

Detecting land use and land cover changes of Thanjavur block in Thanjavur district, Tamilnadu, India from 1991 to 2009 using geographical information system

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ABSTRACT

Land use and land cover is dominant role in the part of urbanization. As the rapid urbanization led various activities in a region and these changes generally takes place in the agricultural land and caused decrease of arable land .The satellite imageries LANDSAT 5TM (1991), LANDSAT 7ETM (1999) AND LISS 111 (2009) data's are used. The scales are 1:50,000 and 1:250,000. 1991, 1999 and 2009 covering a period of 19 years the aerial distribution of the land use and land cover changes has been observed. The changes were identified ,in which the decrease of Agricultural land, Mixed plantation, Scrub land and Water body and increase of Built up land, Fallow land, River sand and Without scrub land. The land use and land cover maps are prepared by using GIS software to evaluate the changes and it is showed strong variation.

Key words: Land use and land cover, urbanization, Thanjavur block and GIS.

INTRODUCTION

Land is the basic resources of human society. It is the most significant among the natural resources of the country and most of its inhabitants depend on agriculture for their livelihood. Land is being used by people for various purposes. The basic requirement of human society is food. Farmers produce food from the land. The second important basic need of the people is home. It takes a very higher priority in its demand of land. Land use / Land cover exhibits the physical and economical situation of any region. Land use / Land cover determines the standard of living of the people and the natural resources found in a region. The development of human race started to develop from when man started to convert the land cover region to land use. Land use and land cover changes degrade and have an instant impact on the global carbon cycle. The global cycle can add or remove carbon di- oxide from the atmosphere, contributing to climate changes which lead to global warming. The information on land use/land cover patterns, their spatial distribution and changes over a time scale are prerequisite for making development plans[4].

A substantial amount of data from the Earth's surface is collected using Remote Sensing (RS) and Geographic Information Systems (GIS) tools. RS provides an excellent source of data from which updated land use/land cover (LULC) information and changes can be extracted, analyzed and simulated efficiently. RS in the form of aerial photography provides comprehensive information of urban changes [1]. It is not, however, without limitations: costs of the acquisition and the analogue data format are the most obvious problems. The cost of acquiring data causes many analysts to remain skeptical about the potential of remotely sensed data [13]. It should also be noted that LULC mapping using remote sensing has long been a research focus of various investigators [2].

Change detection normally entails the application of multi-temporal datasets to quantitatively analyse the temporal effects of the phenomenon. Because of the advantages of repetitive data acquisition, its synoptic view, and digital format suitable for computer processing, remotely sensed data such as Thematic Mapper, Probatoired Observation de la Terre (SPOT), radar and Advanced Very High Resolution Radiometer (AVHRR), have become the major data sources for different change detection applications during the past decades cited by Lu et al[8].

Many methods of change detection have been developed to detect land cover change [6,11] but by far the most popular has been the utilization of post classification comparison method. In spite of the numerous evaluations of these techniques [14], no standard techniques have yet been adopted [9] for all cases. Although the development of RS technology has been developed dramatically within last few years, examples of effective LULC change detection studies remain relatively rare [7].

Owojori and Xie [12] have shown the example of post classification in the study demonstrated the potential for accurate LULC change assessment with advanced atmospheric correction and object-oriented image analysis using medium resolution satellite data (Landsat TM).

The Patterns of land use change and analysis of temporal changes can easily be identified with remote sensing technology in a way that provides an optimal trade-off between cost, accuracy and reliability. The multi-temporal analysis of changes in the land cover provides sufficient information about the dynamics of this typical land use as cited by Maldonado et al [10]. Remote sensing technology over the decades has been an indispensable tool in environmental modeling. Timely and accurate change detection of Earth's surface features is extremely important for understanding relationships and interactions between human and natural phenomena in order to promote better decision making as cited by Lu et al[8].

Aims and objectives.

The aim of the present study is to analyze the land use and cover changes in Thajavur block. The following objectives are as follows.

1. To understand the general topography of the study area.
2. To study the land use categories.
3. To study the land use changes.
4. To use GIS in mapping of Land use land cover changes.
5. Interpretation of land use and land cover changes based on the image analysis.
6. Accuracy assessment to prove the reality with reference to GIS based maps.

