Shijitha M. “Land use pattern in Kerala.” Thesis. Research and Post Graduate Department of Economics, St. Thomas’ College (Autonomous), Thrissur, University of Calicut, 2021.

CHAPTER III
DYNAMICS OF LAND USE IN INDIA AND KERALA

3.1. Introduction

Land is a free Gift of Nature to mankind upon which the human beings can utilise the natural as well as the man-made resources available to the existing Living System in the most possible maximum manner. " Land is a delineable area of the Earth's terrestrial surface, encompassing all attributes of the biosphere, immediately above or below this surface, including those of the near surface climate, the soil and terrain forms, the surface hydrology(including shallow lakes, rivers, marshes, swamps), the near surface sedimentary layers and associated groundwater reserve, the plant and animal population, the human settlement pattern and physical results of past and present human activity(terracing, water storage or drainage structures, roads, buildings etc) (FAO, 1995)

Land use pattern refers to the surface utilisation of all developed and vacant land on a specific point at a given time and space (Freeman T.W, 1968). Land use involves the management and modification of natural environment and wilderness to build environment such as fields, pastures and settlements. It also has been defined as "the arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it". The United Nations Food and Agricultural Organisation(FAO)Water Development Division explains that "Land use concerns the products and benefits obtained from the use of the land as well as land management actions or activities carried out by humans to produce those products and benefits." 'Land is the stage on which all human activities are being conducted and the source of materials needed for this conduct. Human use of land resources gives rise to 'land use' which varies with the purposes it serves, whether they be food production, provision of shelter, recreation, extraction and processing of materials and so on as well as the bio- physical characteristics of land itself (Helen Briassoulis, 2000). Land is fixed in supply and any change in the supply of land is not possible with changes in demand for land. It has the unique characteristics like non-reproducibility, specificity to location, immobility, and instrumentality. It is the basis for life support systems through creation of biomass, for terrestrial bio- diversity, source and sink of green- house gases, groundwater resources, storehouse for raw materials and the basis for human settlements. As the economy develops, the impact of a transformation of strong preference from primary sector to secondary as well as tertiary sector, agriculture to non- agricultural activities, rural life to urban agglomerations reflects in the changes in land use pattern. The impact of

development increases the proportion of land used for non- agricultural purposes, while on the other hand, it creates a negative impact on land used for the agricultural purposes. But if the land used for agricultural purposes is in the right hands, i.e the skilled and traditional agricultural farmers, the agricultural land can be properly utilised and is profitable for those who are engaged in it with a depth of mind. The pattern of land used for agricultural purposes and the inspiring attitude of the farmers together will result in a golden harvest which will provide sufficient food for the people and through it, the food security to the entire system.

3.2 Land and Man on Earth :

Land, the place on which man lives and interacts with other social beings as well as the resources, provides him the space to become the master of earth by utilizing all the available resources- fixed and variable in the efficient manner. The total surface area of Earth is about 510 million km^2(197 million sq. km). Out of this, 70.8 percent (361.13 million km^2) is covered with water, mostly by oceans and this abundance of water provides the nickname of 'Blue Planet' for Earth. The remaining 29.2 percent consists of land together with lakes and rivers that contribute to hydrosphere.

3.3. Land Use Pattern in India and Kerala:

History of Data Construction of Land Use Pattern in India depicts that in 1886, the British Government took an initiative to compile the land use data in order to enhance the revenue collection. Crop forecasting started with a single crop, wheat and later it extended to other crops such as oilseeds, rice, jute, indigo and sugarcane. The recommendations of the Royal Commission on Agriculture (1928) strengthened the statistical system of Land Use in India and during the British Era, the system was based on the Five- fold classification which India followed till 1949-50. The categories of Five- fold classification were:

1) Forests
2) Area not available for cultivation
3) Other uncultivated land, excluding the current fallow
4) Fallow lands
5) Net Area Sown.

In order to tackle the problems of non- compatability and statistical gaps in the existing data collection, the Technical Committee on Co-ordination of Agricultural Statistics (TCCAS) set up in 1948 by the Ministry of Food and Agriculture recommended a nine- fold classification along with the exact definitions for each classification and the standard concepts and definitions each state have to follow and all states except West Bengal which is still following the five - fold classification and Census of India accepted the Nine- fold classification.

3.3.1. Classification of Land Use Pattern

All the states in India except West Bengal is following Nine- fold Classification recommended by The Technical Committee on Co-ordination of Agricultural Statistics set up in 1948 by Ministry of Food and Agriculture, by replacing the old- five fold classification.

Table 3.1
The Nine- fold Classification of Land Use Pattern in India and Kerala (ICAR)

Sl.No	Classifications	Definitions
1.	Forest Area (F)	Forest under any legal enactment or administered as forest, whether state-owned or private
2.	Land put to non-agricultural use (NA)	All land occupied by buildings, settlements, roads, railways, schools, water facilities along with canals, rivers, under water facilities, and all the land put to uses other than agriculture
3.	Barren and Uncultivable land (BU)	Land covered by mountains, deserts, hills etc. Land which cannot be brought under cultivation
4.	Permanent pastures and the grazing land(PG)	Extensively or intensively grazed permanent grasslands with the presence of farm infrastructure
5.	Land under misc. tree crops (T)	Land under casuring trees, thatching grasses, bamboo bushes and other groves for fuel.
6.	CultivableWasteland (CW)	Land available for cultivation, whether taken up or not taken up for cultivation once, but not cultivated during the last five years or more in succession including the current year
7.	Fallow other than current fallowland (FOCF)	Land, which was taken for cultivation but is temporarily out of cultivation for a period for not less than one year and not more than five years.
8.	Current fallow (CF)	Cropped area which is kept fallow during the current year, that is, the land which is left unsown during the current agricultural year only to regain fertility
9.	Net Area Sown (NAS)	Total area sown with crops and orchards

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

3.3.2. Land Use Pattern for Agriculture and Non- Agriculture Purposes :

Total Reporting or Geographical Area (TGA) is the summation of the area used for the land use classifications and can be expressed as

$$TR = F + NAL + UL + FL + NAS$$

- Non- agricultural area(NAA) which comprises of Forests(F), Land under non-agricultural uses(NA), Barren and uncultivable land (BU) and Permanent pastures(PG).

$$\text{Total Non- agricultural area (NAA)} = F + NA + BU + PG$$

- Agricultural area (AA) which comprises of miscellaneous tree crops (T), Cultivable waste lands (CW), current fallow lands (CF), fallow lands other than current fallows (FOCF) and Net Area Sown(NAS).

