9	0.6	0.3	0.1	0	0.4	0.1	-0.3
8	Nemmara	64	60.1	-3.9	4.2	2.8	-1.4	1.3	0.6	-1	1.8	0	-1.8
9	Ottappalam	3.7	2.9	-0.8	13	9.2	-3.8	3.1	0.7	-1	1.5	0.4	-1.1
10	Palakkad	4.3	0.8	-3.5	10.6	11.6	1	1.1	0.7	0	1.1	0.2	-1
11	Pattambi	1.2	-	-1.2	14	14.1	0.1	1	1.1	0.1	0.6	0.5	-0.1
12	Sreekrishnapuram	3.7	-	-3.7	10.7	13.9	3.2	0.6	0.3	0	1.2	0.4	-1
13	Thrithala	0.7	-	-0.7	11.5	11.5	0	0.4	0.4	0	0.5	0.3	-0.2

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Sl.No	Block Names	Cultivable Waste Land			Fallow Land			Net Sown area		
		2001	2011	Change	2001	2011	Change	2001	2011	Change
1	Alattur	6.9	22	15.1	2.7	2.9	0.2	56.4	62.4	6
2	Attappady	1.7	0.8	-0.9	8.3	7.8	-1	22.3	23	0.7
3	Chittur	1.2	10.7	9.5	3.8	5.7	1.9	74.4	71.2	-3.2
4	Kollangode	4.1	13.6	9.5	3	6.8	3.8	70	62.5	-7.5
5	Kuzhalmannam	3.1	2.7	-0.4	3.3	6.5	3.2	70.3	77.2	6.9
6	Malampuzha	2.4	5.4	3	6	7.1	1.1	18.7	34.3	15.6
7	Mannarkkad	4.9	4.5	-0.4	1.9	1.7	-0.2	63.2	71.3	8.1
8	Nemmara	5.1	7.2	2.1	0.6	0.3	-0.3	23	28.7	5.7
9	Ottappalam	25.5	15.7	-9.8	7.8	5.3	-2.5	45.4	68.2	22.8
10	Palakkad	25.2	14.4	-10.8	8.6	7.2	-1.4	49.1	65.1	16
11	Pattambi	2.8	10.9	8.1	13	6.3	-6.7	67.5	66.9	-0.6
12	Sreekrishnapuram	3.4	6.5	3.1	6.8	2.6	-4.2	73.6	77.6	4
13	Thrithala	2.1	13.3	11.2	10	12	2	74.5	62.8	-11.7

Source: Compiled by the Investigator





Pattambi block has the maximum of 14% of its total area under non agricultural use followed by Sreekrishnapuram 13.9%. Area under non-agricultural use accounts 11 to 12% of the area in Chittur, Kollengode, Kuzhalmannam, Palakkad and Thrithala blocks. Alathur has 10.6% of its area under non-agricultural use followed by Malampuzha 9.8% Ottappalam 9.2% and Mannarkkad 7.9%. The plain areas with well developed agricultural practices favoured more developmental activities in these areas, leading to sizable increase in area under non agricultural use.

The non-agriculture use is very minimum in Attappady and Nemmara blocks where it occupies 4.8% and 2.8% respectively. The hilly terrain with vast reserved forest area obstructs the development of settlements and transport facilities in these areas.

- Area under non-agricultural uses increased in 6 blocks and decreased in 5 blocks, whereas there is no change in 2 blocks during the study period.
- Palakkad and Sreekrishnapuram registered the highest increase of this land use while Chittur experienced to maximum decline during the selected time period.
- The introduction of irrigation scheme in Chittur block may be a factor for conversion of non-agricultural land to agricultural activities in 2011.
- Malampuzha, Kuzhalmannam and Ottappalam blocks have registered decrease due to the conversion old land and built up areas in to agricultural purpose and no changes in area in Kollengode and Thrithala blocks.

Barren and Uncultivable Land use

In 2001 barren and uncultivable land occupied less than 1% of the total geographical area of the district. Ottappalam, Kollengode, Alathur, Kuzhalmannam, Nemmara, Palakkad and Pattambi blocks had more than 1% of their areas under barren and uncultivable waste. Ottappalam had 3.1% of its area under barren land followed by 2.8% in Kollengode and 1.8% in Alathur. It was 1.1% in Palakkad and 1% in Pattambi blocks. Attappady, Chittur, Kuzhalmannam, Malampuzha, Mannarkkad, Sreekrishnapuram and Thrithala blocks had less than 1% of their areas under barren and uncultivable land during 2001.