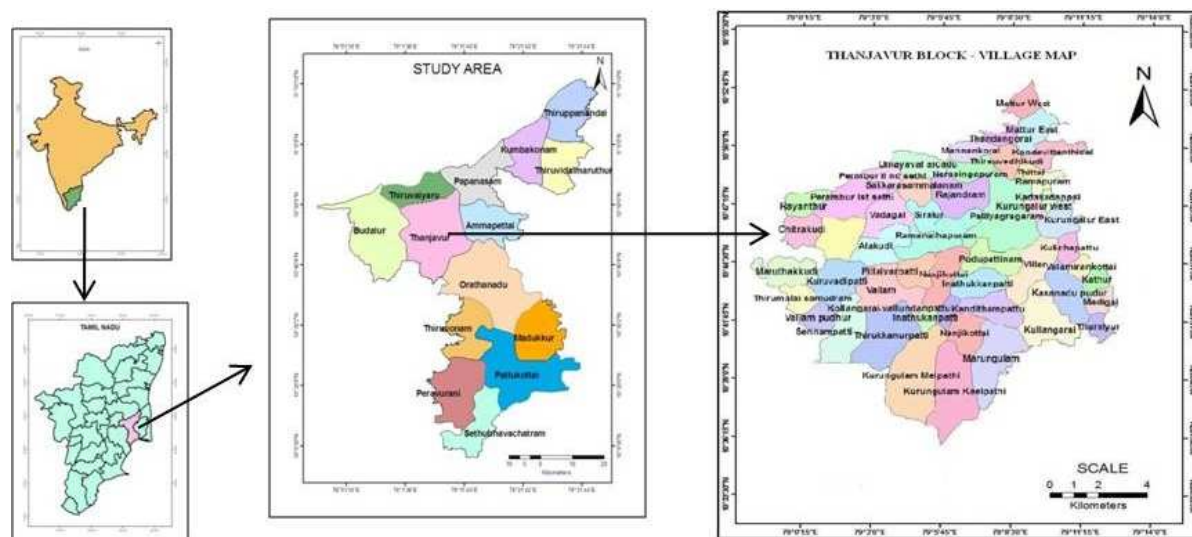


Fig.1. Location of map of the study area.

GEOGRAPHY OF THE STUDY AREA

The study area is located in Thanjavur District from Tamil Nadu. It is the most important urbanized block in Thanjavur District. Thanjavur block has an area of 433.8sq.km with 61 villages. The area under investigation lies in between the Long 79° 0'15'' E to 79° 14'0'' E and Lat. 10° 33' 30'' N to 10° 55'30'' N. This block is bounded to East of Papanasam, Ammapettai and Kumbakonam blocks, West to Budalur, and south by Orathanadu and

Madukkur, North by Thiruvaiyaru block is bounded. This block has rapid urbanization and industrialization of small scale and large scale areas. The study areas are situated in the tropical monsoon region. The climate is more suitable for agricultural purposes. The village map and location maps are shown in fig(1).

Geologically the study area can be broadly divided into four geological zones viz. Mineral resources locally exploited are restricted to brick and tile clays, Kankar and salt and Vallam gravels. Occurrences of Oil drilled (ONGC 1993) and lignite (MEC) are recorded in the area. Geomorphologically the study area is fluvial land forms and very rich in alluvial soil.

MATERIALS AND METHODS

The sources of data have been collected from the statistical offices, agricultural offices and soil survey offices in thanjavur district. The NRSA satellite imageries of LANDSAT 5TM (1991), LANDSAT 7 ETM (1999) and LISS III (2009) are used for image analysis. The simple statistical techniques were applied to present land use land cover changes of given study area. The satellite imagery scales are 1:50,000 (1991, 1999) and 1:250,000 (2009).

The supervised method of image classification is followed for image analysis with accuracy assessment is carried out to avoid misclassification. The study area maps are prepared by using Indian topo sheets with the scale of 1:50,000. The change maps are prepared by using the ERDAS and GIS software.

IMAGE ANALYSIS.

