AGRO ECOLOGY OF KERALA CLASSIFICATION AND FEATURES

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What is agro ecology ?

- First mention of the term agro ecology was by Bensin in 1928 and first book titled ‘Agroecology ‘ published in 1965 by Tischlet
- Components within an agro ecosystem like plants, animals, soils, climate and their interactions
- Impact of human interventions in managing these components for agriculture was studied

Definition

Agro ecology encompasses the relationship between agricultural production systems and ecological processes. It includes all the techniques that allow agricultural practices with due consideration to nature, environment and its ecological specificities to attain sustainability in production

Agro-ecological Analysis

- (NBSS&LUP) generated a map of Agro-ecological Regions of the country (Sehgal *et al*., 1992) by integrating climate, physiography, length of growing period and soils, an improvement on the agro-climatic zone maps
- Agro-ecological regions (AER) map of NBSS&LUP had 20 regions and the entire state of Kerala formed part of region 19: Western Ghats and Coastal Plains, hot humid-per humid eco-region, with red, laterite and alluvium-derived soils with growing period of 210+ days.
- Analysis of agro-ecology of Kerala State based primarily on climate, geomorphology, land use and soil variability was carried out by NBSSLUP in 2008
- Five agro-ecological zones and twenty three agro-ecological units were delineated

AGRO-ECOLOGICAL ZONES

- Agro-ecological zones are broad spatial divisions with emphasis on physiographic features.
- Five agro-ecological zones (AEZ's) have been identified in the state

1. Coastal Plain

- Comprises the nearly level to gently sloping lands along the coast at elevation below 30 metres and lying between the sea and the midlands.
- Includes sandy beaches, sandy plains, coastal laterites, and low lying areas such as estuaries, backwaters, submerged lands, swamps, marshes, *kayal lands*, and broad valleys.
- Covers 5,09,246 ha (13.10 %) in the state

2. Midland Laterites

- Comprises undulating to rolling lands interspersed with narrow valleys between the coastal plain on the west and foothills and hills on the east
- Extends from the southern end to the northern end of the state.
- Elevation ranges from 30 to 300 metres.
- Covers 10,56,385 ha (27.18 %) in the state.

3. Foothills

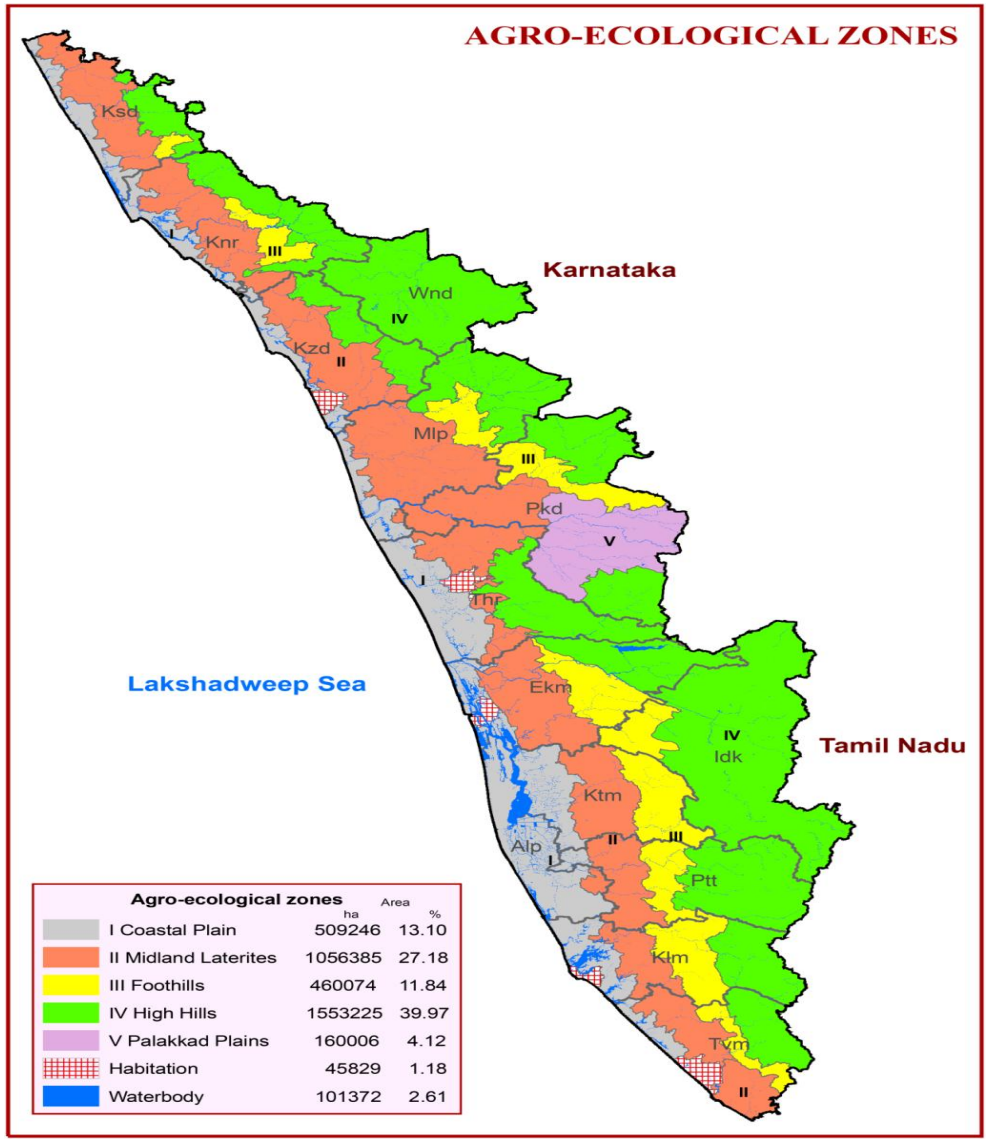
- Undulating to rolling lands and low hills between the midland laterite on the west and high hills on the east
- The terrain has only very narrow valleys.
- The elevation ranges from 300 to 600 metres.
- Covers 4,60,074 ha (11.84 %) in the state