In 2011, nearly 0.6% of the total geographical area of the Palakkad district is under barren and uncultivable land. The area under barren and uncultivable land is comparatively very low in all the blocks in Palakkad district. They occupied from a minimum of 0.3% to a maximum of 1.7% of the total geographical area in the blocks. Kollengode, Malampuzha and Pattambi blocks have more than 1% of their land under barren and uncultivable land. It is between 0.6% and 0.8% in Alathur, Chittur, Kuzhalmannam, Nemmara, Ottappalam and Palakkad blocks. Area under barren land is very minimum i.e. less than 0.4% in Sreekrishnapuram, Thrithala, Attappady and Mannarkkad blocks.

- Decline of area under barren land use occurred in all the blocks except in Malampuzha.

- Malampuzha block registered a 0.8% increase under this category due to introduction of irrigation project.

Tree crops and Grazing Land

In 2001, area occupied by tree crops and grazing land was very meager in Palakkad district. Alathur had the maximum share of 4.8% of its area under this category followed by Nemmara block (1.8%). Kuzhalmannam, Ottapalam, Palakkad and Sreekrishnapuram blocks had about 1% of their area under grazing lands and tree crops.

In 2011, nearly 1% of the total geographical area is under this category in Palakkad district. This land use has a meager share in almost all the blocks, except Thrithala and Sreekrishnapuram. Thrithala has the maximum of 13% of its area under grazing lands and tree crops followed by Sreekrishnapuram (4.9%).

- Maximum increase in this category is noticed in Thrithala and Sreekrishnapuram blocks.
- The introduction of social forestry and new tree plantation programmes carried out by the government and private organization in Thrithala and Sreekrishnapuram areas may be the major factor for this notable increase.

Cultivable Waste Land in 2001

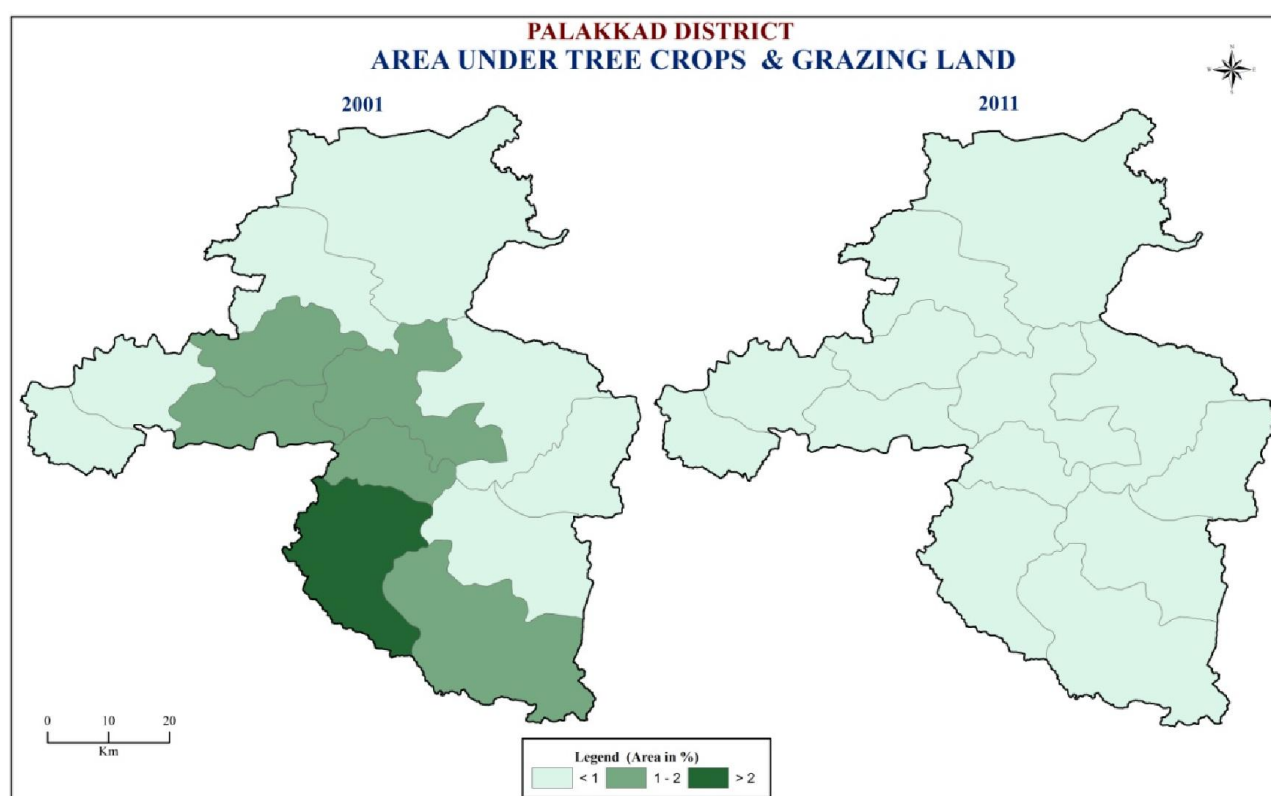
About 5.8% of the area was under cultivable waste in Palakkad district during 2001. Ottapalam block had maximum of cultivable waste land with 25.5% of its area followed by Palakkad block (25.2%). Cultivable waste land occupied 3 to 7% of the areas in Alathur, Kollengode, Mannarkkad, Sreekrishnapuram, Nemmara and Kuzhalmannam blocks. Area under cultivable waste land was between 1 to 3% in Attappady, Chittur, Malampuzha, Pattambi and Thrithala blocks.