In 1991, 1999 and 2009 covering a period of 19 years the aerial distribution of the land use and land cover changes has been presented in the percentage of distribution. In this period many land use and land cover changes has been identified. Each land use and land cover categories has been changing in positive and negatively has been changing since 1991, 1999, and 2009. Within the two segment periods of 9 and 10 years of the selected is observed many changes. The land use and land cover maps are prepared to analysis purpose. From the analysis land use showed strong variation and these all variations are given in the table (1) and in the figure(2).

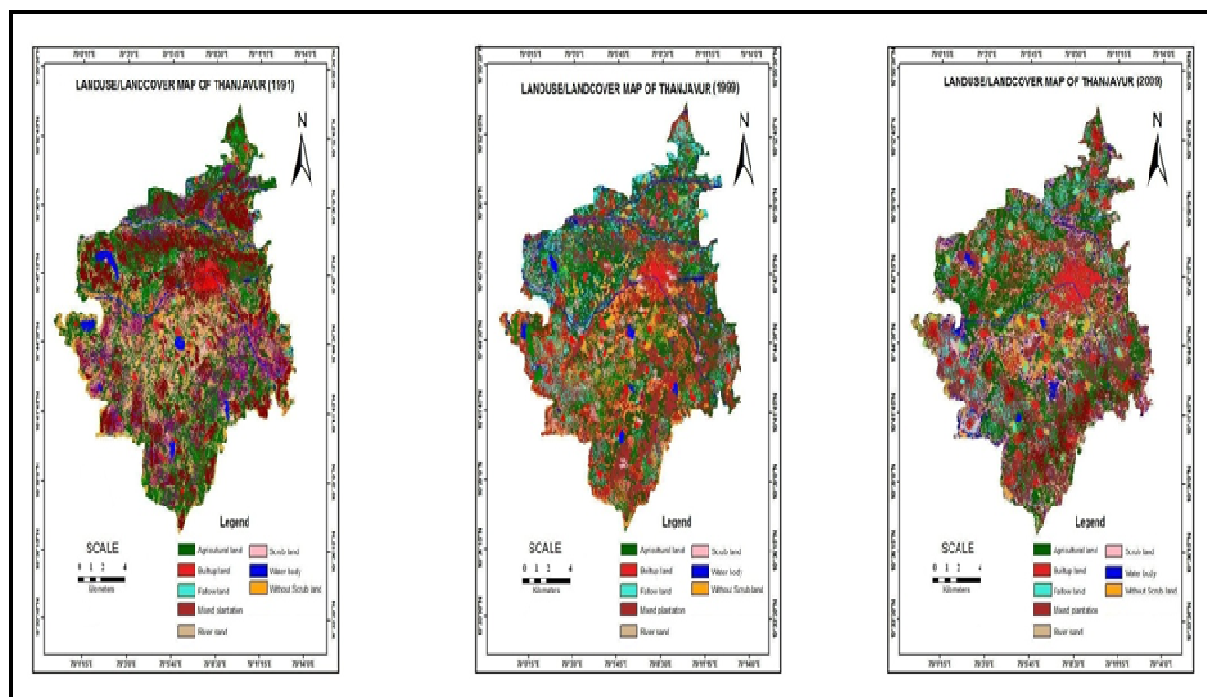


Fig. 2. Land use and land cover changes in Thanjavur block-from 1991,1999 and 2009.

The above table (1) and the figure(3) shows the statistics of land use land cover changes from 1991-2009. In 1991-99 period, the categories of agricultural land, mixed plantation, scrub land and water body are decreased with 0.14%, 0.75%, 1.7% and 0.12% respectively. The categories of built up land, fallow land, river sand and without scrub land have increased with 1.23%, 0.71%, 0.17% and 0.61% respectively.