Agricultural Area(AA) = T + CW + FOCF+CF + NAS where NAS = TCA – ASMO

The limited availability of land compels each economy to utilise the land resources in the maximum possible manner but still there exists the possibility for the existence of unutilized area. The Utilised and Unutilized agricultural area is calculated by the formula,

$$\text{Utilised AA (UAA)} = NAS + T$$

Unutilised AA (UnAA) = CW + FOCF + CF or AA - Utilised AA or AA – (NAS + T)

In order to know the distinction between Land Use Pattern in India and Kerala, the Percentage proportion of Land Use Pattern is explained with the help of Figure 3.1.

Figure 3.1.
Land Use Categories in India and Kerala (2017-18)

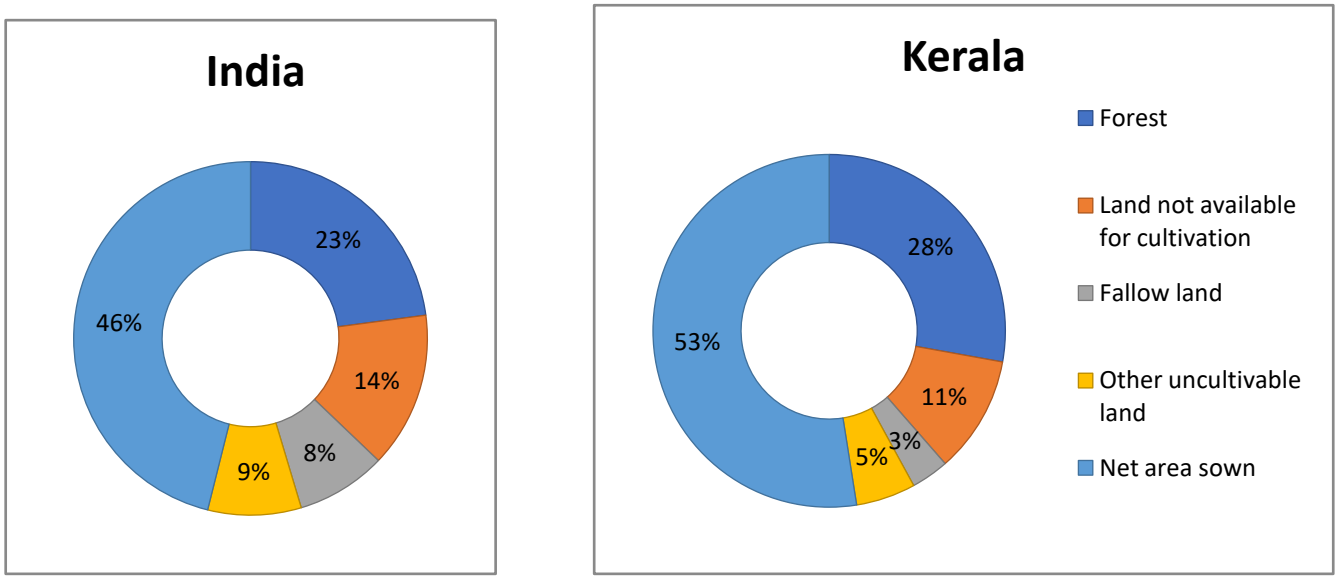


Table No: 3. 2

Land Use Pattern - Proportion to TGA (1950-51 to 2010-11)

	KERALA							INDIA						
Land Use	**1950-51**	**1960-61**	**1970-71**	**1980-81**	**1990-91**	**2000-01**	**2010-11**	**1950-51**	**1960-61**	**1970-71**	**1980-81**	**1990-91**	**2000-01**	**2010-11**
F	25.85	27.38	27.34	27.83	27.83	27.83	27.83	14.24	18.11	21.01	22.18	22.24	22.88	23.28
NA	5.00	6.41	7.12	6.65	7.65	9.83	9.89	3.29	5.42	5.42	6.44	6.92	7.78	8.59
BU	5.28	3.92	1.85	2.01	1.50	0.75	0.50	13.42	12.03	9.26	6.56	6.36	5.73	5.59
PG	1.23	1.17	0.72	0.14	0.05	0.00	0.00	2.35	4.68	4.37	3.94	3.74	3.49	3.35
NAA*	**37.37**	**38.89**	**37.02**	**36.65**	**37.04**	**38.42**	**38.22**	**33.3**	**40.24**	**40.06**	**39.12**	**39.26**	**39.88**	**40.81**
T	5.40	5.30	3.34	1.69	0.88	0.40	0.09	6.97	1.49	1.44	1.18	1.25	1.13	1.04
CW	4.31	3.71	2.09	3.22	2.43	1.53	2.36	8.07	6.44	5.76	5.51	4.92	4.47	4.11
FOCF	3.87	16.15	0.58	0.71	0.68	0.87	1.34	6.14	3.75	2.87	3.2	3.17	3.36	3.36
CF	1.49	1.06	0.66	1.11	1.14	2.00	1.96	3.76	3.9	3.49	4.88	4.49	4.84	4.64
NSA	47.57	30.44	56.30	56.62	57.82	56.78	53.30	41.77	44.63	46.37	46.12	46.86	46.31	46.04
AA*	**62.63**	**56.66**	**62.98**	**63.35**	**62.96**	**61.58**	**59.05**	**66.71**	**60.21**	**59.93**	**60.89**	**60.69**	**60.11**	**59.19**
UAA	**52.96**	**35.73**	**59.65**	**58.31**	**58.71**	**57.18**	**53.40**	**48.74**	**46.12**	**47.81**	**47.3**	**48.11**	**47.44**	**47.08**
UnAA	**9.67**	**20.92**	**3.33**	**5.04**	**4.25**	**4.40**	**5.65**	**17.97**	**14.09**	**12.12**	**13.59**	**12.58**	**12.67**	**12.11**

*AA- Agricultural Area,NAA - Non- Agricultural Area, UAA- Utilised Agricultural Area, UnAA- Unutilised Agricultural Area

Data source :1. 1950-51 to 1978-79, Indian Agriculture in Brief, Directorate of Economics and Statistics, Ministry of Agriculture and Irrigation, Government of India

2. Report of National Commission on Agriculture

The five- fold classification of the Land Use Pattern in India and Kerala reveals that India uses 46 percent of its Total geographical area as Net Sown Area while Kerala uses 53 percent for agricultural purposes. In India, the Forest area together with Net Area Sown occupies 69 percent of Total Geographical area (TGA) while it occupies 81 percent in Kerala. The Net Sown Area is an indicator of sufficient food availability and food security to the existing population in Kerala. The Land Use Pattern of Kerala and India during the seven decades is shown in Table 3.2.

