Table 1. The Complete Attribute-Coding System: Mapping physical attributes to symbolic codes for all land cover classes

Module	Code	Attribute	Explanation
I. A. Main Crops	A11-A1	Trees	Applies to Cultivated & Managed Land
	A11-A2	Shrubs	
	A11-A3	Herbaceous	
	A11-A4	Graminoids (Grasses)	
	A11-A5	Non-graminoids (Forbs)	
	A11-A6	Urban Vegetated Areas	
	A11-A7	Broadleaved	
	A11-A8	Needleleaved	
	A11-A9	Evergreen	
	A11-A10	Deciduous	
	A11-A11	Parks	
	A11-A12	Open Areas w/ Veg.	
	A11-A13	Lawns (Grass)	
B. Area Size	A11-B1	Large-to-Medium Area	Spatial characteristic for Cultivated Land
	A11-B2	Small Area	
	A11-B3	Large Area	
	A11-B4	Medium Area	
B. Distribution	A11-B5	Continuous	Spatial pattern for Cultivated Land
	A11-B6	Clustered / Dispersed	
	A11-B7	Isolated / Dispersed	
II. C. Crop Comp.	A11-C1	Single Crop	Composition structure
	A11-C2	Multiple Crops	
	A11-C3	One Additional Crop	
	A11-C5	Trees	Crop type composition
	A11-C6	Shrubs	
	A11-C7	Terrestrial Herbs	
	A11-C8	Aquatic Herbs	
	A11-C13	Trees (Distribution)	
	A11-C14	Shrubs (Distribution)	
	A11-C15	Graminoids (Dist.)	
	A11-C16	Non-graminoids (Dist.)	
	A11-C17	Simultaneous	Temporal cropping pattern
	A11-C18	Intercropping	
	A11-C19	Crop Rotation	
III. D. Water	A11-D1	Rainfed	Water source for cultivation
	A11-D2	Post-flooding	
	A11-D3	Irrigated	
	A11-D4	Surface Irrigation	Irrigation method
	A11-D5	Sprinkler Irrigation	
	A11-D6	Drip Irrigation	
D. Period	A11-D7	Shifting Cultivation	Cultivation period type
	A11-D8	Fallow Period	
	A11-D9	Permanent Cultivation	
S. Crop Type	A11-S1	Food Crops	General crop category
	A11-S2	Non-Food Crops	

Table 1 – Continued

Module	Code	Attribute	Explanation
	A11-S3	Cereals	Specific crop type
	A11-S4	Roots and Tubers	
	A11-S5	Legumes and Vegetables	
	A11-S6	Fruits and Nuts	
	A11-S7	Fodder	
	A11-S8	Beverages/Stimulants	
	A11-S9	Industrial Crops	
	A11-S10	Timber	
	A11-S11	Bio-filtering Crops	
	A11-S12	Fibre/Structural Crops	
	A11-S13	Others (Food)	
	A11-S14	Others (Non-Food)	
1. A. Main Layer	A12-A1	Woody	Applies to Natural Terrestrial & Aquatic
	A12-A2	Herbaceous	
	A12-A3	Trees	
	A12-A4	Shrubs	
	A12-A5	Non-graminoids (Forbs)	
	A12-A6	Graminoids (Grasses)	
	A12-A7	Lichens/Mosses	
	A12-A8	Rooted (Aquatic)	Applies to Natural Aquatic
	A12-A9	Free-floating (Aquatic)	
	A12-A10	Lichens	Applies to Natural Terrestrial
	A12-A11	Mosses	
A. Veg. Cover	A12-A10	Dense (>70-60%)	Cover density bracket
	A12-A11	Open (70-60-20-10%)	
	A12-A12	Natural/High Cover	
	A12-A13	Lower/Open (40-20-10%)	
	A12-A14	Sparse (20-10-1%)	
	A12-A15	Very Sparse (<10%)	
	A12-A16	Scattered (4-1%)	
	A12-A17	Very Low (<10%)	
	A12-A18	Scattered (4-1%)	
	A12-A20	Dense-Open (100-15%)	
	A12-A21	(100-40%)	
B. Height (1st)	A12-B1	7-2 m (Woody)	Height class for 1st layer
	A12-B2	>30-3 m (Trees)	
	A12-B3	5-0.3 m (Shrubs)	
	A12-B4	3-0.03 m (Herbaceous)	
	A12-B5	>14 m	
	A12-B6	14-7 m	
	A12-B7	7-3 m	
	A12-B8	5-2 m	
	A12-B9	2-0.5 m	
	A12-B10	<0.5 m	
	A12-B11	3-0.8 m	
	A12-B12	0.8-0.3 m	
	A12-B13	0.3-0.03 m	
	A12-B14	5-0.5 m	
	A12-B15	3-0.3 m	
C. Horiz. Dist.	A12-C1	Continuous	Horizontal pattern
	A12-C2	Fragmented	