4. High Hills

- Comprises Western Ghats and plateaus extending from south to north comprise Central Sahyadri, the Nilgiris and South Sahyadri. Mountains are essentially plateau remnants of two or three altitudinal zones.
- Highland plateaus rise 600 m above mean sea level, with a number of peaks over 1800 m
- Slopes of hill ranges can be as high as 80 per cent.
- Covers 15,53,225 ha (39.97 %) in the state

5. Palakkad Plain

- Palakkad Gap, resembles an inland plain with low elevation,is a prominent physical feature along the valley of the Bharathapuzha river.
- Gently sloping lands of Palakkad, east of Kuthiran hills, flanked on the south and north by Nelliyampathy Hills and Attappady Hills, respectively and merging to Tamil Nadu uplands through the gap in Western Ghats
- Cover 1,60,006 ha (4.12 %) in the state.


AGRO-ECOLOGICAL ZONES
Karnataka
Tamil Nadu
Lakshadweep Sea
Ksd
Knr
Wnd
Kzd
Mlp
Pkd
Thr
Ekm
Idk
Ktm
Alp
Ptt
Klm
Tvm
I
II
III
IV
V
Agro-ecological zones
Area
ha
%
I Coastal Plain 509246 13.10
II Midland Laterites 1056385 27.18
III Foothills 460074 11.84
IV High Hills 1553225 39.97
V Palakkad Plains 160006 4.12
Habitation 45829 1.18
Waterbody 101372 2.61

Agro ecological Units.

- Based on climate, land form and soils with the panchayat as the primary unit, twenty three agro- ecological units have been delineated
- For administrative convenience and implementation of development plans, reclassification with development blocks as the unit.
- Grouping has been done by merging of units with only slight variations in climate, land form, soils and limited geographical extent
- Based on the above criteria twenty agro-ecological management units have been identified.

