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Micro Analysis on Changes in Land Use and Cropping Pattern in Tamilnadu

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Abstract: Growth in the agriculture sector may well be judged by the increase in agricultural production over time. The area under different crops has been fluctuating. However; there was improvement in production, which is mainly on account of increase in productivity as result of generation of new varieties or technology of their cultivation. This paper analyses the changes inland use and the cropping pattern in Tamilnadu, The cultivable area has decreased by five percent and the land put to non- agricultural use (i.e urbanization) increased by three percent to the total geographical area of Tamilnadu.

Keywords: Krishi Karman Award, Cropping Pattern, Land Use, Agriculture

1. Introduction

Agriculture is the mainstay of the Indian economy. Agriculture fosters economic growth and development, acts as sources of raw material to industries, ensures food and nutritional security, earns foreign exchange, increases the per capita income of the farmers, increases the employment opportunities, improves the national income, and alleviates poverty. The agriculture sector contributed 51.9 percent to India's GDP in 1950. Since then it has been on a downside and it currently stands at 13.9 percent. Agriculture and allied sectors contribute 17.1 per cent of Gross Domestic Product (GDP of India) during 08-09. The agricultural output, however, depends on monsoon as nearly 55.7 per cent of area sown is dependent on rainfall. Agriculture provides the means of livelihood to about two-thirds of the country's population. This Sector provides employment to 58.4 per cent of the country's workforce and is the single largest private sector occupation. Agriculture accounts for about 10 per cent of the total export earnings and provides raw material to a large number of industries. Besides, the rural areas are the biggest markets for consumer goods, including consumer durables, apart from a major source of domestic savings. Above all, agriculture is the only source of food security for the nation. Growth in the agriculture sector may well be judged by the increase in agricultural production over time. The area under different crops has been fluctuating however; there was improvement in production, which is mainly on account of increase in productivity as result of generation of new varieties or technology of their cultivation.

Cropping pattern means the proportion of area under different crop at a point of time, change in this distribution over a period of time and factors affecting this change in distribution (Misra & Puri; 2011). Cropping pattern is a dynamic concept as it changes in time and space. Cropping pattern in a state keep on changing from time to time with the change in related factors. It is determined mainly by physical, socio-cultural and historic factors. Besides technological factors have also played an important role. Land use is clearly constrained by environmental factors such as soil characteristics, climate, topography, vegetation. But it also reflects the importance of land as a key and finite resource for most human activities including agriculture, industry, forestry, energy production, settlement, recreation, and water catchments and storage. Often improper land use is causing various forms of environmental humiliation. For sustainable utilization of the land ecosystems, it is essential to know the natural characteristics, extent and location, its quality, productivity, suitability and limitations of various land uses. The growth of population is greater than the rate of growth of food production. It is usually achieved through proper use of land resources with the application of bio fertilizers, hybrid seeds, double cropping, modern methods of irrigation and manpower.

2. Crop Cultivation

Tamilnadu grows almost each and every crop. All these crops could be classified into two broad types namely, Food Crops and non food crops. Food Crops are grouped as cereals (Rice, Wheat, Jowar, Bajra, Maize, Ragi and other millets) and pluses (gram, arhar, moong, peas, masoor) and food crops that are used for human consumption. Other than food crops are termed as non-food crops. Non-Food Crops are sub-grouped as Commercial Crops, Plantation Crops and Horticulture. Crops which are grown for sale either in raw form or in semi-processed form are commercial crops. Crops which are grown on Plantations covering large estates are termed as plantation crops.

3. Review of Literature

Many researchers and scholars have tried to examine the determinants of rural non-farm sector both at aggregated and disaggregated level. However, there are few studies available on the theme of the paper in the state. Some of the studies and their findings have been discussed below: Chinky Sangral (2015) studied the changes in cropping pattern and crop diversification in Jammu and Kashmir from 1965-66 to 2009-10, reports that a trend of shift from food grains to non food grains has been observed by the process of development which indicates an increasing tendency towards crop diversification. Within crop groups like cereals, there is an increase in the area under wheat and maize, whereas area under rice has been fluctuated. Kuppurathinam (2014) studied the changes of land use and cropping pattern in Pollachi taluk and found that the main crop of that block as coconut and its area of cultivation increased 14.42 percent in six years and further reports that the net cultivated area decreased around six percent during the study period. Krishnan, S. (2012) in his study on Globalisation and changes in land utilization and cropping pattern-a micro level study also confirms that the cumbu and maize was found to be positive and highest growth rate among other cereals in terms of area of cultivation, production and yield. Kalaivani, M. (2010) studied the growth actions of selected cereal crops in Tamilnadu state and found that, paddy holds good performance in absolute terms, among other crops are concerned. But the compound growth rate reveals that the maize was found to be positive and records a highest growth rate among other cereal crops in term of area of cultivation, production and yield in Tamilnadu state over the period of study.