Table 1 – Continued

Module	Code	Attribute	Explanation
	A12-C3	Park-like Patches	
	A12-C4	Strip-like	
	A12-C5	Reticulate	
II. C. Water	A12-C1-W	> 3 months/year	Water persistence duration
	A12-C2-W	< 3 months/year	
	A12-C3-W	Waterlogged	Water regime
	A12-C4-W	Daily (Tidal)	
	A12-C5-W	Diurnal Variation	
II. D. Leaf Type	A12-D1	Broadleaved	Leaf morphology
	A12-D2	Needleleaved	
	A12-D3	Aphyllous (Leafless)	
E. Phenology	A12-E1	Evergreen	Leaf phenology status
	A12-E2	Deciduous	
	A12-E3	Semi-evergreen (Mixed)	
	A12-E4	Semi-deciduous (Mixed)	
	A12-E5	Mixed (Graminoid/Forb)	
	A12-E6	Annual	
	A12-E7	Perennial	
III. F. 2nd Layer	A12-F1	No Second Layer	Vertical stratification status
	A12-F2	Has Second Layer	
	A12-F3	Woody	Composition of 2nd layer
	A12-F4	Trees/Herbaceous	
	A12-F5	Shrubs	
	A12-F7	Dense-Open	Cover of 2nd layer
	A12-F8	Dense (>70-60%)	
	A12-F9	Open (70-60-20-10%)	
	A12-F10	Sparse (20-10-5%)	
G/H. 2nd Height	A12-G1	Height 7-2 m (Woody)	Height class for 2nd layer
	A12-G2	Height >30-3 m	
	A12-G3	Height 5-0.3 m	
	A12-G4	Height 3-0.03 m	
	A12-G5	Height >14 m	
	A12-G6	Height 14-7 m	
	A12-G7	Height 7-3 m	
	A12-G8	Height 5-2 m	
	A12-G9	Height 2-0.5 m	
	A12-G10	Height <0.5 m	
	A12-G11	Height 3-0.3 m	
	A12-G12	Height 0.3-0.03 m	
F. 3rd Layer	A12-F1-3	No Third Layer	Vertical stratification status
	A12-F2-3	Has Third Layer	
	A12-F3-3	Woody	Composition of 3rd layer
	A12-F4-3	Trees/Herbaceous	
	A12-F5-3	Shrubs	
	A12-F7-3	Dense-Open	Cover of 3rd layer
	A12-F8-3	Dense (>70-60%)	
	A12-F9-3	Open (70-60-20-10%)	
	A12-F10-3	Sparse (20-10-5%)	
T. Species	A12-T1	Single Species	Species floristic aspect
	A12-T2	Group of Species	

Table 1 – Continued

Module	Code	Attribute	Explanation
	A12-T3	Dominant Species	
	A12-T4	Most Frequent Species	
	A12-T5	Statistically Inferred	
	A12-T6	Non-statistically Inferred	
L. A. Surface	B15-A1	Built-up Area	Applies to Artificial Surfaces
	B15-A2	Non-built-up Area	
	B15-A3	Linear	
	B15-A4	Non-linear	
	B15-A5	Dump Sites	
	B15-A6	Extraction Sites	
	B15-A7	Roads	
	B15-A8	Paved	
	B15-A9	Unpaved	
	B15-A10	Railways	
	B15-A11	Pipelines/Comm. Lines	
	B15-A12	Industrial/Other Areas	
	B15-A13	Urban Areas	
A. Cover/Density	B15-A14	High Density	Density of artificial structures
	B15-A15	Medium Density	
	B15-A16	Low Density	
	B15-A17	Sparse	
	B15-A18	Scattered (4-1%)	
Env. Attributes	B15-L	Landform	Environmental element
	B15-O	Climate	
	B15-P	Altitude	
L. A. Surface	B16-A1	Consolidated Surface	Applies to Barren Land
	B16-A2	Unconsolidated Surface	
	B16-A3	Bare Rock/Fragments	
	B16-A4	Hardpans	
	B16-A5	Bare Soil	
	B16-A6	Loose/Shifting Sands	
	B16-A7	Bare Rock	
	B16-A8	Gravels/Stones	
	B16-A9	Iron-rich/Lateritic	
	B16-A10	Calcareous	
	B16-A11	Gypsiferous	
	B16-A12	Stony Surface (5-40%)	
	B16-A13	Very Stony (40-80%)	
	B16-A14	Gravels	
	B16-A15	Stones	
	B16-A16	Boulders	
II. B. Pattern	B16-B1	Dunes	Macroscopic surface pattern
	B16-B2	Barchan Dunes	
	B16-B3	Parabolic Dunes	
	B16-B4	Longitudinal Dunes	
	B16-B5	Dark (Soil)	
	B16-B6	Dark (Sand)	
	B16-B7	Dark	
	B16-B8	Light-colored	
	B16-B9	Light-colored	
	B16-B10	Light-colored	
	B16-B11	Clay Pans/Depressions	
	B16-B12	Termite Mounds	