In India, the objective of sustainable development was initiated with the extension of forest area, the nature's treasure with a plant diversity is showing a sharp increasing trend in the initial decades and a stagnant growth after 1970s by a negligence towards sustainable development. The people themselves took an initiative in creating a balanced ecological system along with sustainable development to protect as well as recreate the nature for the well- being of its own inhabitants. The area under forest which includes private and state - owned is showing an increasing trend from 40.4 million hectares in 1950-51 to 71.59 million hectares in 2016-17. The area under non- agricultural uses especially for infrastructure development activities showed an increase of 5.3 percent, while the total non- agricultural area showed an increase of 7.51 percent. The area not available for cultivation is showing a small declining trend due to decrease in Barren and Uncultivable land from 38.16 million hectares in 1950-51 to 10.28 million hectares in 2017-18 which was further compensated by a sharp increase in area under non-agricultural uses. Since land used for non- agricultural purposes is an important indicator of economic growth; change in land use pattern of India is reflecting the transformation of land from a developing economy to that of a developed economy. The area under miscellaneous tree crops decreased from 6.97 percent to 1.04 percent reflecting the extinction of the same in the near future. Other uncultivated lands including permanent pastures and grazing lands are fluctuating and becomes highest in 1960-61 with 13.97 million hectares gradually declined to 8.4 million hectares in 2017-18 while the land under miscellaneous tree crops has been decreased at a faster rate which led to the decrease in other uncultivated land excluding fallows. The cultivable wastelands showed a declining trend which is an indicator for growth of utilisation of agricultural area. The area under fallows as well as the current fallows is decreasing which means that land is not kept vacant due to the increasing pressure of population on it (B.M.Kumar, 2005). The decreasing trend of fallow lands other than current fallows, and the stagnancy in the

current fallows enunciates positive attitude towards the agricultural area, while declining trend of the area under miscellaneous tree crops is unfavourable to the agricultural area. Net Sown Area, an indicator of pure agricultural area is about 60 percent and above in all the decades which gives us the strong evidence that India is an agriculture based economy and majority of Indians are dependent upon agriculture for their livelihood.

The Land Use Pattern of Kerala is analysed by classifying the period since the formation of Kerala in 1956 into six decades such as

- Period I – 1956-1965
- Period II–1966-1975
- Period III-1976-1985
- Period IV-1986-1995
- Period V-1996-2005
- Period VI -2006-2015.

Since the utilisation of Land varies over time has a direct influence on the change in Land use and purposes for which it is used, the average area of all Land Use Categories from 1956 to 2015 in decades is given in Table 3.3.

Table 3.3

Average Area of Land Use in Kerala(00' hectares)

Period	F	NA	BU	P	T	CW	FOCF	CF	NAS
Period I	10276.02	1482.13	2356.43	424.38	1919.07	1272.49	521.50	496.99	20080.01
Period II	10557.56	2709.03	751.88	246.87	1294.65	911.64	257.46	280.69	21714.21
Period III	10815.09	2663.52	716.17	54.31	621.96	1151.74	269.86	431.49	21982.26
Period IV	10815.09	3000.38	550.13	19.50	349.89	912.25	274.59	467.07	22317.92
Period V	10815.09	3690.34	310.59	4.39	158.34	647.22	348.49	704.44	22121.38
Period IV	10815.09	4082.00	187.98	1.42	42.27	956.53	516.91	745.95	20752.83

Source: computed from data of Directorate of Economics and Statistics, Government of Kerala.

The Table depicts that Net Area Sown has the highest Mean Value in all decades followed by Area under Forest and are the main components of Land Use in Kerala during the whole period of 1956-2015. In 1956-65, the third position is occupied by Barren and Uncultivable land which includes mountains and hills while it acquired only the last position which is approximately around zero in 2006-2015. Net Area Sown reached maximum in 1986-95 due to the Second Green Revolution which gave importance to rice, pulses and oilseeds. The Permanent Pastures and Miscellaneous Tree crops also declined at an increasing rate by negatively affecting the whole eco-system. In 1956-65, the cultivable waste is high and declined further in 2006-15 while Fallow other than current fallows remained stagnant. The Average Current fallows increased in 1956-65 while it

showed a declined trend in 1966-75 as the Govt concentrated upon the extension of area in the initial decades as an initiative for agricultural development. The Forest Area increased in the initial decades and remained constant after 1970s.

In order to compare the variability in Land Use Categories, Coefficient of Variation - a measure of relative dispersion is used which is calculated by the formula

$$\text{Coefficient of Variation} = \frac{Standard\ \ Deviation}{Mean} \times 100$$

Coefficient of variation calculated for Land Use Categories in different decadal time periods from 1956 - 2015 in different periods is given in Table 3.4.

Table 3.4.

Land Use Pattern in Kerala -Coefficient of Variation(%)

Period	F	NA	BU	P	T	CW	FOCF	CF	NAS
Period I	3.60	21.34	9.71	11.33	8.69	35.04	53.87	19.95	6.07
Period II	0.09	2.88	10.16	31.37	18.93	14.26	25.13	16.91	1.38
Period III	0.00	2.55	6.91	25.99	21.84	8.92	3.87	5.18	0.21
Period IV	0.00	4.19	10.42	28.32	10.47	8.20	3.99	5.86	1.02
Period V	0.00	9.98	15.52	62.46	30.70	6.17	15.03	11.89	2.07
Period IV	0.00	7.31	27.62	82.71	49.32	3.73	9.93	7.91	2.23

Source: computed from data of Directorate of Economics and Statistics, Government of Kerala.