Features of AEU's

AEU 1: Southern Coastal Plain

- Represent the nearly level coastal lands where sands are the dominant soil type.
- They are of marine origin, acidic in reaction, have low content of organic matter and are deficient in most plant nutrients
- Capacity to retain plant nutrients and water are extremely low
- Occur as a narrow strip of land along the coastline of the State
- Climate is tropical humid monsoon type (MAT 27.6 °C; rainfall 2360 mm).
- Coconut plantations on uplands and rice in lowlands are the major land use.
- Covers 56,782 ha (1.46 %) in the state.
- Soil test data indicated acidic soils, low in organic carbon and potassium, high in available P and deficient in secondary and micro nutrients

AEU 2 : Northern Coastal Plain

- Represent the nearly level coastal lands where sands are the dominant soil type.
- Extends from Thrissur to Kasaragod District. along the coast
- Tropical humid monsoon climate has rainfall ranging from 3133 to 3254 mm, Mean annual temperature 27.5 °C.
- Dominant crops include coconut in the uplands and rice in the lowlands.
- The unit covers 1,22,970 ha (3.16 %) in the state.
- Soil has almost similar characteristics as the Southern Coastal plain
- Alluvial/colluvial brown hydromorphic soils also occur in the low lands
- Laterite soils occur in the fringes of the midlands of some panchayats

AEU 3: Onattukara Sandy Plain

- A special agro-ecological unit delineated for the sandy plains extending into the midlands from coast
- Covers parts of Kollam and Alappuzha districts.
- Climate is tropical humid monsoon type (mean annual temperature 27.6 °C; rainfall 2492 mm)
- Length of growing period is 240 days and dry period around four months.
- Soils are dominantly sandy throughout the profile and occur in level to gently sloping lands and are prone to severe drought and moisture stress during summer months
- Air and water movement is very rapid
- Deep to very deep, but often limited by high water table
- Soils have slightly higher content of finer particles and organic matter and are similar to coastal sands in general properties and management requirements.
- Coconut plantations on uplands and rice in lowlands are the major land use.
- The unit covers 67,447 ha (1.74 %) in the State

AEU 4: Kuttanad

- A special agro-ecological unit delineated to represent the waterlogged lands spread over Alappuzha, Kottayam and Pathanamthitta districts.
- Major portion of these lands are below, at or just above sea level.
- Climate is tropical humid monsoon type (MAT 27.6 °C; rainfall 2,746.1 mm).
- Hydromorphic soils, often underlain by potential acid-sulphate sediments and unique hydrological conditions characterize the unit.
- Sea water ingress is controlled through bunds and barrages for rice cultivation done by dewatering
- Coconut is grown on the uplands and bunds of the unit and rice in lowlands.
- The unit covers 1,26,931 ha (3.27%) in the state

AEU 5: Pokkali Lands

- Occur below sea level, in coastal areas of Ernakulam and extending to parts of Thrissur and Alappuzha districts.
- Climate is tropical humid monsoon type (mean annual temperature 27.6 °C; rainfall 3,049 mm). Hydrology and soils are similar to those in Kuttanad.
- Seawater inundation is not controlled and hence soils are acid-saline and highly fertile
- A special kind of rice culture, locally known as Pokkali cultivation, is done in lowlands alternating with fish culture
- Soils are formed mainly from marine sediments and fertile from the residues of fish culture
- Inorganic fertilizers are seldom used in cultivation
- Coconut is raised on uplands
- The unit covers 39,765 ha (1.02 %) in the state.

AEU 6: Kole Lands

- Spread over the coastal part of Thrissur and extending to southern coastal parts of Malappuram district
- Climate is tropical humid monsoon type (MAT 27.6 °C; rainfall 2,902 mm).
- Seawater ingress into these lands is controlled through barrages and weirs to facilitate rice cultivation.
- Soils are hydromorphic acid clays, often underlain by potential acid-sulphate sediments.
- Coconut is grown on the uplands and bunds and rice in lowlands.
- The unit covers 71,142 ha (1.83 %) in the state

AEU 7: Kaipad Lands

- Occurs along the coast of Kozhikkode, Kannur and Kasaragod districts as isolated stretches of waterlogged lands.
- Climate is tropical humid monsoon type (mean annual temperature 27.3 °C; rainfall 3,254 mm).
- The hydromorphic, acid-saline, clay soils are often underlain by potential acid-sulphate soils.
- Coconut is grown on the uplands of the unit and bunds and rice in lowlands.
- The unit covers 24,209 ha (0.62 %) in the state

AEU 8: Southern Laterites

- Spread over in south-western part of Thiruvananthapuram district is delineated to represent the uniqueness of climate and soils.
- Tropical moist sub humid monsoon climate receives low rainfall compared to the other areas of midland laterites (mean annual temperature 27.1 °C; rainfall 1,884 mm).
- Soils, acidic and have low activity lateritic clay practically free of gravel and plinthite.
- Soils are deep to very deep, well drained, low cation exchange capacity, low reserve of basic cations and exhibit multi nutrient deficiencies.
- Soil structure is good implying good air and water relationship.
- Coconut on uplands intercropped to a variety of annual and other perennial crops
- Rice, tapioca, banana and vegetables on lowlands
- The unit covers 38,727 ha (1.0 %) in the state.