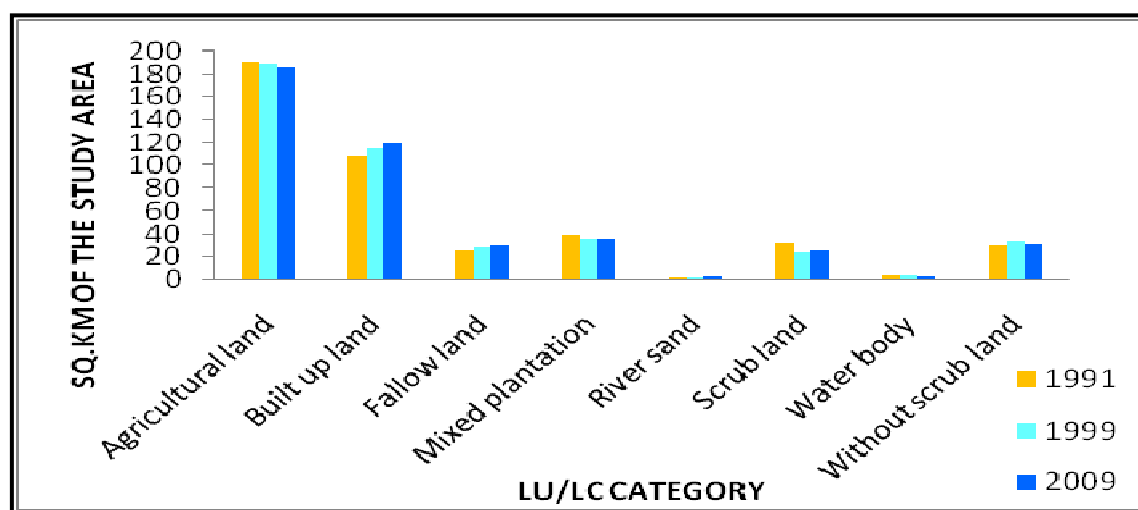
In 1999-2009 period, the categories of agricultural land, mixed plantation, water body and without scrub land are decreased with 0.89%, 0.25%, 0.03% and 0.31% respectively. The categories of build up land, fallow land, river sand and scrub land have increased with 1.12%, 0.26%, 0.04% and 0.07% respectively.

Table.1. Land use and land cover changes in Thanjavur block. from 1991 to 2009.

Description	1991		1999		2009		Changes in percentage		
	Area (sq.km)	Area (%)	Area (sq.km)	Area (%)	Area (sq.km)	Area (%)	1991-1999	1999-2009	1991-2009
Agricultural land	190.23	43.85	189.62	43.71	185.76	42.82	-0.14	-0.89	-1.03
Built up land	109.46	25.23	114.78	26.46	119.63	27.58	1.23	1.12	2.35
Fallow land	25.23	5.82	28.32	6.53	29.44	6.79	0.71	0.26	0.97
Mixed plantation	39.78	9.17	36.52	8.42	35.42	8.17	-0.75	-0.25	-1
River sand	2.14	0.49	2.88	0.66	3.02	0.70	0.17	0.04	0.21
Scrub land	31.79	7.33	24.44	5.63	24.72	5.70	-1.7	0.07	-1.63
Water body	4.83	1.11	4.29	0.99	4.17	0.96	-0.12	-0.03	-0.15
Without scrub land	30.34	6.99	32.96	7.60	31.62	7.29	0.61	-0.31	0.3
Total	433.83	100	433.83	100	433.83	100	-	-	-

In general the changes in the period of 1991-2009 are the categories of agricultural land, mixed plantation, scrub land and water body are decreased with 1.03%, 1%, 1.63% and 0.15 % respectively. The categories of build up land, fallow land, river sand and without scrub land have increased with 2.35%, 0.97%, 0.21% and 0.3% respectively.

Fig.3. Land use and land cover changes in 1991, 1999 and 2009 (In sqkms)



(i) Agricultural land.

Crop land is the major land use category observed in this block. It has undergone several changes in the area. The agricultural land was highly concentrated in Northern and Southern side of the block. The agricultural land occupied the areas of Alankudi, Chithrakudi, Inathukkanpatti, Kadakadappai, Kalvirayanpettai, Kandithampattu, Kasanadu pudur, Kattur, Kollangarai, Kondavittanthidal, Kudalur, Kulichapattu, Kurungalur, Kurungulam East, Kurungulam west, Kuruvadipatti, Madigai, Manakkarambai, Manangorai, Mariammankoil, Marudhakudi, Marungulam, Mathur East, Melaveli, Monnaiyampatti, Nagathi, Nallicheri, Pudupattinam, Ramapuram, Sennampatti, Thandagorai, Vadagal, Vannarapettai, Thandangorai, Soorakkottai, Thirumalaisamuthiram, Thottakadu, Uamayaval Arcadu, Vallampudur, Valamirankottai, Vilar, Siralur, Rayanthur, Rajendram, Thittai, and Thuraiyur. These areas were under the agricultural activities. It occupied an area of 190.23sq.km (43.85%) in 1991.