Comparing the variability in Land Use Categories, the Coefficient of Variation is higher for Land used for Non- Agricultural purposes in 1956-65. In 1996-2005 i.e. the Post Liberalisation Period, NA, BU, P, T, FOCF and CF has a high variability or is less stable compared to NAS and no variability exists in Forest Area. The Net Area Sown is less variable, more consistent, uniform and homogenous in area utilisation. The current land use with a high variation in BU, P, T is a threat to attain the sustainable eco-system of the Kerala Economy. The statistical evidence proves that the Land Use in Kerala is mainly determined by Net Area Sown which gives relevance to agricultural purposes. The Growth rate of Land Use Categories estimated by LoglinSemilogModel (Gujarati, 1995) help to identify the trend and pattern of Land Use in Kerala in which the slope coefficient measures the constant proportional or relative change in Land Use for a given absolute change in the value of the regressor, time (t). The slope coefficient of β_2 is calculated, subtracted from 1 and multiplying the difference by 100 gives the Compound Growth rate which is expressed in Regression Model

$$\text{In } Y_t = \beta_1 + \beta_2 t + u_t$$

Where $Y_t$represents different Land Use Categories in different time periods, β_2 the slope coefficient, and t represents time.

$$\beta_2 = \frac{Relative\ \ Change\ \ in\ regressand}{Absolute\ \ change\ \ in\ regressor}$$

Compound Growth Rates for the Land Use Categories in the decadal time periods is represented in Table 3.5.

Table 3.5

Land Use Pattern in Kerala– CGR(%)

YEAR	F	NA	BU	P	T	CW	FOCF	CF	NAS
Period I	1.01	3.05	-6.95	-3.54	-2.66	-16.14	-9.24	-6.11	1.82
Period II	0.00	0.50	-2.57	-10.51	-6.20	1.11	-6.01	-1.00	0.40
Period III	0.00	0.60	-1.69	-8.52	-6.76	-2.37	0.90	1.71	-0.10
Period IV	0.00	1.31	-3.34	-8.70	-2.96	-2.47	1.11	0.50	0.30
Period V	0.00	2.84	-3.44	-11.04	-9.70	0.60	4.60	2.84	-0.70
Period VI	0.00	0.00	-8.33	-45.17	-12.01	1.01	2.74	-1.69	-0.50
Pre- Reform	0.20	0.70	-3.15	-10.06	-5.73	-0.40	-1.49	-0.05	0.40
Post-Reform	0.00	1.41	-5.73	-21.42	-11.22	1.31	3.05	1.31	-0.50
Whole Period	0.20	0.70	-3.92	-13.93	-7.23	-1.09	0.90	0.90	0.60

Source: Computed from data of Directorate of Economics and Statistics, Govt of Kerala.

The Compound Growth Rate (CGR) of Land Use - Forest, Non-Agricultural Land, Fallow Other than Current Fallow, Current Fallow, Net Area Sown is positive while that of Barren and Uncultivated Land, Permanent Pastures, T, Cultivable Waste, shows rate of decay during the whole period 1956-2018. The Compound Growth Rate show an increasing growth in F, NA, NAS and a decayed growth in BU, P, T, CW, FOCF, CF in initial periods among which the declining trend in CW, FOCF and CF is a symbol of favourable Land Use Pattern. The Pre- Reform period of 40 years reflects positive trend in F, NA, NAS with decayed growth in BU, P, T, CW, FOCF, CF out of which the negative values of CW, FOCF and CF is still favourable to the state. But in the Post Reform Period, F = 0, sharp decay in BU, P, T, sharp increase in CW, FOCF, CF is unfavourable to the state as well as to the environment. The Net Area Sown which provides the food security is almost stagnant throughout the 63 years which proves that utilisation of the area is not much affected by changes in the economy.

The Utilised Agricultural Area is a symbol of agricultural stability for an economy and depicts the proper utilisation of the land which is a fixed and limited factor especially for agricultural purposes. The Utilised Agricultural Area is calculated as a summation of Net Area Sown and area under cultivation of Miscellaneous Tree Crops while Unutilised Agricultural Area as a summation of Cultivable Wastelands, Fallow other than Current Fallows and Current Fallows. The Utilised and UnutilisedAgricultural Area in Kerala gives a clear-cut picture of whether the agricultural area is utilised or kept as fallow is depicted in Table 3.6.

Table 3.6.

Agriculture(Utilised and UnutilisedArea)– A comparison

Year	Kerala			India		
	AA	UAA	UnAA	AA	UAA	UnAA
1950-51	62.63	52.96	9.67	66.71	48.74	17.97
1960-61	56.66	35.73	20.92	60.21	46.12	14.09
1970-71	62.98	59.65	3.33	59.93	47.81	12.12
1980-81	63.35	58.31	5.04	60.89	47.3	13.59
1990-91	62.96	58.71	4.25	60.69	48.11	12.58
2000-01	61.58	57.18	4.40	60.11	47.44	12.67
2010-11	59.05	53.40	5.65	59.19	47.08	12.11
2017-18	57.79	52.15	5.64	59.09	46.01	13.08

Source: Directorate of Economics and Statistics, Government of Kerala.

In 1960-61, the agricultural area under cultivation showed a declining trend and reached the minimum due to agrarian crisis and Food shortage. It led to New Agricultural Strategy (Green Revolution) initiated by M S Swaminathan by the application of HYV seeds and chemical fertilisers along with heavy irrigation. After the initiatives, the production as well as productivity of agriculture started increasing in State and National level. Though the initiatives were taken to improve agriculture, still a proportion of Agricultural Area is kept as unutilized which may be due to price fluctuations or personal attitude of the farmers towards agriculture. In 1960-61, about 20 percent of Total Agricultural Area is kept as unutilized in Kerala which is far higher than 14.09 percent at the National level. But after that Kerala recouped from the crisis by reducing the unutilized area and it remained stagnant at around 5 percent from 1970 onwards which is lesser than 12 percent at National level interpreting that Kerala is successful in utilizing

the land resources especially the agricultural area and is helpful to provide a better food security to the living population.