AEU 9: South Central Laterites

- Represents the midland laterite terrain with typical laterite soils and short dry period.
- Covers the midlands extending from Thiruvananthapuram to Ernakulam district.
- Climate is tropical humid monsoon type (mean annual temperature 26.5 °C; rainfall 2827 mm).
- Soils, acidic and have low activity lateritic clay practically free of gravel and plinthite.
- Soils are deep to very deep, well drained, low cation exchange capacity, low reserve of basic cations and exhibit multi nutrient deficiencies.
- Soil structure is good implying good air and water relationship.
- Mono-cropped rubber and coconut intercropped to a variety of annual and other perennial crops is the major land use on uplands
- Rice, tapioca, banana and vegetables are grown on lowlands.
- Covers 3,65,932 ha (9.42 %) in the state.

AEU 10: North Central Laterites

- Represent midland laterite terrain with longer dry period.
- Climate tropical humid monsoon type (MAT 27.6°C; rainfall 2795 mm).T
- Soils of uplands strongly acid, gravelly, lateritic, low-activity, clay often underlain by plinthite. Lowlands have strongly acid, non-gravelly clay soils with impeded drainage.
- Coconut intercropped to a variety of annual and perennial crops is the major land use on uplands
- Rice, tapioca, banana and vegetables on lowlands.
- The unit covers 1,71,469 ha (4.41 %) in the state.
- Southern, South Central and North Central Laterites soils have serious constraints to crop production, namely high gravel content, low water retention, multi nutrient deficiencies, high phosphorus fixing capacity.
- Soil conservation measures, adequate external inputs lime, organic matter, macro, secondary and micro nutrients based on soil tests are necessary for high productivity.

AEU 11: Northern Laterites

- Midland laterites from Malappuram to Kasaragod districts with long dry period.
- Climate is tropical humid monsoon type (MAT 27.3 °C; rainfall 3217 mm).
- The uplands have strongly acid, gravelly, lateritic, low-activity, clay soils often underlain by plinthite, laterite duricrusts (hardend laterite) are also frequent due to longer dry period
- Coconut intercropped to a variety of annual and other perennial crops is the major land use on uplands, Cashew plantations are also extensive ,Rice, tapioca, banana and vegetables in lowlands
- Covers around 4,60,257 ha (12.36 %) in the state.
- Soils have serious constraints to crop production, like gravelliness, low water retention, multi nutrient deficiencies, high P fixing capacity.
- Sub soil hard pans cause difficulty in root penetration
- Severe erosion has exposed plinthite layer to the surface in many landscape, forming duricrusts, especially in level lands and top of undulating hills.
- Measures to prevent erosion and adequate external inputs of lime, organic matter, macro, secondary and micro nutrients can increase productivity

AEU 12: Southern and Central Foothills

- Represent undulating lands with low hills, between midland laterites and high hills of Western Ghats.
- Climate is tropical humid monsoon type (MAT 27.5 °C; rainfall 3462 mm).
- Strongly acid, gravelly, lateritic, low-activity, lateritic clay soils rich in organic matter.
- The narrow valleys have similar but non-gravelly soils with impeded drainage conditions. Shorter dry period, absence of plinthite layer and higher soil organic matter distinguish the foothills from midland laterites.
- Plantations of rubber, coconut, pepper and coffee abound in the unit.
- Covers 3,15,893 ha (8.13 %) in the State.