In 1999, the agriculture land occupied an area of 189.62sq.km (43.71%). In 1991 compared to 1999 in the nine year period the reduction of land has been identified i.e., 0.14%. In some villages, it has been added from mixed plantations and built-up in such villages were Marudukkudi, Thirumalaisamuthiram, Vallam, Chitrakudi, Alakudi, Mattur East, Rayanthur, Palliyagaram, Villar, and Nanjikottai. It was missed in agriculture land and it goes the fallow land in Mattur, Manongorai, Ramapuram, Palliyagaram, and Nedar.

In 2009 the land occupied an area of 185.76 sq.km (42.82%) has been decreased. In 1999 to 2009 the ten years period the land has been decreased i.e., -0.89%. It was identified in the places of manongorai, Thandankorai, Ramapuram, Palliyagaram, Nanjikottai, Siralur, Marungulam, Thirukanurpatti, and Maruthakudi. From 1991 to 2009, in the last nineteen years period the agricultural lands were reduced i.e., 1.03%. Because, this block has had a municipality, because of increasing population and migration of peoples need to all infrastructural facilities in this block because of this block well developed in municipality. So many agricultural lands were transformed to fallow land. The fallow lands were converted to built-up land.

(ii) Built-up land.

Built-up land was highly concentrated in this block. This block has had largest municipality area in this district. The built-up land was identified in entire study area. In this block central part of urban areas which are highly developed. The town areas are located in Thanjavur, Vallam, Nanjilkottai and Palliyakragaram. In this block, all village settlements were extended or developed. In this block, some agricultural fields were converted into fallow land and after few months the land was converted to Real Estate land. Such places were identified in the villages of Mathur East, Thirumalaisamuthram, Vallam, Mathur west, Thandonkorai, Manankorai, Nedar, Pasupathikoil, Ayyempettai, Palliyakrakaram, Manonkorai, Thittai, Ramapuram, Marungulam, and Tirukkanurpatti. This block has well developed transportation facilities. The built-up lands were not only settlements but also Government offices, Education Institutions and Pharm productions were identified in this block.

The built-up area occupied an area of 109.46sq. km (25.23%) in 1991. The settlements were extended and identified to Thanjavur, Kadakadappai, Kalvirayanpettai, Kandithampattu, Kudalur, Kulichapattu, Kurungalur, Kurungulam East, Kurungulam west, Kuruvadipatti, Madigai, Manakkarambai, Manangorai, Mariammankoil, Marudhakudi, Marungulam, Mathur East, Melaveli, Monnaiyampatti, Nagathi, Nallicheri, Pudupattinam, Ramapuram, Sennampatti, Thandangorai, Vadagal, Vannarapettai, Thandangorai, Soorakkottai, Thirumalaisamuthiram, Thottakadu, and Uamayaval Arcadu.

In 1999 the built-up land occupied an area of 114.78sq.km (26.46%). In 1991 compared to 1999 in the nine years period the land has been increased i.e., 1.23%. It was extended in the settlements of Manangorai, Thandongorai, Nedar, Ramapuram, Thirttai, Palliyagaram, Thirumalaisamuthiram and Mathur. In 2009 the land occupied an area of 119.63sq.km (27.58%). From 1999 to 2009 in the ten years period the land has been increased i.e., 1.12%. In this period also, some area of Managorai, Thandongorai, Nedar, Ramapuram, kurungulam, Thittai, Palliyagaram, Thanjavur, Nanjikottai, Villar, Pillaiyarpatti, Neelagiri therukkuthottam, and Pudupattinam was extended. From 1991 to 2009 in the nineteen years period, the land has been increased i.e., 2.35% specially. In this block, the national highway lines have been well developed. In this block many Real Estate land's were newly formed along with National high way. So the settlements were increasing day by day. In 2009 particularly in the block most of the agricultural lands were converted to real estate land. The village people need to infrastructural facilities so people move in rural to urban. These are the reasons built-up land was increased in this block.