The District –wise distribution of Nine-fold classification is necessary to know about the Land Use Pattern in Kerala, especially the proportion of agricultural and non-agricultural area to the Total Geographical Area of Kerala. Land Use Pattern in all Districts of Kerala including Thiruvananthapuram (TV), Kollam (KL), Pathanamthitta (PT), Alappuzha (AL), Kottayam (KT), Idukki (ID), Ernakulam (ER), Thrissur (TS), Palakkad (PL), Malappuram (MA), Kozhikode (KZ), Wayanad (WN) , Kannur (KN) and Kasargode (KS). Whether the thin flat stretch of land is utilised properly is answered with the available information from Directorate of Economics and Statistics and Land Use Board of Kerala is given in the Table 3.7.

Table 3.7

District- wise Land-Use Pattern in Kerala (2017-18) (%)

No	Districts	F*	NA	B	P	TNA	T	CW	FOCF	CF	NAS	AA	UAA	UNAA
1	**TV**	1.28	0.83	0.00	0	2.12	0.00	0.01	0.02	0.07	3.33	3.44	3.34	0.11
2	**KL**	2.10	0.72	0.00	0	2.82	0.00	0.07	0.05	0.06	3.20	3.39	3.21	0.18
3	**PT**	3.99	0.50	0.00	0	4.49	0.00	0.06	0.05	0.09	2.06	2.27	2.06	0.21
4	**AL**	0.00	0.65	0.00	0	0.65	0.00	0.38	0.06	0.05	2.15	2.65	2.16	0.49
5	**KT**	0.21	0.75	0.03	0	0.98	0.00	0.17	0.06	0.11	4.18	4.52	4.19	0.33
6	**ID**	5.11	0.37	0.04	0	5.51	0.00	0.05	0.03	0.04	5.29	5.42	5.29	0.13
7	**ER**	1.82	1.16	0.01	0	2.99	0.00	0.39	0.17	0.21	3.82	4.58	3.82	0.76
8	**TS**	2.67	1.02	0.00	0	3.69	0.01	0.24	0.16	0.21	3.35	3.96	3.36	0.61
9	**PL**	3.51	1.21	0.04	0	4.75	0.02	0.48	0.33	0.22	5.32	6.36	5.34	1.02
10	**MA**	2.66	1.36	0.02	0	4.04	0.00	0.15	0.15	0.16	4.47	4.94	4.48	0.46
11	**KZ**	1.06	0.85	0.01	0	1.93	0.00	0.06	0.02	0.05	3.82	3.95	3.82	0.13
12	**WA**	2.03	0.30	0.00	0	2.33	0.00	0.03	0.03	0.06	2.92	3.04	2.92	0.12
13	**KN**	1.25	1.00	0.03	0	2.29	0.01	0.17	0.08	0.10	4.82	5.18	4.83	0.35
14	**KS**	0.14	0.74	0.08	0	0.97	0.01	0.18	0.05	0.05	3.76	4.04	3.76	0.28
15	**Total**	27.83	11.40	0.28	0	39.51	0.06	2.48	1.27	1.48	52.50	57.80	52.56	5.24

Source : Directorate of Economics and Statistics,Government of Kerala.

*F- Forest, NA – Land for Non-Agricultural Purposes, B – Barren Land, P- Permanent Pastures, TNA – Total Non-Agricultural Land, T – Miscellaneous Tree Crops, CW – Cultivable Waste, FOCF – Fallow other than Current Fallows, CF – Current Fallow, NAS – Net Area Sown, AA –Agricultural Area, UAA – Utilised Agricultural Area, UNAA – Unutilised Agricultural Area

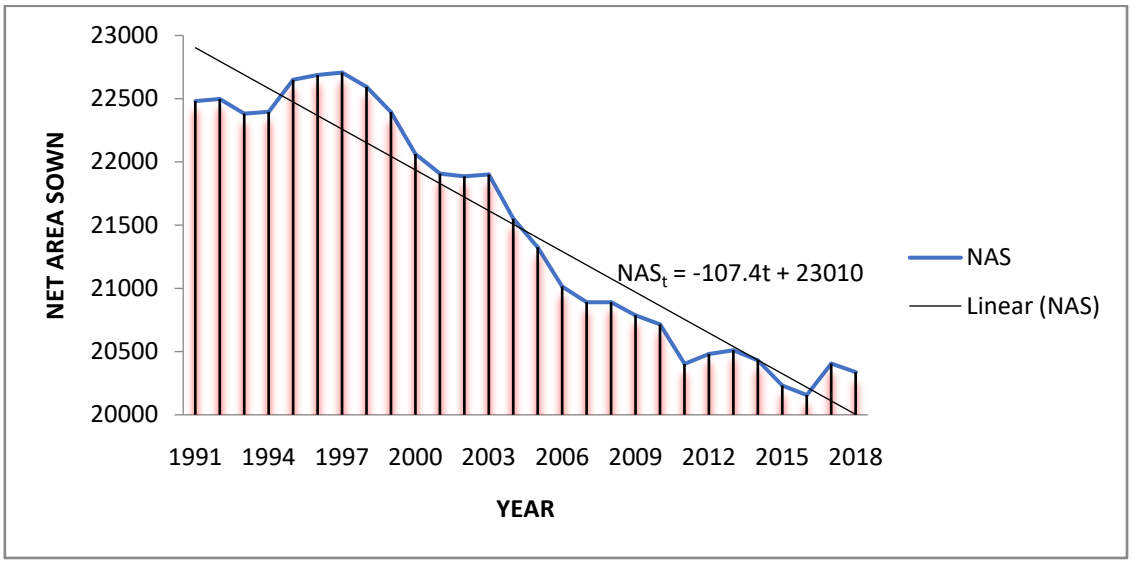
Kerala, the God's Own Country proves that every district contributes about 60 percent of the total area to agriculture and 40 percent to non- agricultural purposes. Palakkad District occupies the first position in Net Area Sown as well as in Total Agricultural Area. The districts such as Pathanamthitta, Idukki, Palakkad, Malappuram have a higher proportion in total non-agricultural area due to the existence of high proportion of forest area and not due to increase in area used for non- agricultural purposes. So a comparative analysis of Area used for agricultural purposes and non- agricultural purposes proves that the Net Area Sown is far above the proportion of land for non-agricultural purposes reflecting the sustainable and ecological utilisation of land giving preference to Millenium Goals. This is the result of a long run perspective of our forefathers who created a strong ecological base for the proper utilisation of land. The agriculture in Kerala is dependent upon the climate, temperature, rainfall, altitude (together called as topography) and the differences in agriculture which is expressed through methods of production, selection of crops, crop diversification and cropping intensity are dependent upon the regional differences based upon which Kerala is classified into Physiological Climatic Zones which is purely based upon rainfall, soil type, topography and altitude.