4. Methodology

The present study is analytical in nature, Compound Annual Growth Rate (CAGR) of area, production and yield for the selected major crops in Tamilnadu State are calculated for each period to study the changes in land use, the growth in area, production and yield of these crops. The objectives of the study are (i) to analyse the existing cropping pattern and the changes, (ii) to analyse the changes in land use pattern in the present scenario, (iii) to find outthe reason for the changes in the cropping pattern. The present study is restricted for a period of 10 years, the data for the period of 2005-06 to 2014-15 was taken to analyse the changes in cropping pattern and production. To have a broader outlook about the changes in land use pattern the data from 1990-91 to 2014-15 of Tamilnadu state was taken for analysis. The necessary data for the selected crops was purely based on secondary sources and it was collected from various issues of Season and Crop Report (SCR), Department of Economics and Statistics, Chennai.

5. Status of Agriculture Production in the Study Area-Tamilnadu

The study area of Tamilnadu has 7,21,47,030 population (2011 census) of which 3,61,37,975 are male and the remaining 3,60,09,055 are female. Around 80 percent of them are literates. Tamilnadu has 38,55,375 cultivators and 72,34,101 agricultural labourers those who aremainly depending on agriculture for their livelihood. The state has 130.33 lakh hectare of area and 58 percent of it (75.50 lakhs hectare) is cultivable area. According to sixth Economic census Tamilnadu has 50,29,402 establishments of which 35 percent (17,47,205) are agricultural and allied establishments and these establishments provides around 26 percent of total employment ofall establishments (Report on Sixth Economic Census-Tamilnadu, 2016). Government of Tamilnadu has been conferred with awards galore in recognition of its creditable performance in increasing the food grain production through novel initiatives and successful technologies. Government of Tamilnadu has thus bagged “Krishi Karman Award” four times in a period of six years from Government of India, once for the highest food grain production (2011-12), once for the highest pulses production (2013-14) and once for the highest coarse cereals production (2014-15) and “Krishi Karman Award” of five crore for the record production of 130 lakh tonnes of food grains during the year 2015-16. The state has also received the “State Agriculture leadership award 2013” and “Food Production Program Leadership Award 2015” from the leading magazine, “Agriculture Today”. Government of Tamil Nadu was also conferred with the “Best Big Agriculture State Award” by the popular magazine “India Today”. Tamil Nadu received the Best Practices Innovative Award under the scheme IWMP for formulating parallel online MIS. The award was presented by Minister of Rural Development, GOI in a function held at New Delhi on 19.02.2015. So there is need to study the changes in land use and cropping pattern in Tamilnadu.

Table 1. *Land Utilisation and Cropping intensity in Tamilnadu 1990-91-2014-15 (area in Lakhs Hectares).*

SlNo	Item	1990-91	2000-01	2010-11	2014-15
1	Total Geographical area	130.19	129.19	130.33	130.33
2	Cultivable waste	2.90	3.52	3.30	3.25
3	Current follow	12.49	11.34	10.14	9.98
4	Other follow	10.44	12.28	15.80	17.33
5	Net area sown	55.78	53.03	49.53	48.19
6	Cultivable Area(2+3+4+5)	81.61	80.17	75.47	75.50
7	Area sown more than once	10.53	10.34	7.99	11.75
8	Gross cropped area(5+7)	66.32	63.28	57.52	59.94
9	Cropping intensity (8/5 x 100)	118.9	119.5	116.1	124.3
10	Land put to Non agricultural use	18.35	19.85	21.77	21.99
11	Ratio of net area sown to available cultivable area(5/6)	68.34	66.15	65.62	63.82

Source: Season and crop report Department of Economics and Statistics.