(iii) Fallow land

In 1991 the fallow land was identified i.e., 25.23sq.km (5.82%). The fallow land was identified in the villages of Marunkulam, Kurungulam, Vallam, Thirumalaisamuthiram, Vilar, Pudupattinam, Palliyagaram, Alakudi, Ramanathapuram, Ramapuram, Mathur, Thandonkorai, Manangorai, Thittai and Nanjikottai. In 1999 the fallow land occupied an area of 28.32sq.km (6.53%). From 1991 to 1999 in the nine years period the fallow land has been increased i.e., 0.71%.

In 2009 the fallow land was found in 29.44sq.km (6.79%). In 2009, fallow land has been increased highly. In 1999 to 2009 the ten years period the fallow land has been increased i.e., 0.26%. The fallows were identified in Mathur East, Nallicheri, Thandangorai, Manangorai, Nedar, Palliyagaram, Kurungulam, Marungulam, Nanjikottai, and Marudakkudi. From 1991 to 2009 in the nineteen years period the land has been increased i.e., 0.97%.

Because of failure of monsoon for long period, an active agricultural delta has registered with the high order of the fallow land. Two crop fields have been brought down into single crop fields for more than a decade. It has must have been the reason to have higher order of fallow land in this region. In this year 2009, it has shown a rise. These fallows must have been the area left for settlement and house plots in the vicinity of the major developing town like Palliyakragaram, Mathur west, Thandangorai, Manongorai, Nedar, Vallam and Nanjikottai. These are the regions where many fallow lands were identified and converted into built-up land.

(iv) Mixed plantation.

The plantations were located into all villages and towns. Mostly in this block coconut plantations, cashew plantation, plantain, tamarind, palm trees are high level concentration. During 1991 the area observed under this

category was 39.78sq.km (9.17%). In 1991 compared to 1999 in the nine years period the plantations were decreased to -0.75. In this places were noticed to Pudupattinam, Ramapuram, Sennampatti, Thandangorai, Vadagal, Vannarapettai, Thandangorai, Soorakkottai, Thirumalaisamuthiram, Thottakadu, Uamayaval Arcadu, Vallampudur, Valamirankottai, Vilar, Siralur, Rayanthur, Rajendram, Thittai, and Thuraiyur. In 1999, the plantation land occupied an area of 36.52sq.km (8.42%).

In 2009 the land occupied an area of 35.42sq.km (8.17%). From 1999 to 2009 in the ten years period, the land has been missed i.e., -0.25%. It was identified in the places of Vilar, Nanjikottai, Thirukanurpatti, Kurungulam, Vallam, Palliyagaram, Mathur west, and Manakarambai. From 1991 to 2009 the last nineteen years period the mixed plantations were decreased i.e., -1%. In 2009 in this block the southern side had horticultural and sugarcane fields were highly concentrated because of sugarmill and government horticultural nurseries were located in Marungulam and Kurungulam area.

(v) River sand

The river sand was noticed in Cauvery river basin and Grand anicut canal areas. During 1991 the area observed under this category was 2.14sq.km (0.49%). It was increased i.e., 2.88sq.km (0.66%) and 3.02sq.km (0.70%) in 1999 and 2009. In 1991 compare to 1999 the nine year period the land has been observed i.e., 0.17%. In 1999 compared to 2009 in the ten year period the land has been noticed i.e., 0.04%. From 1991 to 2009 the nineteen years period the land has been identified i.e., 0.21%. The reason was water level has been decreased, so the river sand has been increased. The river sand was identified in river basin area.

(vi) Scrub land

In 1991 the scrub land was founded in 31.79sq.km (7.33%). The scrub land was identified in the villages of Manakarambai, Palliyagaram, Ramapuram, Siralur, Thirumalaisamuthiram, Pillaiyarpatti, Vallam, Thirumalaisamuthiram, Ramapuram, Sennampatti, Thirukanurpatti, Neelagiri, Kuruvadipatti, Kurungalur, and Kulichapattu. In 1991 compared to 1999, the land has been observed i.e., -1.7%. The scrub land concentrated in the places of Siralur, Vallam, Palliyagaram, Neelagiri, Vilar, Vallampudur, Ramapuram, Nagathi, Thenperambur and Thettai. These lands were converted into built-up land.