AEU 13: Northern Foothills

- Represents foothills from Thrissur to Kasaragod and differs from its southern counterpart for longer dry period.
- Climate is tropical humid monsoon type (MAT 27.5 °C; rainfall 3462 mm).
- Strongly acid, gravelly, lateritic, low-activity, clay soils are rich in organic matter.
- Narrow valleys have similar, but non-gravelly, soils with impeded drainage conditions.
- Shorter dry period, absence of plinthite layer in soil and enhanced levels of organic matter distinguish the foothill soils from north central and northern midland laterites.
- Plantations of rubber, coconut, pepper and coffee are the major land use.
- The unit covers 1,44,181 ha (3.71 %) in the state

AEU 14: Southern High Hills

- Extends from Thiruvananthapuram to Nelliyampathy in Palakkad district has elevation more than 600 metres.
- Besides elevation, the steep slopes of the terrain and lower temperatures distinguish the high hills from the foothills and midlands.
- Climate is tropical humid monsoon type, but lower temperatures than in coastal plain and midlands (MAT 21.6 °C; rainfall 3602 mm).
- The steeply sloping hilly terrain has deep, well drained, strongly acid, organic-matter-rich clay soils.
- Forests cover major part of the unit, plantations of rubber, coconut, pepper, tea and coffee are not uncommon.
- Covers 6,72,675 ha (17.31 %) in the state.

AEU 15: Northern High Hills

- Extending from Thrissur to Kannur is similar to its southern counterpart except for the longer dry period. Climate is tropical humid monsoon type (MAT 26.2 °C; rainfall 3460 mm).
- The hilly terrain has deep, well drained, strongly acid, organic-matter-rich, clay soils.
- The valleys have deep, imperfectly drained, acid clay soils.
- Forests cover major part of the unit, plantations of rubber, coconut, pepper and coffee are grown.
- Covers 5,28,434 ha (13.60 %) in the state.

AEU 16: Kumily High Hills

- Represent low-rainfall parts of the High Hills zone
- Differs from Southern High Hills in the lower rainfall, and the extensive occurrence of very deep, non-gravelly clay soils.
- Covers parts of Peerumedu and Udumbanchola taluks of Idukki district
- Climate is tropical humid monsoon (mean annual temperature 22.5 °C; rainfall 1809 mm).
- Soils for most part are very deep, well drained, acid, non-gravelly, low-activity clay, rich in organic matter.
- Soils of highland valleys are similar, except for impeded drainage conditions.
- Plantations of cardamom, tea, coffee, and pepper are the major land use.
- forest cover is also substantial.
- Covers around 1,50,984 ha (3.81 %) in the state.

AEU 17: Marayur Hills

- Represent the low rainfall region (rain-shadow) of the high hill zone and comprises only three panchayats of Idukki district.
- The climate is tropical subhumid monsoon type (MAST 23.7 °C; rainfall 1276 mm).
- The unit distinguishes itself from other AEU's of high hill zone by the lower temperatures, low rainfall and better soil qualities.
- The fertile, deep, clay soils, rich in organic matter with favourable soil reaction (slightly acid to neutral) are well supplied with bases.
- Land use, besides forest, comprises temperate fruits, potato, sugarcane, temperate vegetables and rice. C
- Covers 28,968 ha (0.75 %) in the state.

AEU 18: Attappady Hills

- Spatially distributed as a narrow strip of land along the valley in central part of the hills in North Palakkad
- Represents land areas of comparatively low rainfall.
- It comprises parts of Sholayur and Agali panchayats.
- The climate is subhumid tropical monsoon type (mean annual temperature 24.3°C; rainfall 1482 mm).
- Other distinguishing feature is the fertile, near neutral to slightly alkaline clay soils rich in organic matter and bases.
- Land use is mainly coconut plantations, banana, vegetables, maize and rice.
- covers 8,872 ha (0.23 %) in the state.

AEU 19: Attappady Dry Hills

- Represents land areas of very low rainfall and dry period around eight months in a year.
- Comprises parts of Puthur, Agali and Sholayur in Palakkad
- Climate is tropical dry subhumid to semi-arid type (MAT 24.7 °C; rainfall 856 mm).
- Much of the rainfall is received from the NE monsoon.
- The hilly terrain has shallow, slightly acid or neutral, stony and gravelly clay soils.
- Sparse vegetation with thorny shrubs and occasional trees are the dominant land cover. Cultivation is confined to limited areas of valley lands and around tribal hamlets.
- The unit covers 18,495 ha (0.48 %) in the state.