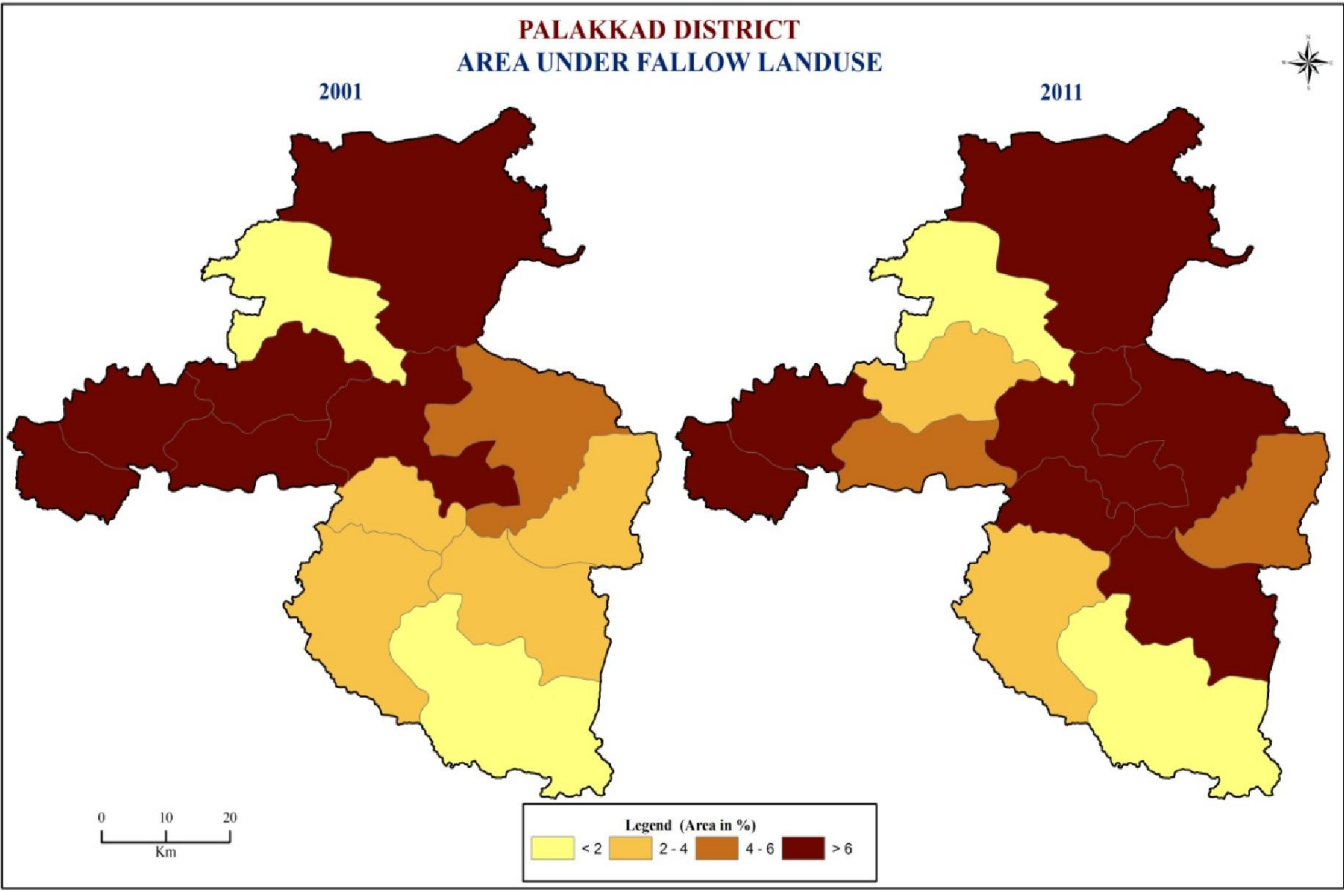
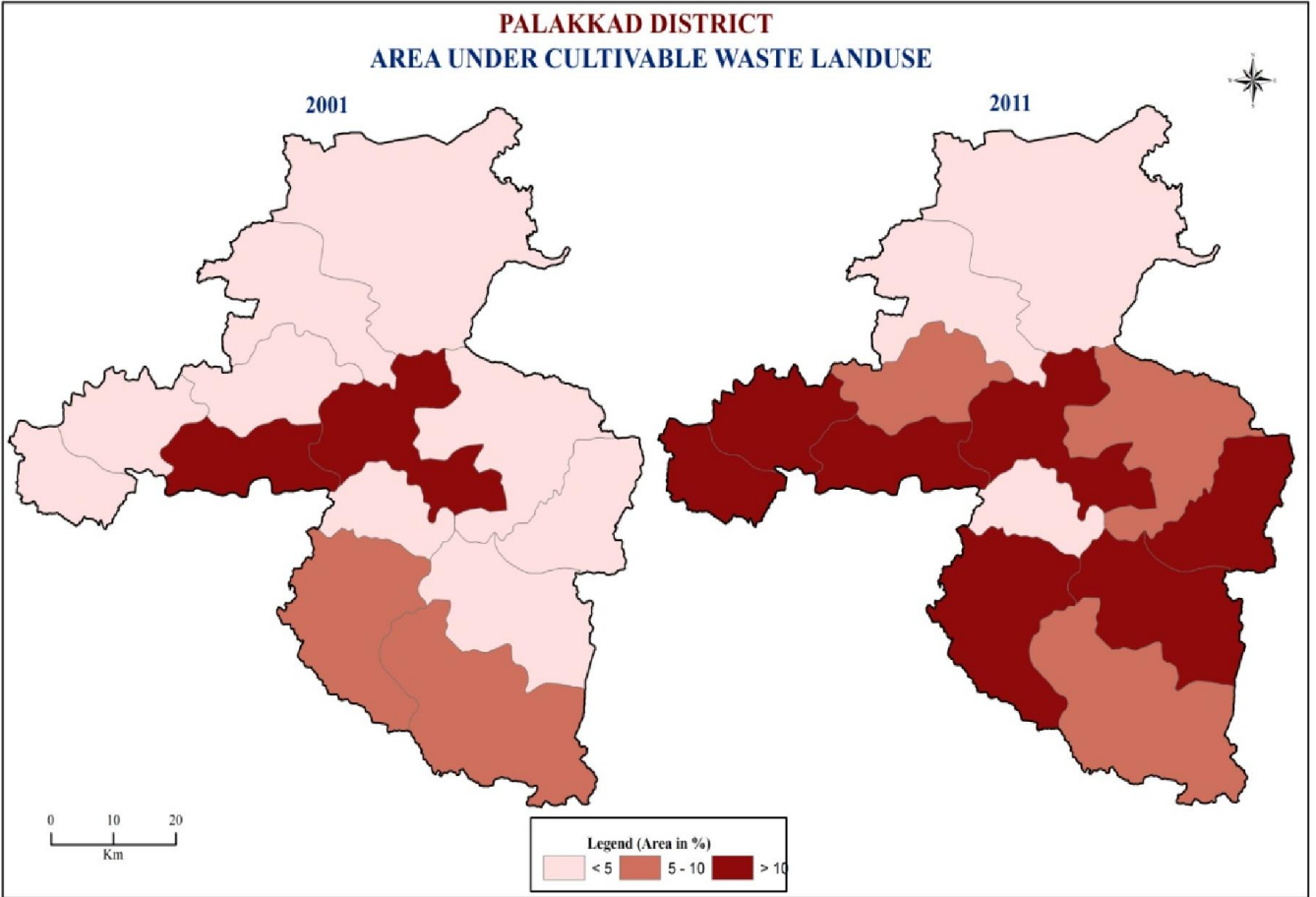
In 2011 about 8.3% of the total geographical area of the Palakkad district is under cultivable waste land. Alathur block has maximum of 22% of its area under cultivable waste followed by Ottapalam block (15.7%). It occupies 5 to 8% of the areas in Chittur, Malampuzha, Nemmara and Sreekrishnapuram blocks. Area under cultivable waste is very minimum in Attappady block. It is between 2 to 5% in the remaining blocks of Palakkad district.