In 1999 the scrub land was observed to be 24.44sq.km (5.63%). From 1999 to 2009 in the ten year period, the land has been observed i.e., 0.07%. It was identified in the villages of Chitrakudi, Vallam, Palliyagaram, Kuruvadipatti, and Pillaiyarpatti. In 2009 period the scrub land has been observed in an area of 24.72sq.km (5.70%). From 1991 to 2009 in the nineteen years period, -1.63% of the land has been decreased. In 2009 the scrub land was converted in to the built-up land. It was noticed in Palliyagaram, Ramanathapuram, Ramapuram, Thittai, Alangudi, Nanjikottai, Inathukanpatti and Kasanadupudur.

(vii) Water body.

The water bodies have been noticed in Grand anicut canal in central part of the block. The northern part was observed in Vennar, Vettar, and Jambulingam River. The small water bodies were noticed in the entire study area. Because this block was in deltaic region with well potentiality of water. In this block, the western part was identified to have two small water bodies. In 1991 the total area was of 4.83sq.km (1.11%) the water level was decreased i.e., 4.29sq.km (0.99%) and 4.17sq.km (0.96) in 1999 and 2009. In 1991 compared to 1999 in the nine years period the water bodies have been decreased i.e., -0.12%. In 1999 compared to 2009 the ten years period the water bodies decreased i.e., -0.03%. From 1991 to 2009, in the nineteen years period the water bodies has been decreased i.e., -0.15%. Because of in this river system was of mainly for perennial and non Perennial River. So the flow of water level in winter season was only increased, summer season decreased. The rivers aligned with mixed plantations in some places. Small tanks aligned with the settlement of villages and towns.

(viii) Without scrub land

In 1991 the without scrub land occupied an area of 30.34sq.km (6.99%). The land is a type of waste land or salt affected land. The land was observed in all villages and towns. It was identified in the places of Neelagiri-therukuthottam, Sennampatti, Vallam, Pillaiyarpatti, Nanjikottai, Rayanthur, Thanjavur, Chithrakudi, Palliyagaram, Ramapuram, Seeralur, Thanjavur, Inathukanpatti, and Thirukanurpatti.

In 1999 the without scrub land occupied an area of 32.96sq.km (7.60%). In 1991 compared to 1999 in the nine years period 0.61% the without scrub land has been increased. Such lands were identified in the villages of Ramapuram, Palliyagaram, Nanjikottai, Thirukanurpatti, and Neelagiri. In 2009 the without scrub land has been observed to be in 31.62 sq.km (7.29%). In 1999 compared to 2009 in the ten year period, -0.31% the land has been decreased. Such places were identified in Palliyagaram, Thanjavur, Thittai, Pillaiyarpatti, and Manakarambai. In this place were the without scrub was land converted in built-up land. From 1991 to 2009 in the nineteen years

period 0.3% of the without scrub land has been increased. It was noticed that Vallam, Palliyagraharam, Alakudi, Pudupattinam, Thanjavur, Villar and Inathukhanpatti. The without scrub land in future might be transformed in to built-up land.

Accuracy studies

It is important to remember that no land cover map is a perfect representation of reality. There are always errors in maps and thus needed to keep in mind how accurate they are, and whether that level of accuracy is sufficient and these are to be used with the map information. Based on the 30-meter resolution of the LANDSAT and LISS III, 23.7m resolution data used to prepare the maps, it's important to keep in mind that this map would be the most accurate one for viewing geographic patterns over larger areas. The result of an accuracy assessment provided the researcher with an overall accuracy of the map based on an average of the accuracies for each class in the map.

The user's accuracy or reliability has been the probability that a pixel classified on the map actually represented that category on the ground [5]. An error matrix was generated for the supervised land use and land cover map was prepared for the year of 1991, 1999 and 2009. The expansion of abbreviations used in change matrix tables area in A.L-Agricultural Land, A.P- Aquaculture Pond, B.L-Built-up Land, F.L- Fallow Land, M.P-Mixed Plantation, R.S- River Sand, S.L-Scrub Land, W.B- Water Body, W.S.L-Without Scrub Land, and M.A- Mangroves.