The table-1, gives the picture about the land use pattern of Tamilnadu from 1990-91 to 2014-15. The net area sown declined from 55.78 to 48.19 lakh hectares. The land available for cultivation has also declined from 81.61 to 75.50 lakh hectares during the year 1990-91 to 2014-15. The Gross cropped area decreased from 66.32 to 59.94 which represents five percent decrease to the total geographical area of Tamilnadu. The land put to non agriculture use increased from 18.35 lakh hectares to 21.99 lakh hectares during the study period, which is around 3 percent increase to the geographical area. It is well known fact that most of the decreased cultivable land was occupied by the land put to non-agriculture use category.

Table 2. *Area of Crops in Tamilnadu (area in 000' hectares).*

Sl No	Crops	2005-06	2006-07	2007-08	2008-09	2009-10	2010-09	2011-12	2012-13	2013-14	2014-15	CAGR
1	Cereals	2791	2629	2487	2655	2498	2537	2541	213	2658	2721	-0.25
2	Pulses	525	536	609	535	535	636	666	512	815	883	5.34
3	Sugarcane	335	391	354	308	293	315	346	348	313	263	-2.39
4	Spices & Condiments	135	148	145	145	143	151	141	137	115	114	-1.68
5	Fruits	368	377	388	387	395	389	389	392	374	368	0
6	Vegetables	229	238	238	223	223	226	219	181	194	206	-1.05
7	Other Food crops	13	12	12	11	12	12	11	11	11	10	-2.59
8	Non food crops	1634	1508	1581	1555	1437	1482	1542	1421	1414	1425	-1.36
9	Total Food Crops	6032	5842	5815	5824	5571	5752	5889	5139	5897	5994	-0.06
10	Rainfall (mm)	1304.1	859.7	1164.8	1023.1	937.8	1165	937	743.1	790.6	988.5	-2.37

Source: Season and Crop Report Department of Economics and Statistics, Chennai

Table-2 explains in detail about the changes in the cropping pattern of Tamilnadu state, as per the CAGR the area under all crops decreased by 2.37 percent CAGR. As against this fact the area under pulses is increased by 5.34 percent CAGR. The analysis shows a truth that even the area under all crops are in decreasing trend, the Pulses area is increasing because of the changes in the cropping pattern, due to various factor like less rainfall, less cost of cultivation and encouragements of the Government introduced pulses Improvement scheme. The area under pulses increased slowly year by year and reached 883 lakh hectares, which represents 68 percent increase comparing the base year 2005-06. The CAGR for all crops shows a negative value of 0.06 and the other food crops has the highest negative value of 2.59 comparing the base year 2005-06, next to that the sugarcane has the negative value of 2.39. The rainfall of the state has also slowly decreased from 1304m.m to 988m.m during the study period. It seems that the highest rainfall has improved the area of cultivation during the year 2005-06, at the same time the increased rainfall during the year 2007-08, 2010-11 has not made any change in the area of cultivation of that year or the next year. It is also found that the area left follow due to scarcity of water was not brought to cultivation again after increase in rainfall, so there is an urge to study the ways to bring the land left follow, for cultivation. It is concluded that even with less rain fall the Pulses development scheme has made tremendous changes in the area of pulses cultivation in Tamilnadu. During the year 2012-13 the area of all crops decreased by 14 percent to the base year due to monsoon failure.

Table 3. *Area of major crops in Tamilnadu 2005-06 to 2014-15(area in 000' hectares).*

Sl No	Crop/Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	CAGR
1	Paddy	2050	1931	1789	1931	1845	1905	1903	1493	1725	1794	-1.33
2	Cholam	316	294	283	258	238	243	197	210	347	415	2.76
3	Cumbu	81	65	59	56	54	49	46	42	54	57	-3.45
4	Ragi	99	95	93	90	82	75	82	70	118	104	0.49
5	maize	202	197	223	286	244	230	280	291	380	321	4.74
6	Varagu	5	11	5	4	5	8	4	3	3	2	-8.76
7	Samai	27	24	24	21	22	17	20	17	22	17	-4.52
8	Bengal Gram	5	5	6	6	7	7	8	7	8	6	1.84
9	Red Gram	37	29	30	27	26	35	35	42	59	72	6.88
10	Green gram	136	134	158	138	138	171	164	118	195	229	5.35
12	Black Gram	215	251	307	263	259	304	308	208	365	373	5.66
13	Sugarcane	335	391	354	308	293	315	346	348	313	263	-2.39
14	Bannana	94	105	112	115	113	107	103	105	92	91	0.32
15	Mango	125	125	128	130	132	139	141	144	143	140	1.14
16	Tapioca	127	139	140	124	118	119	105	81	83	87	-3.71
17	Onion	29	29	29	30	31	31	34	24	24	28	-0.35
18	Tomato	21	22	22	22	23	22	21	21	24	23	0.91
19	Groundnut	618	508	535	489	413	385	385	339	336	336	-5.91
20	Gingelly	65	52	74	63	62	48	43	33	56	64	-0.15
21	Cotton	109	100	99	114	104	120	135	133	150	186	5.49
22	All Crops	6032	5842	5815	5824	5571	5752	5889	5139	5897	5994	-0.06