Table 1 – Continued

Module	Code	Attribute	Explanation
	B16-B13	Salt Flats	
Env. Attributes	B16-L	Landform	Environmental element
	B16-O	Climate	
	B16-P	Altitude	
	B16-Q	Erosion	
	B16-U	Vegetation presence	
L. A. Physical	B27-A1	Water	Applies to Water/Snow/Ice
	B27-A2	Snow	
	B27-A3	Ice	
	B27-A4	Flowing	Water flow status
	B27-A5	Standing	
	B27-A6	Moving	Ice/Snow status
	B27-A7	Stationary	
B. Persistence	B27-B1	Perennial (>9 Mo)	Water duration
	B27-B7	9-7 Months	
	B27-B8	6-4 Months	
	B27-B9	3-1 Months	
	B27-B2	Non-perennial	
	B27-B3	Tidal Area	
II. C. Depth	B27-C1	Deep to Medium	Water body depth
	B27-C2	Shallow	
D. Sediment	B27-D1	Almost No Sediment	Suspended solids
	B27-D2	High Sediment	
V. Salinity	B27-V1	Fresh (<1000 ppm)	Water quality
	B27-V2	Slightly Saline	
	B27-V3	Moderately Saline	
	B27-V4	Highly Saline	
	B27-V5	Brine	
Env. Attributes	B27-O	Climate	Environmental element
	B27-P	Altitude	

Table 2. The Attribute-Driven Hierarchy: Deriving multi-level classes through attribute combinations.

Code	L1 Class	L2 Class	L3 Class	Attribute-code combination
0100	Cultivated Land			A11 A1 A2 A3 C19
0110		Paddy Field		A23 D3 S3 S13
0120		Dry Land		A11 S3 S4 S5
0130		Orchards		A11 A1 A2 A3 B5 S6
0131			Arbor/Shrub Orchard	A11 A1 A2 S6
0132			Vine Orchard	A11 A1 D9 S6
0133			Herbaceous Orchard	A11 A3 D9 S6
0140		Tea Garden		A11 A2 B5
0150		Mulberry Field		A11 A1 A7 B5 S7
0160		Rubber Plantation		A11 A1 B5
0170		Nursery		A11 A1 B5
0180		Flower Nursery		A11 A3 B5

