

LAND COVER AND LAND USE DESCRIPTIONS FOR CLASSIFICATION SYSTEM

1.1 Land Cover and Land Use

Land cover and land use are often used interchangeably but there is an important distinction between them. **Land cover** refers to the cover of the earth's surface, such as vegetation, bare soil, built-up (settlement), and so on, without reference to how that cover is used. **Land use** refers to the actual economic and/or cultural activity associated to the cover type, e.g. grazing, food production, logging.

In many cases land cover and land use are directly related; for example, grassland is a land cover which is generally associated with livestock grazing as the land use. Grassland could also be used to support wildlife when it is the cover in a game/wildlife reserve or park.

Generally, remote sensing data provides land cover images only. The use type of the cover in the imagery is known by field observation or checking with the imagery. This is known as '**ground truthing**'.

1.2 The Classification

The land cover and land use classification system for Ghana was developed specifically for the Ghana Environmental Resource Management Project (GERMP) by the Remote Sensing Applications Unit (RSAU). It was first presented in 1995 at a Workshop organised by RSAU to which all interested end-users were invited to present their comments. The system that was agreed upon has been tried through field visits. Its original layout has been largely retained; new uses would be incorporated into the original frame.

The classification system has a hierarchical structure, which accommodates different levels of information starting with broad-level classes structured to allow further subdivision into more detailed sub-classes. The system can be applied for

mapping at scales ranging from 1/25,000 down to small scales. Four levels are recognized; the first two levels corresponding to land cover categories, and the third and fourth corresponding to the land use categories and sub-categories respectively.

- Level I: Principal vegetative and non-vegetative landscape cover
- Level II: Sub-categories of the principal vegetative and non-vegetative covers defined in terms of formation characteristics, canopy closure, tree stand density, and dominant life form.
- Level III: Land use defined in terms of the major management systems
- Level IV: Land use categories defined in terms of products and services.

The Coding System

For the map symbolization and the database development, a coding system has been developed for the nine cover/use categories. It is a four -digit (numerical) system, ranging from 1000 to 9000 for the Level I, 1100 – 9900, for level II, 1110 to 9990 for level III and 1111 to 9999 for Level IV.

The nine categories at Level I are:

1000	Agricultural Land
2000	Forest
3000	Savanna Woodland
4000	Shrub-thicket

5000	Non-biotic
6000	Bare land
7000	Water body
8000	Wetland
9000	Unclassified

Level II is a sub-category land cover of Level I. For example, 1100 is Agricultural land in the Forest region. 1110 is a plantain agriculture in the Forest Region Agricultural land. 1111 is cocoa plantain within the Agricultural Land in the Forest region.

The Legend therefore reflects both land cover/land use and the ecological context of the specific use type.

1.3 Terminology

The legend has employed some common terms, which need to be defined in order to minimize ambiguities: The basic terms refer to the nine categories of Land Cover:

1.3.1 1000 Agricultural land

The map unit referred to as Agricultural land is where over 50% of the unit is under agriculture. This may be currently cropped or lie fallow; it may include areas used for grazing of livestock. Level II agricultural land is according to the vegetation type within which it occurs. Level III agricultural land will refer to the management type – plantation, mixed cropping, etc. Level IV refers to the crop type, crop mixture.

1.3.2 Forest

The map unit refers to continuous, multi-storied stand of trees at least 5m high with interlocking crowns, usually lacking a grass ground cover. Forest is sub-categorized at Level II into “closed canopy” where the canopy cover exceeds 60% (>60% canopy cover), and “open canopy” where the canopy cover is less than 60% (<60% canopy cover).

1.3.3 3000 Savanna

Savanna has been mapped as an area of land comprising a mixture of woodland (a single storied of trees less than 5m high), and/or bushes (woody plant with multiple stems, usually over 2m tall), and/or shrubs (woody plant with multiple stems, usually less than 2m tall), and/or grassland with or without scattered cultivation. Savanna is sub-divided at level II into closed (more than 150 trees/ha) and open (less than 150 trees/ha) woodland, grassland and riverine vegetation. It covers both the coastal and inland savannas.

1.3.4 4000 Shrub thicket

Areas which have been mapped as shrub thicket are dominated by dense shrubs in association with grassland. The coastal thicket on the high ground of the coastal savanna of the Winneba-Accra-Lower Volta Plains are in this category. The zone between Cape Coast and Winneba is included.

1.3.5 5000 Non biotic constructed surfaces

The non-biotic map units refer to surfaces modified by construction activities of man. Such surfaces are referred to as “built-up” and associated with settlements, roads, airfields, etc. Though such surfaces are noted for their compacted surfaces, which prevent seepage, the map unit may generally include man-made or man-allowed landscaping vegetation, pond, etc as ornamentals.

1.3.6 6000 Bare land

Bare land map unit refers to surfaces which are devoid of vegetation cover, either naturally (rock, sand) or through the results of human activity (erosion, mining, road construction, etc). The sub-types include stone quarry, sand winning, and mineral mining. Bare land will include also the surfaces eroded including laterite surfaces, sand deposits like shore line (beach) and salt flats used for salt winning.

1.3.7 7000 Water bodies

The free water surfaces of rivers, ponds, lakes and lagoons are mapped as water bodies where they are wide enough to be delineated as map units.

1.3.8 8000 Wetland

Where the water table is at or near the surface, such as marshland, swamp, it is mapped as wetland. It could be seasonal, tidal or permanent. The sub-categories include inland and coastal marshes and swamps. The vegetation could be mangrove and sedges. Wetlands may be for wildlife (birdlife), fuelwood, fishing, etc.