Source: Season and Crop report Department of Economics and Statistics

Table 3 explains in detail about the crop wise area of cultivation for major crops. The main crop of Tamilnadu is paddy, its percentage of cultivation to total crops was 33 in 2005-06 and it decreased to 30 percent in 2014-15. It is found that in the cereal crops, the area of paddy, cumbu, varagu, samai are decreased and the area of cholam, ragi and maize are increased. The area of cultivation of maize increased 59 percent and cholam by 31 percent comparing the base year area. In the pulses group the area of cultivation of red gram nearly doubled (95%) and its CAGR is 6.88, and the area of black gram increased 73 percent and its CAGR is 5.66. There are no abnormal changes in the area of cultivation of onion, tomato and gingelly during the study period. The area of varagu which has more nutritional values in the cereals is decreasing year by year due its traditional processing methods. The area of cultivation of Tapioca was decreased last three years. Around 46 percent in groundnut and 21 percent in sugarcane area is decreased during the study period. It is to be concluded that the area of cultivation of all crops is decreased by less than one percent in Tamilnadu during the study period of ten years.

Table 4. *Production of major crops in Tamilnadu 2005-06 to 2014-15 (000'Tonnes).*

Sl No	Crop/Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	CAGR
1	Paddy	5209	6610	5039	5183	5665	5792	7458	4050	7115	7949	4.32
2	Cholam	321	293	247	213	221	246	252	174	513	868	10.46
3	Cumbu	94	98	85	84	82	77	114	56	117	177	6.53
4	Ragi	132	148	175	169	160	171	224	138	362	349	10.21
5	maize	241	759	810	1257	1138	1027	1695	946	2245	2647	27.08
6	Varagu	8	5	8	30	6	12	8	4	6	5	-4.59
7	Samai	19	16	24	25	19	17	25	19	25	25	2.78
8	Bengal Gram	4	4	4	3	4	4	5	4	5	4	0
9	Red Gram	20	16	21	21	20	23	31	33	57	90	16.23
10	Green gram	47	31	46	77	45	57	85	33	151	180	14.57
12	Black Gram	96	82	79	143	70	123	178	88	310	358	14.07
13	Sugarcane	29758	32798	38070	45168	35113	34251	38974	34014	32454	28092	0.57
14	Bannana	4647	5151	5384	5148	4887	4800	4505	3909	3840	3725	-2.19
15	Mango	636	644	702	694	537	957	626	1189	830	894	3.46
16	Tapioca	4857	5635	5912	4533	4089	3881	3967	2769	2499	2851	-5.19
17	Onion	233	258	287	286	302	299	376	199	240	240	0.3
18	Tomato	277	282	299	296	311	298	265	300	303	345	2.22
19	Groundnut	1097	1006	1047	947	895	895	1060	785	915	925	-1.69
20	Gingelly	48	54	54	53	55	44	33	17	26	25	-6.32
21	Cotton	168	220	200	187	225	247	381	255	416	598	13.54