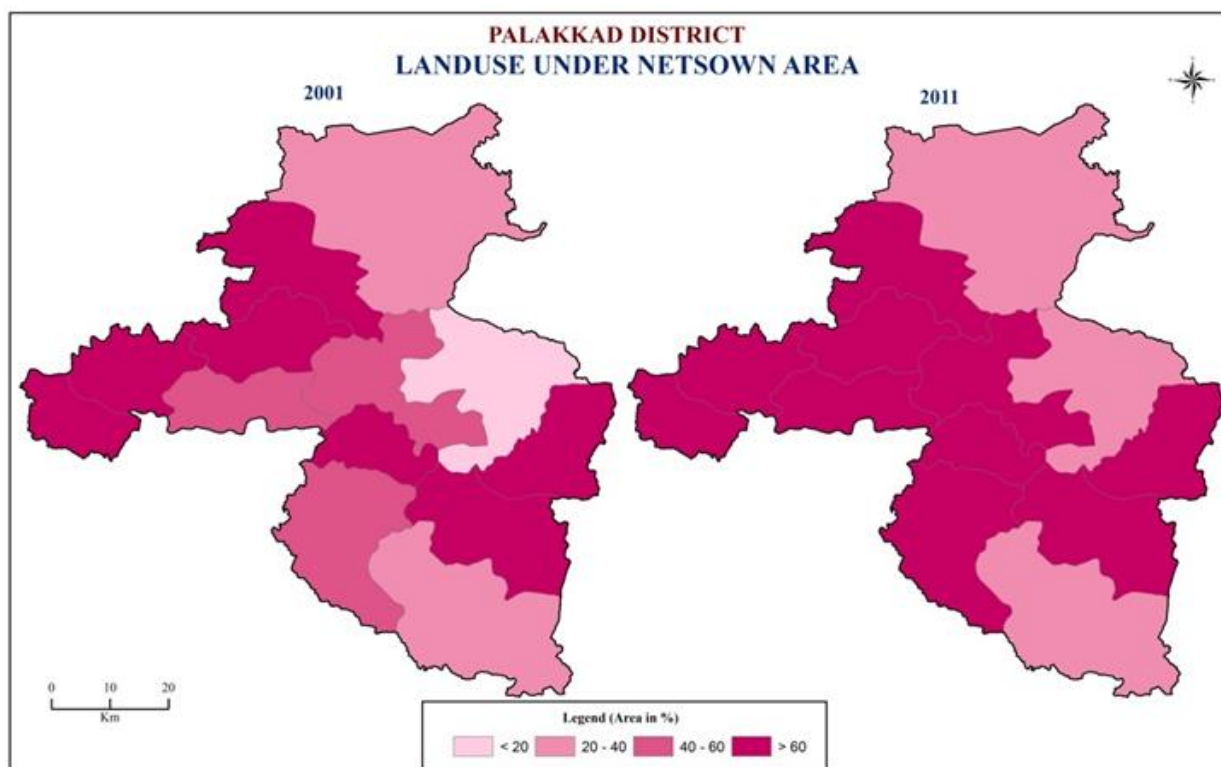
- An increase in area under cultivable waste land is noticed in 8 blocks, Alathur block recorded maximum increase of 15.1% area under this category. Remarkable increase in this category is noticed in Thrithala, Chittur, Kollengode and Pattambi blocks.
- The introduction of minor irrigation schemes to support agricultural activities in these areas might have resulted in an increase of land under cultivable waste in most of the blocks in the district.