3.4. NAS - A PROXY VARIABLE FOR AREA UNDER AGRICULTURAL PURPOSES:

In the Nine- fold classification, the main contributing factor is the Net Area Sown which is a proxy variable for land used for agricultural purposes. Agriculture, the key concept of Primary sector among the three dominant sectors which contribute to Gross Domestic Product(GDP) is the largest rural livelihood provider in India and the main contributor for food security, healthy nutrients and creates a healthy younger generation through whom the economy can attain rural employment, economic growth, increasing Gross Domestic Product, increasing standard of living and through that economicdevelopment. Since a healthy food intake is necessary for creating a healthy younger generation, agriculture promotes the development of not only the existing generation, but also the coming generations for which availability of healthy food through agricultural development is necessary and vital. A recent clear-cut picture of the Net Area Sown is given with the application of a linear trend line in the Figure 3.2.

Figure 3.2.

Net Area Sown in Kerala (1991- 2018)



The figure shows a declining trend in the Net Area Sown during the period of 1991 to 2018 – the Post-Liberalisation Period but still the variations are occurring within the limits of 200 million hectares to 230 million hectares. Since β_2 (= -107.46) < 0 indicating rate of decay(Gujarati, 1995) in Net Area Sown, the linear trend line is downward sloping from left to right.

Agricultural crops in Kerala can be classified as

i. Food and Non- Food Crops.

ii. Seasonal, Annual and Perennial Crops.

Food and Non- Food Crops include food crops such as cereals, pulses and millets, sugar crops, spices and condiments, fresh fruits, vegetables etc and non-food crops such as rubber, betel leaves, lemon grass, teak etc. Food crops are crops that form a major proportion of the daily diet in relatively large quantities as a source of energy(cereals, tubers), proteins(pulses and beans), vitamins (Fruits and vegetables) and minerals. Cereals provide 50 percent calories and half of proteins consumed by human population. The area under food and non-food crops and the Food to Non-food Crop Ratio in Kerala is given in Table 3.8.

Table 3.8

Area Under Food and Non- Food Crops in Kerala (000' Hectares)

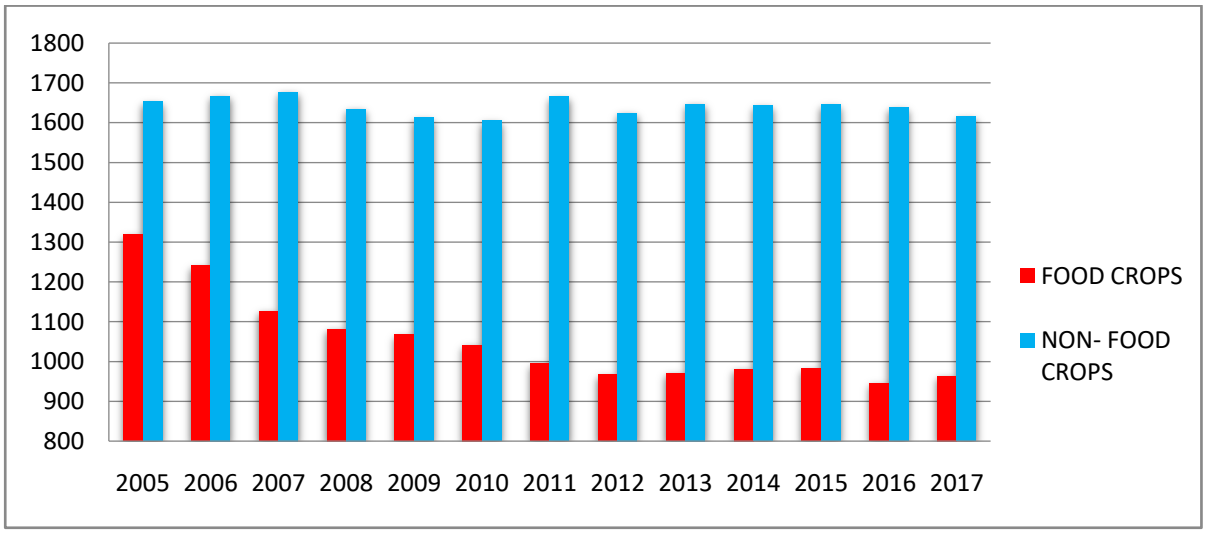
YEAR	FOOD CROPS	NON- FOOD CROPS	FD/NON FD C-RATIO
2005	1318.644	1653.319	0.80
2006	1240.582	1667.083	0.74
2007	1126.495	1676.959	0.67
2008	1081.873	1634.599	0.66
2009	1067.468	1613.07	0.66
2010	1041.54	1605.921	0.65
2011	995.669	1666.088	0.60
2012	966.954	1624.78	0.60
2013	970.703	1646.567	0.59
2014	981.72	1642.904	0.60
2015	982.302	1645.275	0.60
2016	945.608	1638.400	0.58
2017	963.397	1616.302	0.60
% Variation	-26.9403	-2.23895	

Source: Directorate of Economics and Statistics,Government of Kerala.

The Net Area Sown under Food Crops and Non- Food Crops is reflected in two different ways - the area under Food crops is decreasing at an increasing rate with a variation of -26.94 percent, while that of Non- Food crops are decreasing at a decreasing rate with a variation of -2.24 percent which reflects the probability for the occurance of food shortage in the future time periods. The Area under food crops and Non- Food Crops in Kerala in the past 12 years is given in Figure 3.3

Figure 3.3

Area under Food and Non-Food Crops in Kerala (2005-17)



The decreasing areal distribution of food crops is a dangerous indicator of the food insecurity in Kerala which will result in either famines or dependency on other states instead of self- sufficiency in foodgrains. In Kerala, decreasing proportion of food to non-food crop ratio is a threat to economy and Government have to take initiatives to improve the ratio by increasing the cultivation of Food Crops. The Figure shows that the ratio is decreasing due to decreasing trend of Food Crops and Increasing trend of Non- Food Crops. Finding a solution to the problem is necessary as Keralites have to realize the present situation and a diversion back to the cultivation of Food Crops is necessary. The study is relevant as it is focusing upon the farmers who are experienced and learnt about cultivation from their forefathers.