1.3.9 9000 Unclassified

Mapping with satellite images has limitations. Cloud cover is one of them when it masks the cover type image. Bush fire obliterates the vegetal cover. Where the cover type is either masked or obliterated so that the natural class of cover cannot be assigned, the map area is deemed unclassified.

A few terms have been used which apply to Levels II and III cover /use types. They are the following:

1.3.10 Bush Fallow Cropping

It is a system of farming in which the farmer relies mainly on the natural re-growth of the vegetation to restore the fertility of the soil and control of weeds. The degree of restoration of fertility depends upon the length of the fallow period and the composition of the fallow vegetation. "Land rotation" and "recurrent cultivation" are other terms used to describe the system. "Shifting cultivation" is a variant of the bush fallow system, where the farmer relocates with the dwelling/household to cultivate fresh areas, and may come back to the abandoned field with the dwelling/household after a long period. Population pressure and property boundary consolidation are some of the factors that have eliminated the classical shifting cultivation.

1.3.11 Short and Long Fallows

In the bush fallow system, the intensity of cultivation is indicated by the length of the period of the fallow. The legend uses **short fallows** to imply a cultivation factor <33%, while for **long fallows** the factor is >33%-66%. The cultivation factor is calculated as the ratio of the years under cropping between the total length of the cropping and the fallow cycle. It has been suggested that, adequate fallow periods in the forest and savanna ecological areas should be 5 and 15 years

respectively. The legend has taken 3 years as the cut-off between short and long fallows. This is a strategy to facilitate image detection of short and long fallow cover types.

1.3.12 The Bush Fallow and associated vegetation

The fallow cover types

The term bush fallow is in the context of the natural/derived vegetation, such as the following:

- **Grass/herb fallow with/without scattered trees**

It is of grass and other herbaceous forb-regrowth scattered trees.

- **Dense herb/bush fallow**

It is mainly in the forest and the transition zone between the forest and the savanna environment where the original forest trees have given way to secondary species and dense undergrowth of shrubs and tall grasses.

- **Mosaic of thickets and grass**

The original scrub vegetation has given way to thicket and grass. It is mainly in the coastal shrub and savanna zone.

- **Closed savanna woodland fallow**

The woodland tree density is more than 150 trees/ha

- **Open savanna woodland fallow**

The woodland tree density is between 75-150 trees/ha

- **Widely open savanna woodland fallow**

The woodland tree density is between 10-75 trees/ha, giving a general landscape view of parkland

1.3.13 Compound Farming

The permanent cultivation of crops immediately around dwelling units and groups of them known as “compounds”. Cultivation is intensive, made possible by the use of household refuse for manure, particularly in the dispersed settlement areas of the northern parts of Ghana.

3.14 Mixed Cropping

The cultivation of more than one crop on the same piece of land, in a complex mixture at the same time. Mixed cropping may be arable crops, (maize, cassava, vegetables) tree crops (oil palm, citrus, mango), and mixed tree and arable crops. Some crops may be self-sown but tended by the farmer, for instance the fruit trees; others may be ratoon such as sugar cane and plantain.

1.3.15 Gathering

This is a form of land use activity in Ghana, in which a wide variety of wild produce and wildlife are collected from the forests, savannas, wetlands and water bodies. Basically it is for household subsistence and the surplus for cash income to the household, but gathering on commercial basis is growing as a means of rural alternative seasonal self-employment. The products include fuelwood, honey, medicinal herbs, fodder, thatch and meat. Gathering is done primarily in the “open access” areas, but some of the statutory reserved areas are periodically allowed to be accessed. There are also the traditional reserves (the grooves), which provide medicinal herbs and serve as sanctuary for some wildlife, such as snails in the humid south, and rodents in the savannas.

1.3.16 Open Access

Open access describes areas that are not subject to restrictions as to entry to exploit the products and resources by members of the community. Resources exploited include wood for fuel and construction, mushroom, snails, game animal, medicinal herbs, fodder, etc.

1.3.17 Reserved

In contrast to “open access,” reserves are areas that have been gazetted and designated as Forest Reserves and Wildlife Parks. There is restriction on use of such areas. Reserves may be the high forest, savanna woodland or shrub-thicket depending upon the ecological zone situation. The cover vegetation within has been mapped according to the conditions as portrayed in the imagery.

1.3.18 Mosaic of grass and thicket and crop cover

Applies to a cover of shrub thicket and grassland, where neither of the two can be a separate map unit.

1.4 Tree Density and Canopy Cover of the Vegetation

Tree densities and canopy cover have been estimated with image and field information. Four sub-categories have been considered, namely:

- Less than 10 trees/ha (<10 trees/ha)
- 10 – 75 trees/ha

- 75 – 150 trees/ha
- More than 150 trees/ha (>150 trees/ha)

1.5 Sub-Classes considered in the Mapping Exercise

1.5.1 Agricultural land

Fifty-six (56) sub-classes of agricultural land were mapped, which covered various crop mixtures, fallow types (natural vegetation) and length of the fallow. A summary of the classes are:

- Tree crops of the high forest
- Non-tree mono crop
- Irrigation crop
- Livestock (grazing land)
- Mixed arable crops and fallows (high forest region)
- Mixed arable and tree crops
- Sub-canopy cropping
- Mixed arable crops and fallows (Savanna woodland region)
- Mixed arable crops and fallows (grassland, thicket)

1.5.2 Forest

Eight (8) classes were mapped, which included closed, and open canopies, open-access, reserves and plantations.

1.5.3 Savanna Woodland and Riparian Vegetation

National land cover land use classification scheme for Ghana (1999)
Ghana Environmental Resource Management Project

Thirteen (13) classes were mapped, reflecting on reserves, open access on one hand, and density of tree per hectare on the other hand.