Source: Season and Crop report Department of Economics and Statistics

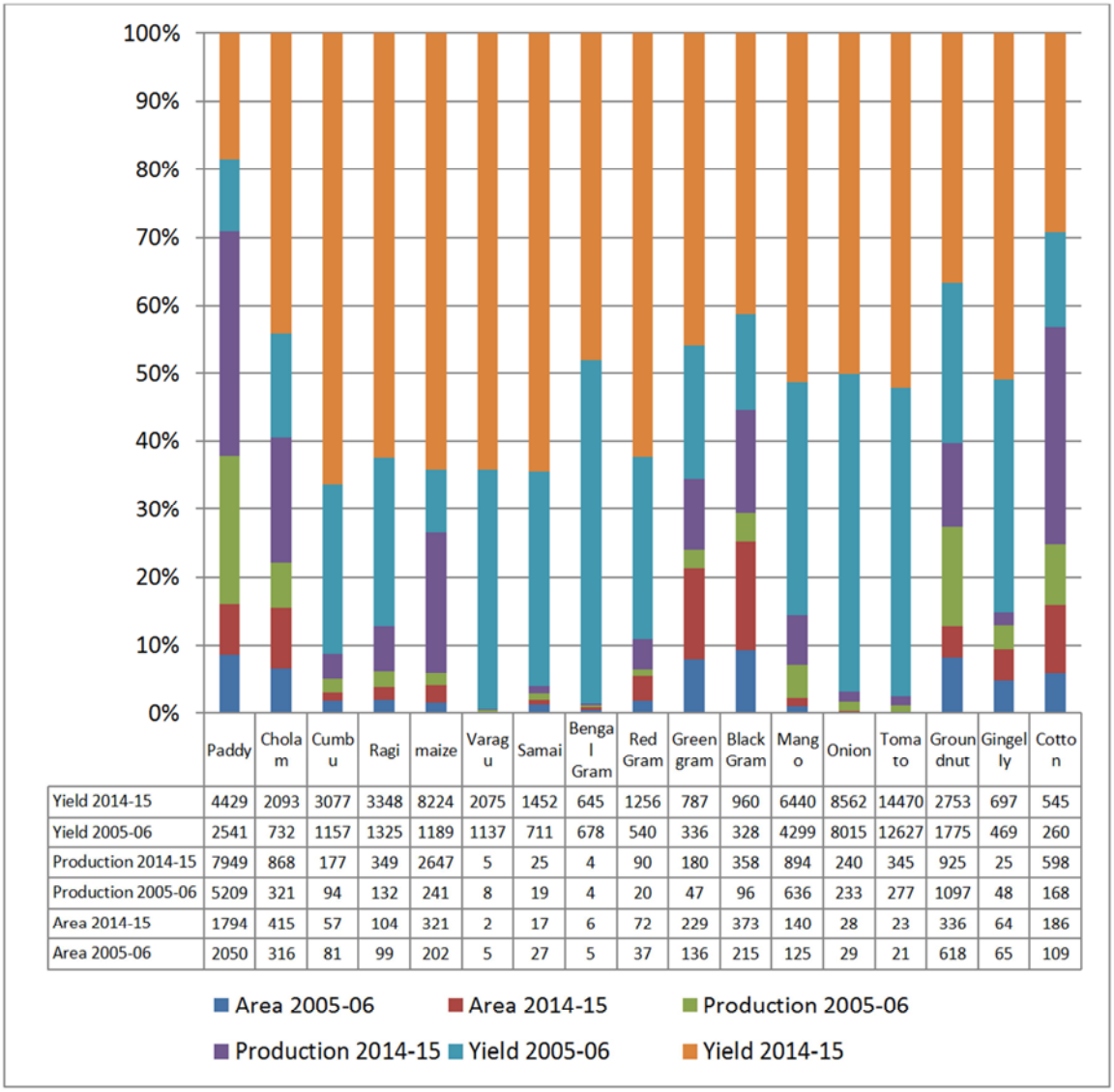
The table 4 elicits the information about the production of the selected crops of Tamilnadu state. Even though the area of cultivation of all crops decreased to the base year 2005-06, the production of all crops are increased due to introduction of HYV and adoption of new technology in cultivation by the framers of Tamilnadu state. This has helped the state to get more all India awards like "Krishi Karman Award". The production of main crop of Tamilnadu paddy has increased by 52 percent comparing the base year its CAGR stands as 4.32. The highest production was happened in maize and its production increased more than ten times to the base year production, this is because of assured prices and more demand in the poultry farms. Cholam got 170 percent increase in its area of cultivation and its CAGR was 10.46. The pulses got more improvement in their production. The red gram got 350 percent increase and its CAGR stands as 16.23, the green gram got 282 percent increase and its CAGR is 14.57, the Black gram got 273 percent increase in its area of cultivation and its CAGR stands as 14.07. The cotton production has increased by 256 percent to the base year and its CAGR stands as 13.54. Among the 21 major crops taken for the study five crops production is in negative trend and the highest negative trend was happened in the gingelly and the other crops in this list are groundnut, tapioca, banana and varagu. It is found that the production of 16 crops studied is in positive trend which has helped to improve the state production.