Seasonal, Annual and Perennial Crops which includes

a) Seasonal crops – Paddy, Pulses, Tapioca, Vegetables, Sweet Potato, Tubers, Groundnut, Ginger, Turmeric, Cotton, Tobacco, Onion, Tur etc
b) Annual Crops – Sugarcane, Banana, Plantain, Pineapple, Betel leaves etc
c) Perennial Crops – Coconut, Arecanut, Cashew, Mango, Jackfruit, Tamarind, Pepper, Rubber, Tea, Coffee, Cardomom, Cloves, Nutmeg, Cinnamon, Cocoa, Papaya etc

Paddy, the leading crop in Kerala is cultivated in all the three seasons – Autumn (July –October), Winter (November – March) and Summer (April – June) except in Wayanad where there exists no paddy cultivation in Autumn Season. The upland cultivation in paddy is a new change in the cropping pattern of Kerala which is preferred due to the climatic fluctuations. The first position and third position in Paddy Cultivation is occupied by Palakkad and Thrissur Districts respectively. Palakkad also occupies the first position in cultivation of Pulses, Palmyrah, Turmeric, Fresh fruits, Mango, Banana, Groundnut and Millets. Idukki and Wayanad leads in the production of Pepper, Ginger, Cardamom, Tea, Coffee, Malappuram for Arecanut, Ernakulam for Pineapple, Tapioca (tubers), Colocasia, Yam for Kollam, Coconut for Kozhikode and Rubber for Kottayam. The percentage variation in Area and Production of the Principal Crops in Kerala is represented in Table 3.9

Table 3.9

Percentage Variation in Area, Production and Productivity of Principal Crops in Kerala

		Area			Production			Productivity		
Crops	Type*	1961-62	2017-18	Variation	1961-62	2017-18	Variation	1961-62	2017-18	Variation
Paddy	S	753009	198026	-73.70	988150	578256	-41.48	1312	2920	-123
Arecanut	P	56764	95739	68.66	8091	99925	1135.01	143	1044	-632
Turmeric	S	4867	2484	-48.96	4267	6694	56.88	877	2695	-207
Cashew	P	55051	38781	-29.55	84449	15635	-81.49	1534	403	74
Tapioca	S	236776	61874	-73.87	1618713	2325007	43.63	6836	37576	-450
Banana	A	42693	52868	23.83	55443	424048	664.84	1299	8021	-518
Coconut	P	505035	760946	50.67	32476516	5231758	63.20	6431	6878	-69
Ginger	S	12050	3275	-72.82	11185	15124	35.22	928	4618	-398
Pepper	P	99887	82761	-17.15	26550	362183	1264.15	266	4376	-1546
Sesamum	P	11953	197	-98.35	2539	1543	-39.23	212	7832	-3587
Rubber	P	133133	551115	313.96	24589	540775	2099.26	185	981	-431
Coffee	P	18807	84976	351.83	8145	64676	694.06	433	761	-76
Tea	P	37426	36473	-2.55	37428	60760	62.34	1000	1666	-67

Source : Department of Economics and Statistics, Government of Kerala

*Type of crops - S – Seasonal crop, P – Perennial crop, A – Annual crop

The Table depicts that Seasonal Crops such as Paddy, Turmeric and Ginger are showing a declining trend while the Perennial and Annual Crops are showing a sharp increasing trend in Area and Production in Kerala. High positive variations are reflected in three crops – Rubber, Arecanut and Banana – the crops which have cost effectiveness and high market prices while negative variations occurred in paddy and tapioca, the main staple food crops of Kerala. The highest areal and crop- wise variation occurred in the cultivation of Rubber from 188.07 Hundred Hectares to 853.59 Hundred Hectares while the production increased at a peak rate from 24589 Million Tonnes to 798940 Million Tonnes.

Productivity refers to the physical relationship between the quantity produced (Output) and the quantity of resources used in the production process. Agricultural productivity is equal to the ratio of Total Agricultural Crop Production to Total Land Area used for cultivation which refers to the amount of crop production in per hectare land. High productivity reflects decreasing cost of production and increasing profitability which will help the farmer to increase the living standards and increasing exports. It will be also helpful for farmers to provide the agricultural commodities at a lower cost to the customers. The table focuses upon the changes in area, production and productivity of thirteen principal crops which depicts that productivity of Tapioca, Banana, Ginger and Rubber sharply escalated while that of pepper, coffee and paddy increased very slowly. The productivity of Coconut is remaining stagnant in Kerala in the areawise distribution. Planting coconut seedlings in doughs is an indicator reflecting the first step of land conversion from paddy and other cereals cultivation to the usage of land for other purposes or substitution of low valued crops to high valued crops. Though The Kerala Conservation of Paddy land and Wetland Act 2008 was initiated and implemented, the area under land used for paddy cultivation has been declined while that of coconut has been increased without much increase in productivity. In 1961-62, paddy occupied the leading position in area under cultivation followed by coconut and tapioca. In 2017-18, the situation changed as area under paddy showed a declining trend while area under coconut showed an increasing trend.

3.4.1. Crop Diversification

Crop Diversification refers to a shift of crop or area under crop to another crop or area under another crop. The Diversification is preferred by farmers to tackle with the

physiological as well as economic problems faced by them and the problems arising from one crop will be independent from the other crops if a number of crops are cultivated. It will be helpful to the farmer in maintaining the stagnant or increased income though one crop is less profitable. So the farmer can prefer multiple cropping, high valued crops and less water consuming crops instead of monocropping, less valued crops and high water consuming crops.