AEU 20: Wayanad Central Plateau

- Represents highland plateau with low temperature and high rainfall.
- Covers 11 panchayats in Wayanad district.
- Climate is tropical humid monsoon type (MAT 22.6 °C; rainfall 2659 mm).
- Upland soils are deep, acid clays and are fairly rich in organic matter.
- Valley soils are similar, but suffer from impeded drainage conditions.
- Plantations of coffee, tea, coconut, arecanut and pepper are the dominant land use on uplands and rice and banana in lowlands.
- Forests cover a significant area.
- The unit covers 74,471 ha (1.92 %) in the state.

AEU 21: Wayanad Eastern Plateau

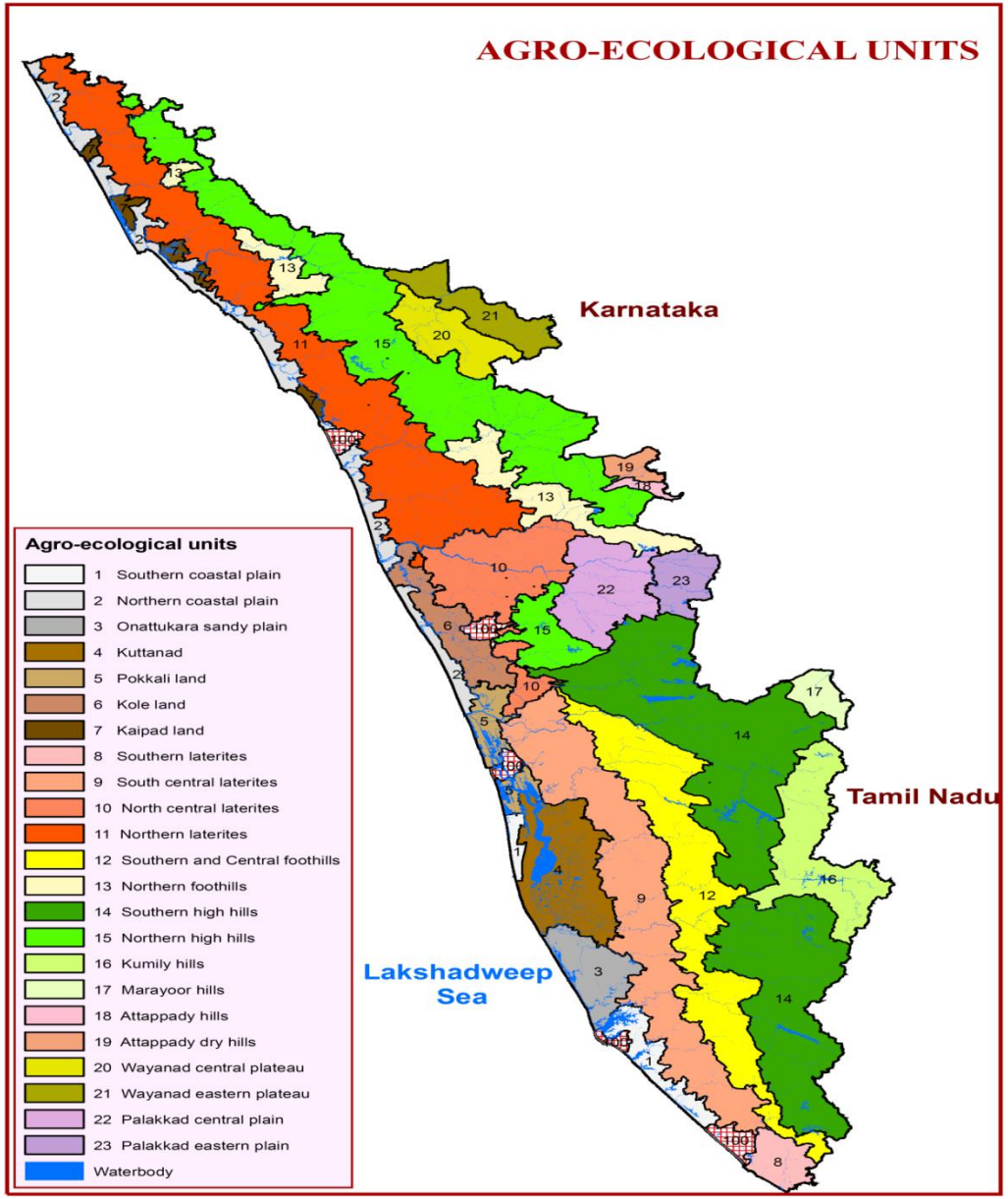
- Represents parts of the high land plateau with lower rainfall.
- Comprises 6 panchayats, one in Mananthavady taluk and rest in f Wayanad district.
- Climate is tropical subhumid to humid monsoon type (MAT 22.6 °C; rainfall 1394 mm).
- Differs from Central Plateau in having lower rainfall and longer dry period.
- Soils have favourable soil reaction (slightly acid to neutral), and are well supplied with bases. Plantations of coffee, tea, coconut, arecanut and pepper are the dominant land use on uplands and rice and banana in lowlands.
- Forests cover a significant area.
- The unit covers 70,325 ha (1.81 %) in the state.