Table 5. *Yield of major crops in Tamilnadu 2005-06-2014-15 (in kg/per hectare).*

Sl No	Crop/Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	CAGR
1	Paddy	2541	3423	2817	2682	3070	3039	3918	2712	4123	4429	5.71
2	Cholam	732	999	874	824	831	1014	1277	830	1479	2093	11.08
3	Cumbu	1157	1511	1436	1483	1519	1564	2453	1316	2158	3077	10.28
4	Ragi	1325	1552	1878	1887	1955	2262	2716	1963	3053	3348	9.71
5	maize	1189	3838	3626	4388	4661	4458	6042	3252	5902	8224	21.34
6	Varagu	1137	2774	1489	1390	1485	1610	2012	1351	1734	2075	6.2
7	Samai	711	1030	1002	777	883	961	1230	1095	1139	1452	7.4
8	Bengal Gram	678	646	675	637	611	677	643	643	653	645	-0.5
9	Red Gram	540	732	701	608	765	662	870	787	967	1256	8.81
10	Green gram	336	577	291	226	345	336	519	284	775	787	8.88
12	Black Gram	328	570	260	315	380	404	580	425	851	960	11.34
13	Sugarcane	105	115	108	106	101	108	113	98	104	107	0.19
14	Bannana	49104	48965	47741	44453	42996	44700	43695	36879	41534	40705	-1.86
15	Mango	4299	5519	5477	4958	4795	6867	4438	8230	5799	6440	4.12
16	Tapioca	38211	40360	42203	36471	34468	32449	37663	34180	29922	32438	1.62
17	Onion	8015	8731	9635	9453	9753	9365	10797	8291	9620	8562	0.66
18	Tomato	12627	12611	13047	13017	13091	13506	12068	14228	12338	14470	1.37
19	Groundnut	1775	1981	1957	1990	2169	2323	2751	2314	2721	2753	4.49
20	Gingelly	469	519	433	506	463	527	613	518	596	697	4.04
21	Cotton	260	374	343	279	368	349	481	326	469	545	7.68

Source: Season and Crop report Department of Economics and Statistics Chennai.

The per hectare yield of the selected crops in Tamilnadu is discussed in detail in the table 5. According to the ten year yield rate in Tamilnadu, maize has highest growth of yield rate and it has 591 percent growth when comparing the base year 2005-06, its CAGR stands 21.34, the black gram stands second in growth rate of yield per hectare and its CAGR is 11.34. The cumbu crop got 160 percent growth with 10.28 CAGR. Among the 21 crops taken for analysis, 19 crops per hectare yield is increased year by year and in the remaining two crops namely banana and bengal gram yield per hectare is decreased in the study area. Maize crop yield per hectare increased around seven times comparing the base year. In the sugarcane yield there is no abnormal change. The farmers of Tamilnadu are made aware about the single seedlings usage in paddy and nursery planting in pulses particularly red gram. The analysis gives a clear picture that per hectare yield of major crops in Tamilnadu is increasing year by year tremendously due the technological practices of the farmers in seed, water, fertilizer and pesticides. The changes in harvest and post harvest methods adopted by the Tamilnadu farmers has also improved the per hectare yield of all crops. In Tamilnadu before ten years the paddy harvesting was done manually and threshing was done by animals particularly bulls. Nowa day's mechanization has made easier and saves so much of waste of seeds in the field on transportation and in threshing floor.



	Paddy	Cholam	Cumbu	Ragi	maize	Varagu	Samai	Bengal Gram	Red Gram	Green gram	Black Gram	Mango	Onion	Tomato	Groundnut	Gingelly	Cotton
Yield 2014-15	4429	2093	3077	3348	8224	2075	1452	645	1256	787	960	6440	8562	14470	2753	697	545
Yield 2005-06	2541	732	1157	1325	1189	1137	711	678	540	336	328	4299	8015	12627	1775	469	260
Production 2014-15	7949	868	177	349	2647	5	25	4	90	180	358	894	240	345	925	25	598
Production 2005-06	5209	321	94	132	241	8	19	4	20	47	96	636	233	277	1097	48	168
Area 2014-15	1794	415	57	104	321	2	17	6	72	229	373	140	28	23	336	64	186
Area 2005-06	2050	316	81	99	202	5	27	5	37	136	215	125	29	21	618	65	109