The Herfindal- Hirschman's Index of Crop Diversification is applied to analyse the Crop Diversification and Magnitude of Crop Diversification in Kerala. It is calculated by the formula

$$\text{Herfindal Index} = \text{H.I} = \sum_{i=1}^{n} Pi^2 \text{ where Pi} = \frac{Ai}{A}$$

where Ai refers to Net Area Sown in the ith crop and A refers to the Total Net Area Sown

$$\text{Index of Crop Diversification (ICD)} = 1 - \sum_{i=1}^{n} Pi^2 = 1 - \text{H.I}$$

Herfindal Index is an index for crop specialization which ranges from zero to one where onerepresents complete specialization and zero represents perfect diversification(Gupta and Tewari, 1985). An Index of Crop Diversification which is obtained from Herfindal Index also ranges from zero to one where one represents complete diversification and zero represents complete specialization. The Magnitude of Diversification be diversified as

1. Magnitude of High Diversification – 0.80 – 1.00
2. Magnitude of Moderate Diversification – 0.60 – 0.80
3. Magnitude of Low Diversification – < 0.60

Table 3.10.

Area –wise Index and Magnitude of Crop Diversification in Kerala (2017-18)

STATES	HI	ICD	Magnitude	Topography
TV	0.25	0.75	Moderate	Red Loam Lands
KL	0.22	0.78	Moderate	Midlands
PT	0.26	0.74	Moderate	Malayoram
AL	0.27	0.73	Moderate	Lowland
KT	0.33	0.67	Moderate	Malayoram
ID	0.19	0.81	High	Highland
ER	0.26	0.74	Moderate	Coastal Sandy Lands
TS	0.25	0.75	Moderate	Midlands, Coastal Sandy Lands
PL	0.25	0.75	Moderate	Coastal Plains, Black Soils
MA	0.26	0.74	Moderate	Malappuram Lands
KZ	0.37	0.63	Moderate	Malappuram Lands
WA	0.17	0.83	High	Highland
KN	0.21	0.79	Moderate	Malayoram
KS	0.25	0.75	Moderate	Malappuram Lands

Source: Department of Economics and Statistics, Government of Kerala

Index of Crop Diversification is high and approaches one in almost all the Districts of Kerala indicating perfect diversification. The crop diversification and selection of crops is preferred according to the regional differences in the physiological climatic regions. The number of crops is highest in Highlands with the largest variety of crops cultivated while in all the other physiological regions, there exists moderate or high crop diversification and Kerala is proving to be a model for other states due to existence of the crop diversification which reduces the risk and uncertainty in agricultural productionandprovides a guidance to agriculturists to bravely face the possibility of occurance of an agricultural crisis and be a risk averters in agricultural sector. Idukki and Wayanad are the two districts with a large variety of diversified perennial crops such as Pepper, Cardamom, Arecanut, Banana, Plantains, Tea, Coffee, Rubber, Coconut and Jackfruit.

3.4.2. Crop Ranking and Crop Combinations :

The Utilisation of Agricultural Land and Crop Combinations selected by farmers in the land is varying according to changes in the physiological characteristics in Kerala. Kerala may be accepted as a true example for utilizing the land resources according to the existing topography.Topography is one of the parameters used for identifying Agro-Climatic Zones explained by ENVIS Centre, sponsored by Ministry of Environment, Forests and Climate Change, Government of India. The crop combinations of the Districts in Kerala give a picture of the area-wise leading crops in Kerala and the topography as which is given in Table 3.11.

In the areal pattern of leading crops in Kerala, Coconut is the leading crop with first rank in 7 districts and second rank in 4 districts of Kerala, thus making Kerala prestigious with the name itself which derived out of the Malayalam word – ‘Kera’ which means Coconut. The other leading crops in area-wise distribution is Rubber in 3 districts which is related to Malappuram lands, Paddy in Lowlands of Alappuzha, Pepper in Idukki and Coffee in Wayanad. In Kerala, 12 different leading crops with equal to or more than five percent as the ratio to Net Area Sown exists and it implies that Crop Diversification exists in the Districts of Kerala. The traditional Farmers are well planned enough to face the uncertain and risky situations arising from climatological and socio- economic circumstances. The farmers are accepting the crop combinations which are very much suitable or apt for the particular agricultural area.

Table 3.11.

Topography and District-wise Crop Combinations in Kerala

Crops	Crop Combinations	Districts	Topography
One Crop	Nil	0	……
Two Crops	Paddy+Coconut (S+ P)	AL	Lowland
	Rubber+Tapioca(P+S)	PT	Malayoram
	Rubber+Coconut(P+P)	ER	Coastal Sandy Lands
Three Crops	Coconut+Rubber+Tapioca(P+P+S)	KL	Midlands
	Rubber+Coconut+Paddy(P+P+S)	KT	Malayoram
	Coconut+Paddy+Rubber(P+S+P)	TS	Midlands & Coastal Sandy Lands
	Coconut+Rubber+ Arecanut(P+P+P)	KS,MA	Malappuram Lands
	Coconut+Rubber+Cashew(P+P+P)	KN	Malayoram
Four Crops	Coconut+ Rubber+Tapioca+Plantain(P+P+S+A)	TV	Red Loam Lands
	Paddy+Coconut+Rubber+Banana(S+P+P+A)	PL	Palakkad Coastal & Chittoor Black Soils
	Coconut+Rubber+Arecanut+ Jackfruit(P+P+P+P)	KZ	Malappuram Lands
Seven Crops	Pepper+Rubber+Cardamom+Tea+ Jackfruit+Coconut+Coffee	ID	Highland
	Coffee+Arecanut+Banana+Pepper+ Coconut+Rubber+Paddy(P+P+A+P+P+P+S)	WA	Highland

Source :Computed from data of Directorate of Economics and Statistics, Govt of Kerala.

Conclusion:

Among the Land use categories, major proportion of land is acquired by Net Area Sown which helps to create food security to the existing population. The Net Area Sown is the most important Land Use in Kerala as it occupies more than sixty percent of Total Geographic Area. The Utilisation Pattern of Net Area Sown is the most predominant than other Land Use Categories and the main participants in the proper utilisation of Net Area Sown is the farmers and the ways and procedures in which they are utilizing the land in the maximum possible manner is to be identified. If an individual is provided an acre of land and if it is utilised properly by people themselves with the assistance of those who are experts in traditional agriculture, they can create golden harvest in their own fields. It can help to create a healthy younger generation and a proper eco-system through a favourable environment.