Table 2 – Continued

Code	L1 Class	L2 Class	L3 Class	Attribute-code combination
0190		Other Economic Crops		A11 A1 A2 A3 B5 D9
0191			Other Arbor/Shrub	A11 A1 A2 B5
0192			Other Vine	A11 A1 B5
0193			Other Herbaceous	A11 A2 A3 B5
0300	Forest & Grass			A12 A1 A2 C1
0310		Arbor Forest		A12 A1 A10 B1 C1
0311			Broadleaf Forest	A12 A3 A10 D1 E1 E2
0312			Coniferous Forest	A12 A3 A10 D2
0313			Mixed Forest	A12 A3 A11 D1 D2
0320		Shrub Forest		A12 A4 A13 B3
0321			Broadleaf Shrub	A12 A4 B3 D1
0322			Coniferous Shrub	A12 A4 B3 D2
0323			Mixed Shrub	A12 A4 A11 D1 D2
0330		Mixed Arbor-Shrub		A12 A3 A4 A13
0340		Bamboo Forest		A12 A1 D1 D2
0350		Sparse Forest		A12 A1
0360		Greening Woodland		A12 A3 C4 C3
0370		Young Plantation		A12 A3 A14
0380		Sparse Shrub-Grass		A12 A4 A13
0390		Natural Grassland		A12 A2 A1 A15
0391			High-Coverage Grass	A12 A2 A12
0392			Med-Coverage Grass	A12 A2 A11
0393			Low-Coverage Grass	A12 A2 A14
03A0		Artificial Grassland		A12 A2 A1 A15
03A1			Pasture	A12 A2
03A2			Landscaped Grass	A12 A2 C3
03A3			Sand-Fixation Grass	A12 A4 A2
03A4			Slope Protection	A12 A4 A2 C5
03A9			Other Artificial Grass	A12 A2
0500	Buildings			B15 A1 A13
0510		Multi-story Area		B15 A13
0511			High-Density Multi	B15 A14
0512			Low-Density Multi	B15 A16
0520		Low-rise Area		B15 A15
0521			High-Density Low	B15 A14
0522			Low-Density Low	B15 A16
0530		Abandoned Buildings		B15 A13
0540		Multi-story Indiv.		B15 A13
0541			Multi-story Indiv.	B15 A13
0542			Mid-High Indiv.	B15 A13
0543			High-rise Indiv.	B15 A13
0544			Super-High Indiv.	B15 A13
0550		Low-rise Indiv.		B15 A13
0600	Roads & Rail			B15 A7 A10
0610		Railway		B15 A10
0620		Highway		B15 A7
0630		Urban Road		B15 A7
0640		Rural Road		B15 A7
0650		Ramp		B15 A7
0700	Structures			B15 A12
0710		Hardened Surface		B15 A12
0711			Square/Plaza	B15 A12 B

Table 2 – Continued

Code	L1 Class	L2 Class	L3 Class	Attribute-code combination
0712			Open Stadium	B15 A12 B
0713			Open Parking	B15 A12 B
0714			Apron & Runway	B15 A12 B
0715			Hardened Slope	B15 A12 B
0716			Threshing Floor	B15 A12 B
0717			Open Storage	B15 A12 B
0718			Compacted Earth	B15 A12 B
0719			Other Hardened	B15 A12
0720		Hydraulic Struct.		B15 A12
0721			Dam	B15 A12 B
0722			Sluice Gate	B15 A12 B
0723			Pumping Station	B15 A12 B
0729			Other Hydraulic	B15 A12 B
0730		Transport Facilities		B15 A1
0731			Tunnel	B15 A1 B
0732			Bridge	B15 A1 B
0733			Dock/Wharf	B15 A1 B
0734			Ferry Terminal	B15 A1 B
0735			Highway Entrance	B15 A7 B
0736			Gas/Charge Station	B15 A1 B
0737			Overpass	B15 A1 B
0740		City Wall		B15 A1 B
0750		Greenhouse		B15 A1 B
0760		Hardened Pool		B15 A1
0761			Swimming Pool	B15 A1 B
0762			Sewage Pool	B15 A1 B
0763			Salt Pan	B15 A1 B
0769			Other Pool	B15 A1 B
0770		Industrial Facility		B15 A12
0780		Sand Barrier		–
0790		Other Structures		B15 A1
0800	Piles & Digging			B15 A6
0810		Open-pit Mine		B15 A6
0811			Coal Mine	B15 A6
0812			Iron Mine	B15 A6
0813			Copper Mine	B15 A6
0814			Quarry	B15 A6
0815			Rare Earth Mine	B15 A6
0819			Other Mines	B15 A6
0820		Piles		B15 A5
0821			Tailings	B15 A5
0822			Garbage Dump	B15 A5
0829			Other Piles	B15 A5
0830		Construction Site		B15 A12
0831			Demolition Site	B15 A12
0832			Building Site	B15 A12
0833			Road Site	B15 A12
0839			Other Site	B15 A12
0890		Other Piles/Digs		B15 A2
0900	Desert & Barren			B16 A2
0910		Saline-Alkali Land		B16 A2
0920		Mudflat		B16 A5
0930		Sandy Land		B16 A6

Table 2 – Continued

Code	L1 Class	L2 Class	L3 Class	Attribute-code combination
0940		Gravel Land		B16 A15
0950		Rocky Land		B16 A7
1000	Water Bodies			B28 A1
1010		River/Canal		B28 A1
1011			River	B28 A1
1012			Canal	B28 A1
1020		Lake		B28 A1
1030		Reservoir/Pond		B27 A1
1031			Reservoir	B27 A1
1032			Pond	B27 A1
1040		Sea Surface		B28 A1
1050		Ice and Snow		B28 A2 A3 B1
1051			Glacier	B28 A6 B1
1052			Permanent Snow	B28 A2 B1