Table.2. Accuracy assessment of Thanjavur block for 1991,1999 and 2009

LULC(1991)	A.L	B.L	F.L	M.P	R.S	S.L	W.B	W.S.L	Total	P.A %)(O.E)
A.L	1368	35	12	17	2	4	16	0	1454	94.08
B.L	21	318	0	36	3	15	4	0	397	80.10
F.L	16	0	415	1	1	0	0	0	433	95.84
M.P	15	4	0	566	3	1	1	0	590	95.93
R.S	11	11	0	0	438	0	0	0	460	95.21
S.L	12	3	12	14	2	454	0	0	497	91.34
W.B	4	1	11	0	11	0	426	0	453	94.03
W.S.L	0	0	0	0	0	0	1	453	454	99.78
Total	1447	372	450	634	460	474	448	453	4738	
U.A%)(C.E)	94.54	85.48	92.22	89.27	95.2	95.7	95.08	100		
Kappa coefficient =0.75					Overall accuracy =78.52%					

LULC(1999)	A.L	B.L	F.L	M.P	R.S	S.L	W.B	W.S.L	Total	P.A %)(O.E)
A.L	1289	38	25	11	13	15	17	0	1408	91.54
B.L	13	321	16	14	12	13	12	0	401	80.04
F.L	3	6	424	11	11	0	11	0	466	90.98
M.P	14	25	2	611	0	12	2	0	666	91.74
R.S	11	1	1	0	412	0	1	0	426	96.71
S.L	10	3	52	3	0	458	2	0	528	86.74
W.B	10	1	1	10	1	0	412	0	435	94.71
W.S.L	0	0	0	0	0	0	0	513	513	100
Total	1350	395	521	660	449	498	457	513	4843	
U.A%)(C.E)	95.48	81.26	81.38	92.5	91.7	91.9	90.1	100		
Kappa coefficient =0.82					Overall accuracy =85.67%					

LULC(2009)	A.L	B.L	F.L	M.P	R.S	S.L	W.B	W.S.L	Total	P.A %)(O.E)
A.L	1187	36	19	35	14	13	7	0	1311	90.54
B.L	10	493	13	37	12	22	5	0	592	83.27
F.L	34	12	485	23	2	21	2	0	579	83.76
M.P	26	15	4	684	1	4	2	0	736	92.93
R.S	31	11	0	0	453	0	0	0	495	91.51
S.L	32	41	1	32	0	437	1	0	544	80.33
W.B	32	2	1	0	3	0	387	0	425	91.05
W.S.L	0	0	0	0	0	0	0	517	217	100
Total	1352	610	523	811	485	497	404	517	4899	
U.A%)(C.E)	87.79	80.8	92.73	84.34	93.40	87.9	95.7	100		
Kappa coefficient =0.84					Overall accuracy =87.78%					

Kappa values are also characterized into 3 groups: a value greater than 0.80 represents strong agreement, a value between 0.40 and 0.80 (40to 80%) represents moderate agreement, and a value below 0.40 (40%) represents poor agreement [3]. The result of the overall and Kappa accuracies have been different since the two measures incorporated different information. The overall accuracy incorporated the major diagonal and excluded the omission and commission errors. Conversely, Kappa computation incorporated the off-diagonal elements as a product of the column and row marginal's.

In Thanjavur block in 1991, 1999 and 2009 all the classes, have had values more than 80% for both producer's and user's accuracies. These indicate that for these land cover classes, the omission errors (most pixels of these classes were correctly classified) were high, and the commission errors (most pixels were incorrectly classified) were low. With Kappa accuracy of the years 1991, 1999 and 2009 the values were 0.75, 0.82 and 0.84 and overall accuracy was 78.52, 85.67 and 87.78%. The result shows that there is a moderate agreement for the year of 1991, as well as 1999 and 2009 has been a strong agreement between the classification maps and the ground reference information. The table (2) shows the accuracy details.

CONCLUSION

Finally the researcher has been identified the decreased categories are Agricultural land, Mixed plantation, Scrub land and Water body and increased categories are Built up land, Fallow land, River sand and Without scrub land. The increasing population is main reason for considering the urban expansion which led decrease of agricultural land and which converted into other categories., it was easy to notice that the most important agricultural city like Thanjavur have expanded during the last nineteen years even though it is still look like the rural and traditional view in most part of this city, while some small villages have moved to other places maybe due to the change in land management prospective.

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