Figure 1. *Area, Production, Yield of Crops in Tamilnadu 2005-06 and 2014-15.*

6. Major Findings

The net area sown declined from 55.78 to 48.19 lakh hectares. The Gross cropped area decreased from five percent to the total geographical area of Tamilnadu. The land put to non agriculture use increased around 3 percent to the geographical area. The area under pulses reached 883 lakh hectares, which represents 68 percent increase comparing the base year 2005-06. The area under all crops are in decreasing trend, the pulses area is increased, due to various factors including encouragements of the Government introduced pulses Improvement scheme. The main crop of Tamilnadu is paddy, its percentage of cultivation to total crops was 33 percent in 2005-06 and it decreased to 30 percent in 2014-15. The area of cultivation of maize increased 59 percent and cholam by 31 percent comparing the base year. In the pulses group the area of cultivation of red gram nearly doubled (95%), and the area of black gram increased 73 percent. There are no abnormal changes in the area of cultivation of onion, tomato and gingely during the study period. The pulses got more improvement in its production. The red gram got 350 percent increase; the green gram got 282 percent increase. Among the 21 major crops taken for the study 16 crops production is in positive trend which has helped to improve the state production, Among the 21 crops taken for analysis, 19 crops per hectare yield is increased year by year. Maize crop yield per hectare increased around seven times comparing the base year. The changes in harvest and post harvest methods adopted by the farmers of Tamilnadu has also improved the per hectare yield of all crops.

7. Conclusion

Farmers are having so many problems in India. According to the NSSO (2003) 40 percent of the farmers are willing to quit farming, if they had the choice to do so. About 27 percent of farmers deemed farming as unprofitable occupation and 8 percent found it risky. But with all these hurdles the farmers of Tamilnadu is adopting all new

technological knowhow and using it to improve the productivity of crops. The decreasing rainfall and increased cost of cultivation affects the area of cultivation, the available water and the land has been utilized to the maximum to improve the productivity. In this juncture there is an urgent need to bring the land left follow for cultivation. This can help us to multiply the crop production and to win more and more National awards to Tamilnadu.

References

[1] Misra, S. K. and Puri, V. K. (2011), Indian Economy- Its Development and Experience; Himalaya publishing house Pvt. Ltd.

[2] Dr. Saravanadurai. A and Kalaivani., M (2010) "Growth Actions and Selected Cereals Crops in Tamilnadu State" IJABPT volume I, Issue-3, Nov-Dec 2010 PP 778-785.

[3] Krishnan, S, "Globalisation and Changes in Land Utilisation and Cropping Pattern- A micro Analyse of Madurai district, Tamilnadu" Journal of Radix International Educational and Research Consortium Volume 1, Issue 8 (Aug. 2012).

[4] Kuppurathinam, V. Sunilkumar, R. Sanjeevi Prasad, S. "Changes of Land use and Cropping Pattern in Pollachitaluk, Coimbatore District Tamilnadu, India," African Journal of Geo Science Research, 2014, 2(4)Pp 15-17.

[5] Chinky Sangral, "Changes in Cropping Pattern and Crop Diversification in Jammu and Kashmir" IOSR-JHSS Vol 20, Issue 4, Ver, II April 2015 Pp 07-09.

[6] Season and Crop Report (SCR), 2005-06 to 2014-15, Department of Economics and Statistics, Chennai.

[7] Thirumalai P, Anand P. H and Murugesan, J "Changing Land Use Pattern In Nilgiris Hill Environment Using Geospatial Technology" International Journal of Recent Scientific Research Vol. 6, Issue, 4, pp. 3679-3683, April, 2015, Pp 3679-3683.

[8] Arul Kumar. C, and Manimannan, G. "Spatial Pattern of Agriculture Productivity of Crops in Cauvery Delta Zone of Tamilnadu" Journal of Agriculture and Veterinary Science (IOSR-JAVS) Volume 7, Issue 11 Ver. II (Nov. 2014), PP 01-07.

[9] Vanita Ahlawat, and Renu "Regional Disparity in Cropping Intensity and Relative Impact of Irrigation in Haryana" IOSR Journal of Business and Management (IOSR-JBM). Volume 18, Issue 9. Ver. III (September. 2016), PP 41-45.

[10] Agricultural Situation in India. Publication Division DIRECTORATE OF ECONOMICS AND STATISTICS DEPARTMENT OF AGRICULTURE AND COOPERATION MINISTRY OF AGRICULTURE GOVERNMENT OF INDIA C-1, HUTMENTS, DALHOUSIE ROAD, NEW DELHI-110 011. VOL. LXXII, May, 2015. Pp 1-67.