Fallow Land use

This category includes fallow lands of current fallow and other fallow lands. In 2001 fallow lands occupied 5.2% of the total geographical area of the district. Fallow lands are maximum in Pattambi, where it occupied 13% of its total area, followed by Thrithala (10.2%). Areas under fallow lands are between 6 and 9% in Attappady, Malampuzha, Ottapalam, Palakkad and Sreekrishnapuram blocks. Palakkad and Attappady had more than 8% of their area under fallow lands. Fallow lands occupied 3.8% of the area in Chittur block, 3.5% in Kuzhalmannam, 3% in Kollengode, 2.7% in Alathur and 1.9% in Mannarkkad blocks in 2001. The fallow lands are minimum in Nemmara block. In 2011 nearly 6.6% of the total geographical area of the Palakkad district is under fallow lands. Fallow land occupies very meager area in Nemmara block (0.3%). Fallow lands are maximum in Thrithala block (11.1%).







Fallow land occupies 5 to 8% of the areas in Attappady, Palakkad, Pattambi, Ottapalam, Malampuzha, Kuzhalmannam, Kollengode and Chittur blocks. Alathur (2.9%) and Sreekrishnapuram (2.6%) have nearly 3% of their area under fallow lands in the district in 2011.

- Areas under fallow lands increased in 6 blocks and decreased in 7 blocks in Palakkad district.
- Marginal increase is noticed in Kollengode, Kuzhalmannam, Alathur, Thrithala, Malampuzha and Chittur blocks. The increase of land value in nearby urban areas and demand for more residence influenced the agricultural practices in these areas. It causes the increase of area under fallow land in Palakkad district.
- Decline of this category is noticed in Pattambi, Sreekrishnapuram, Ottapalam and Palakkad blocks. The introduction of minor irrigation schemes and conversion of land in to residential and commercial uses caused the decrease of fallow lands in these areas in Palakkad district.

Net Sown Area

In 2001, nearly 47% of area was under cultivation in Palakkad district. Area under cultivation varied from a minimum of 18.7% to maximum of 74% in the blocks. Area under cultivation was above 70% in Chittur, Kollengode, Kuzhalmannam, Sreekrishnapuram and Thrithala blocks. The availability of irrigation facilities in these areas favours suitable crop cultivation in these areas. Area under cultivation was more than 60% in Mannarkkad and Pattambi blocks. It was 45 to 56% in Alathur, Ottapalam and Palakkad blocks. Area under cultivation was less than 30% in Attappady (22.3%) Nemmara (23%) and Malampuzha block (18.7%).

The hill areas with reserved forest cover restricted the area under cultivation in these areas. In 2011 nearly 44% of the total geographical area of the Palakkad district is under cultivation. Net sown area among the blocks shows that it varies from a share of 23% to maximum of 77%. The area under cultivation is above 70% in Sreekrishnapuram, Kuzhalmannam, Chittur and Mannarkkad blocks. Area under cultivation is between 60 and 70% in the Ottapalam, Alathur, Kollengode, Palakkad, Pattambi and Thrithala blocks. Attappady block has only 23% of its area under agriculture. Area under cultivation is 28.7% in Nemmara and 34.3% in Malampuzha block. It is interesting to note that area under cultivation is well above 60% in most of the blocks located in midland and lowland plain areas. Area under cultivation is less than 35% in hilly areas of north and south of the district.

- The area under cultivation increased in nine blocks and decreased in four blocks in Palakkad district. An increase in area under cultivation is maximum in Ottapalam, Malampuzha, Palakkad, Kuzhalmannam, Mannarkad, Nemmara and Sreekrishnapuram blocks.
- The increase in area under cultivation resulted mainly due to the introduction of irrigation schemes and conversion of old residential and mixed land use areas for agricultural purpose in these areas.
- Decrease of area under cultivation is noticed in four blocks of Thrithala (11.7%) Kollengode (7.5%) and Chittur blocks (3.2%). The decreases of net sown area in these areas mostly resulted due to the conversion of agricultural lands into residential, transport and communication purpose. The expansion of urban centers and introduction of manufacturing units in these blocks caused the changes in agricultural land use in these areas.

Conclusion

To sum up, the analysis of the general land use pattern and its changes reveals that area under forest, barren uncultivable land use, tree crops and grazing lands decreased in most of the blocks. An increase in land under cultivable waste and fallow lands occurred in the district. Area under cultivation increased in 9 blocks and decreased in 4 blocks during this period of the study in Palakkad district.

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