AEU 22: Palalakkad Central Plain

- Represent the land areas of moderate rainfall and dry period around five months is transitional to the drier eastern plain and humid western parts (AEU 10).
- Climate is tropical subhumid to humid monsoon type (MAT 27.6 °C; rainfall 1966 mm).
- The deep, well drained upland soils are non-gravelly loams and clays. Soil reaction is slightly acid or neutral and the soils are well supplied with bases.
- The valley soils are similar, but with impeded drainage conditions.
- Coconut intercropped to a variety of annual and perennial crops is the major land use on uplands and rice in lowlands.
- The unit covers 1,12,957 ha (2.91 %) in the state

AEU 23: Palakkad Eastern Plains

- Represent the drier parts of eastern Palakkad plain in the gap region of Western Ghats, having low rainfall, long dry period and fertile soils.
- Climate is tropical dry subhumid monsoon type (MAT 27.6 °C; rainfall 1340 mm) and dry period around six months
- Uplands soils have slightly acid or neutral red clay soils well supplied with bases and plant nutrients. Lower parts of the uplands and lowlands have alkaline, swell-shrink clay soils.
- Soils are rich in bases and plant nutrients. Lowlands have impeded drainage.
- Coconut, arecanut and mango are the major plantation crops. Annual crops include rice, groundnut, cotton, banana, maize, jowar and sugarcane.
- The unit covers 47,049 ha (1.21 %) in the state.


AGRO-ECOLOGICAL UNITS
Karnataka
Tamil Nadu
Lakshadweep Sea
Agro-ecological units
1 Southern coastal plain
2 Northern coastal plain
3 Onattukara sandy plain
4 Kuttanad
5 Pokkali land
6 Kole land
7 Kaipad land
8 Southern laterites
9 South central laterites
10 North central laterites
11 Northern laterites
12 Southern and Central foothills
13 Northern foothills
14 Southern high hills
15 Northern high hills
16 Kumily hills
17 Marayoor hills
18 Attappady hills
19 Attappady dry hills
20 Wayanad central plateau
21 Wayanad eastern plateau
22 Palakkad central plain
23 Palakkad eastern plain
Waterbody

Southern Coastal Plain

Coconut Plantation -Uplands

Rice Cultivation- Low lands

Northern Coastal Plain

Coconut Plantation -Uplands

Rice Cultivation- Low lands

AEU 3 –Onattukara Sandy Plain -

Coconut Plantation -Uplands

Lowlands: fallow Rice field

AEU 4 - Kuttanad Landscape

AEU 5 - Pokkali Lands

AEU 6-Kole Lands- Landscape

AEU -7 Flooded Kaippad Lands

Rice field- with canal

Paddy field with soluble iron in water and soil

AEU -8 Southern Laterites

AEU -9 South Central Laterites

AEU 10 North Central Laterite

AEU – 11 Northern Laterite

AEU 12 South and Central Foot Hills

AEU 13 – Northern Foot Hills

AEU 14 Southern High Hills

AEU 15 - Northern High Hills

AEU 16 Kumuli High Hills

AEU 17- Marayur – Terraced landscape

AEU 17- Marayur Hills

Sugarcane field

Marayoor Valley

AEU- 18 Attapady Hills

AEU 19 Attappady Dry H ills

AEU -20 Wayanad Central Plateau

AEU-21 Wyanad Eastern Plateau- Low lands

AEU 22 -Palakkad Central Plain

Palakkad Plain – Transplanting of paddy seedlings

Reference

NBSS&LUP, 2011, Publ. No. 962, Agro-ecology of Kerala, National Bureau of Soil and Land Use Planning,Nagpur , India


Thank You